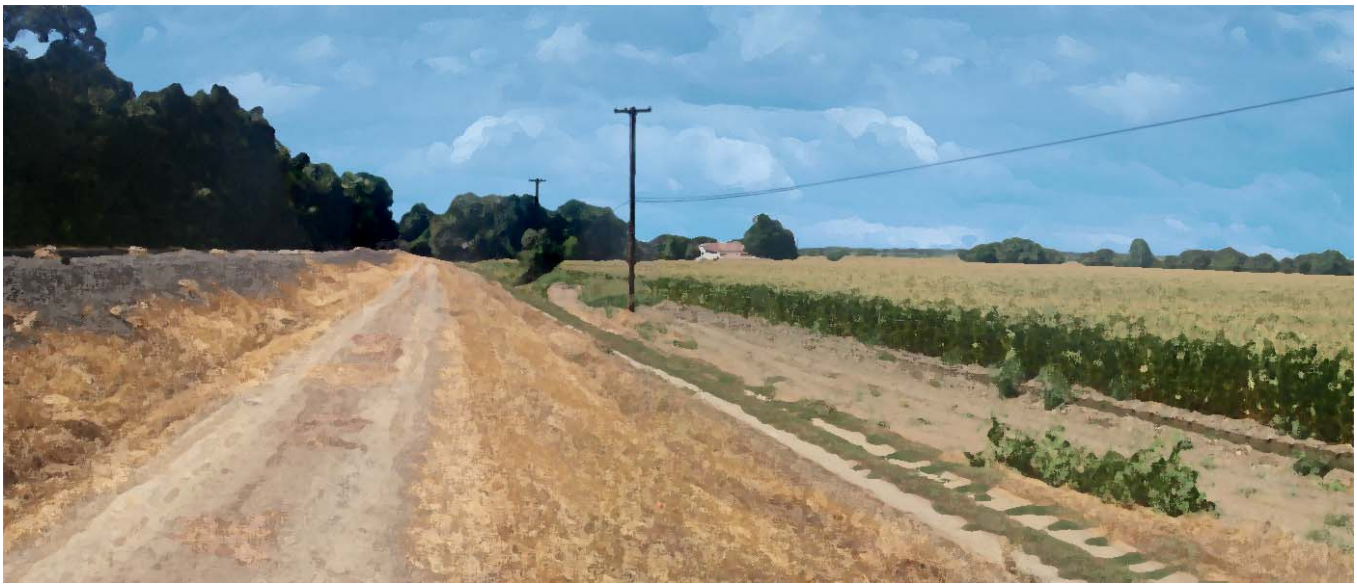
Draft Environmental Impact Statement



408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project, Sacramento, CA

US Army Corps of Engineers ®
Sacramento District

June 2008

Draft Environmental Impact Statement

408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project, Sacramento, CA

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June 2008

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408 PERMISSION AND 404 PERMIT
TO SACRAMENTO AREA FLOOD CONTROL AGENCY
FOR THE NATOMAS LEVEE IMPROVEMENT PROJECT, SACRAMENTO, CA

DRAFT ENVIRONMENTAL IMPACT STATEMENT

JUNE 2008

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

Abstract:

The Sacramento Area Flood Control Agency (SAFCA) is proposing the Natomas Levee Improvement Program (NLIP) Landside Improvements Project, consisting of early implementation (2008–2010) improvements to the perimeter levee system of the Natomas Basin in Sutter and Sacramento Counties, California, and associated landscape and irrigation/drainage infrastructure modifications. This EIS considers the early implementation project in its entirety, with the 2008 construction phase addressed in detail and the 2009 and 2010 construction phases addressed at a general, programmatic level. The 2008 construction phase would be initiated in 2008 and completed in 2009.

To implement the proposed improvements, SAFCA is requesting permission from USACE pursuant to Section 14 of the Rivers and Harbors Act of 1899 (33 United States Code [USC] 408, hereinafter referred to as "Section 408") for alteration of Federal Project levees, and under Section 404 of the Clean Water Act (33 USC 1344) for the placement of fill in jurisdictional waters of the United States. Permission under Section 10 of the Rivers and Harbors Act (33 USC. 403) would also be required where work would be performed in, under, or over navigable waters.

The EIS describes the flood control and related problems and needs that would be addressed by the proposed early implementation project, identifies the proposed action (Alternative 1) and alternatives to the proposed action, and presents an analysis of the environmental impacts and mitigation associated with the proposed action and alternatives. The action alternatives would result in unavoidable significant adverse effects to agricultural resources, aesthetics, transportation and circulation, noise, air quality, and potentially to cultural resources.

Public Review and Comment:

The public comment period for the EIS begins on June 13, 2008 and closes on July 28, 2008. For further information regarding the EIS, please contact Elizabeth Holland, USACE Sacramento District, Planning Division, 1325 J Street, Sacramento, CA, 95814, or email Elizabeth.G.Holland@usace.army.mil.

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ACRONYMS AND ABBREVIATIONS

µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
µin/sec	microinch per second
µS/cm	microSiemens per centimeter
AB	Assembly bill
AC	Advisory Circulars
ACHP	Advisory Council on Historic Preservation
ADT	average daily traffic
afy	acre-feet per year
AG-20	20 Acre Minimum Parcel Size
AG-80	Agriculture–80 Acre Minimum Parcel Size
AG-RC	Agriculture–Rural Community
Airport	Sacramento International Airport
ALUC	airport land use commission
AQAP	air quality attainment plan
AQMD	air quality management district
ARB	California Air Resources Board
ARWI	American River Watershed Investigation
ASTM	American Society for Testing and Materials
ATCM	Airborne Toxics Control Measure
BACT	best available control technology
Bank Protection EIR	*Draft Environmental Impact Report on Natomas Levee Improvement Program Bank Protection Project*
basin plan	water quality control plan
Basin Plan	*Water Quality Control Plan for the Sacramento and San Joaquin River Basins*
Bay-Delta	San Francisco Bay/Sacramento–San Joaquin Delta
BMP	best management practice
B.P.	Before Present
Bypass	Sacramento River and the Yolo Basin (
ºC	degrees Celsius
CAA	Clean Air Act
CAAA	Clean Air Act Amendments of 1990
CAAQS	California ambient air quality standards
Cal/EPA	California Environmental Protection Agency
Cal/OSHA	California Occupational Safety and Health Administration
Caltrans	California Department of Transportation
CAR	California Association of Realtors
CB	cement-bentonite
CCAA	California Clean Air Act
CCR	California Code of Regulations
CDF	California Department of Forestry and Fire Protection
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CHABA	Committee of Hearing, Bio Acoustics, and Bio Mechanics

City	City of Sacramento
CLUP	*Sacramento International Airport Comprehensive 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
Comprehensive Study	Sacramento and San Joaquin River Basins California Comprehensive Study
Cortese list	California Department of Toxic Substances Control Hazardous Waste & Substances Site
CTR	California Toxics Rule
cu. yd.	cubic yards
CWA	Clean Water Act
dB	decibel(s)
dBA	A-weighted decibel(s)
DEIR	draft environmental impact report
Delta	Sacramento–San Joaquin Delta
DFG	California Department of Fish and Game
DOC	dissolved organic carbon
DOT	U.S. Department of Transportation
DPS	Distinct Population Segments
DSM	deep soil mixing
DTSC	California Department of Toxic Substances Control
DWR	California Department of Water Resources
EDR	Environmental Data Resources, Inc.
EFH	essential fish habitat
EHS	Sutter County Environmental Health Services Department
EIR	environmental impact report
Elkhorn Canal	Elkhorn Main Irrigation Canal
EMD	Sacramento County Environmental Management Department
EPA	U.S. Environmental Protection Agency
EO	Executive Order
ER-L	Effects Range–Low
ER-M	Effects Range–Median
ESA	federal Endangered Species Act
ESU	Evolutionarily Significant Unit
ºF	degrees Fahrenheit
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FBI	Federal Bureau of Investigation
FEIR	final environmental impact report
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIP	Federal Implementation Plan
FIRM	Flood Insurance Rate Map
FMMP	Farmland Mapping and Monitoring Program
FPP	Farmland Protection Program

FPPA	Farmland Protection Policy Act
FR	*Federal Register*
FRAQMD	Feather River Air Quality Management District
FTA	Federal Transit Administration
FWCA	Fish and Wildlife Coordination Act
GGS/Drainage Canal	canal designed to provide giant garter snake habitat and convey drainage
GHG	greenhouse gas
GRR	General Re-evaluation Report
HAP	hazardous air pollutant
hp	horsepower
HPMP	Historic Property Management Plan
HRA	health risk assessment
HUD	U.S. Department of Housing and Urban Development
H:V	horizontal-to-vertical
I-	interstate highway
in/sec	inches per second
IWM	instream woody material
Joint Vision	*North Natomas Joint Vision Plan*
kV	kilovolt(s)
L_{dn}	day-night average noise level
L_{eq}	energy-equivalent noise level
LESA	Land Evaluation and Site Assessment
LAFCo	Sacramento County Local Agency Formation Commission
lb/day	pounds per day
lb/in	pounds per inch
L_{max}	Maximum Noise Level
L_{min}	Minimum Noise Level
LNWI	Lower Northwest Interceptor
Local Funding EIR	*Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area*
LOS	level of service
LSCE	Luhdorff & Scalmanini, Consulting Engineers
L_X	noise level exceeded X% of a specific period of time
M	(earthquake) magnitude
MACT	maximum available control technology
masl	meters above sea level
mbsl	meters below sea level
MBTA	Migratory Bird Treaty Act
MCL	maximum contaminant level
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
MLD	Most Likely Descendant
mm	millimeter(s)

msl	mean sea level
MVA	megavolt ampere(s)
N	nitrogen
NA	not available
NAAQS	national ambient air quality standards
NAHC	Native American Heritage Commission
NALP	North Area Local Project
NBHCP	Natomas Basin Habitat Conservation Plan
NCC	Natomas Cross Canal
NCC Phase 1 Improvements	Natomas Cross Canal South Levee Phase 1 Improvements
NCIC	North Central Information Center
NEIC	Northeast Information Center
NEMDC	Natomas East Main Drainage Canal
NEPA	National Environmental Policy Act
NESHAP	national emissions standards for hazardous air pollutants
NFIP	National Flood Insurance Program
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NLIP	Natomas Levee Improvement Program
NMFS	National Marine Fisheries Service
NMWC	Natomas Central Mutual Water Company
NNCP	North Natomas Community Plan
NO_2	nitrogen dioxide
NOI	notice of intent
NOP	notice of preparation
NO	nitric oxide
NO_X	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTR	National Toxics Rule
NTU	nephelometric turbidity unit(s)
NWP	nationwide permit
OES	Governor's Office of Emergency Services
OPR	Governor's Office of Planning and Research
OSHA	Occupational Safety and Health Administration
P	phosphorus
PA	programmatic agreement
PCB	polychlorinated biphenyl
PG&E	Pacific Gas and Electric Company
PGCC	Pleasant Grove Creek Canal
PL	Public Law
PM	particulate matter
$PM_{2.5}$	fine particulate matter with an aerodynamic diameter of 2.5 micrometers or less
PM_{10}	respirable particulate matter with an aerodynamic diameter of 10 micrometers or less
ppm	parts per million
PPV	peak particle velocity

Porter-Cologne Act	Porter-Cologne Water Quality Control Act of 1969
PRC	Public Resources Code
PRG	preliminary remediation goal
RBDD	Red Bluff Diversion Dam
RCRA	Resource Conservation and Recovery Act
RD	Reclamation District
Reclamation	U.S. Bureau of Reclamation
Riverside Canal	Riverside Main Irrigation Canal
RM	River Mile
RMS	root mean square
ROG	reactive organic gases
RWQCB	regional water quality control board
SACOG	Sacramento Area Council of Governments
SAFCA	Sacramento Area Flood Control Agency
SB	soil-bentonite
SCAS	Sacramento County Airport System
SCB	soil-cement-bentonite
SEIS	supplemental environmental impact statement
SGA	Sacramento Groundwater Authority
SHPO	State Historic Preservation Officer
SIP	State Implementation Pla
SIR	Supplemental Information Report
SLIC	State Water Resources Control Board's California Spills, Leaks, Investigations, and Cleanup
SMAQMD	Sacramento Metropolitan Air Quality Management District
SMARA	Surface Mining and Reclamation Act of 1975
SMF Master Plan	*Sacramento International Airport Master Plan*
SMUD	Sacramento Municipal Utility District
SO_2	sulfur dioxide
SR	State Route
SRA	shaded riverine aquatic
SRFCP	Sacramento River Flood Control Project
SSCI/C	South Sutter County Industrial/Commercial
State	California Central Valley Flood Protection Board
STP	shovel test pit
SVAB	Sacramento Valley Air Basin
SVP	Society of Vertebrate Paleontology
SWPPP	storm water pollution prevention plan
SWRCB	State Water Resources Control Board
TAC	toxic air contaminant
T-BACT	toxic best available control technology
TDS	total dissolved solids
The Reclamation Board	State of California Reclamation Board
TMDL	total maximum daily load
TNBC	The Natomas Basin Conservancy
TPY	tons per year
TRD	trench remixing deep
UCMP	University of California, Berkeley Museum of Paleontology

UNWI	Upper Northwest Interceptor
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
VdB	vibration decibels
VMT	vehicle miles traveled
WDR	waste discharge requirement
WHMP	Wildlife Hazard Management Plan

ES EXECUTIVE SUMMARY

PURPOSE OF THIS DOCUMENT

The Sacramento Area Flood Control Agency (SAFCA) is proposing the Natomas Levee Improvement Program (NLIP) Landside Improvements Project, consisting of early implementation (2008–2010) improvements to the perimeter levee system of the Natomas Basin in Sutter and Sacramento Counties, California, and associated landscape and irrigation/drainage infrastructure modifications. SAFCA has initiated this effort in concert with the California Department of Water Resources and the California Central Valley Flood Protection Board (State), and the U.S. Army Corps of Engineers (USACE) with the aim of incorporating the early implementation improvements and the NLIP as a whole into the Federally authorized American River Common Features Project (Common Features Project).

To implement the proposed improvements, SAFCA is requesting permission from USACE pursuant to Section 14 of the Rivers and Harbors Act of 1899 (33 United States Code [USC] 408, hereinafter referred to as "Section 408") for alteration of Federal Project levees, and under Section 404 of the Clean Water Act (33 USC 1344) for the placement of fill in jurisdictional waters of the United States. Permission under Section 10 of the Rivers and Harbors Act (33 USC 403) would also be required where work would be performed in, under, or over navigable waters. USACE has prepared this Environmental Impact Statement (EIS) in compliance with the National Environmental Policy Act (NEPA) to evaluate the effects of the project on the human environment and will use the EIS to support its decisions about whether to grant the requested permissions for the 2008 construction phase of the project.

The EIS considers the proposed early implementation project in its entirety, with the 2008 construction phase addressed in detail and the 2009 and 2010 construction phases addressed at a general, programmatic level. The 2008 construction phase would be initiated in 2008 and completed in 2009. The program-level approach for the 2009–2010 construction elements allows for the consideration in this EIS of broad policy-level issues for the project as a whole, including fundamental alternative approaches to meeting the project purpose and the combined effects of all phases of the project, while supporting the specific USACE decisions on whether to grant permission for the 2008 construction phase of the improvements proposed by SAFCA pursuant to Section 408 and Section 404 and to Section 10 if applicable.

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, the County of Sacramento, and the County of Sutter (**Plates 1 and 2**). In addition to the American and Sacramento Rivers on the south and west, the Natomas Basin is bordered on the north by the Natomas Cross Canal (NCC) and on the east by the Pleasant Grove Creek Canal (PGCC) and the Natomas East Main Drainage Canal (NEMDC)/Steelhead Creek. 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 water bodies and in the American and Sacramento Rivers by an interconnected perimeter levee system.

BACKGROUND

The Natomas Basin perimeter levee system was originally created to promote agricultural development. Flood control has historically been a major concern to the agricultural and urban settlers in the Sacramento River basin because of the unique topographical and meteorological factors that make the basin capable of producing very high peak flood discharges. Nevertheless, a coordinated flood control plan for the basin was not initiated until after the historic Sacramento River floods of 1907 and 1909. These two floods triggered the comprehensive, Federally financed and managed flood control effort that has unfolded over the past 85 years, under the leadership of USACE and the State. The product of this effort is the Sacramento River Flood Control Project (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 of the 20th century to protect farmlands and urban areas in the Sacramento Valley from large floods.

Today, the Natomas Basin is the location of the Sacramento International Airport (Airport) and the site of extensive recent urban development 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 the State and Federal law, and expansion of the urban footprint into the remaining agricultural areas is regulated 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 Natomas Basin floodplain is occupied by more than 83,000 residents and $8.2 billion in damageable property.

Following is a timeline of the major events in the history of the Natomas Basin flood control system. The major flood control projects that are related to the proposed action are described below.

History of the Natomas Basin Flood Control System

Year/ Timeframe	Flood Control Project/Event
1911–1915	Natomas Basin reclaimed: levees and interior drainage constructed
1917	Levees authorized as part of SRFCP
1968	National Flood Insurance Program (NFIP) authorized
1978	First NFIP Flood Maps issued
1986	Major floods lead to SRFCP system re-evaluation
1989	Sacramento urban area mapped into regulatory floodplain
1990–1993	Sacramento Urban Levee Reconstruction Project
1993–1998	North Area Local Project (NALP)
1996	Congress authorizes raise of Sacramento River East Levee
1997	Major flood in SRFCP
1998	Natomas Basin restores 100-year FEMA flood protection
1999	Congress authorizes raise of Natomas Cross Canal 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 seepage criteria
2004	USACE adopts Standard Operating Levee Design Procedures
2004	SAFCA initiates planning for Natomas Levee Evaluation Program
2004	USACE initiates General Re-Evaluation of the Common Features Project
2004	SAFCA initiates planning for Natomas Levee Evaluation Program (NLEP)
2006	SAFCA completes NLEP
2006	USACE recommends levee decertification based on new geotechnical information and new standards
2006	SAFCA initiates Natomas Levee Improvement Program (NLIP)

The 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 protection under regulations adopted by the Federal Emergency Management Agency (FEMA), (2) design criteria used by the USACE and the State for the levees comprising the Common Features Project, and (3) design "200-year" water surface elevations developed by SAFCA in cooperation with the State using hydrologic modeling data developed as part of the Sacramento-San Joaquin River Basins Comprehensive Study.

While SAFCA anticipates that all segments of the Natomas perimeter levee system will be improved to meet all of the above design criteria, the early implementation project focuses only on the segments that do not currently meet the 100-year design criteria adopted by FEMA: 18 miles along the Sacramento River east levee, more than 5 miles along the NCC south levee, and more than 3 miles along the PGCC west levee. SAFCA proposes to modify these segments to meet all of the above design criteria by the end of 2010. The remaining segments of the perimeter levee system would be improved by the USACE to meet USACE and State standards for the "200-year" water surface elevation following Congressional approval for expanding the scope of the Common Features Project based on a General Re-evaluation Report (GRR) to be completed by the USACE for presentation to Congress in 2010.

The 100-year early implementation project and the subsequent "200-year" improvement project that constitute the NLIP are part of a larger program of improvements to the flood control system protecting the Sacramento Area that was initiated as part of the American River Watershed Investigation (ARWI) following the record flood of 1986. These improvements include the following:

- **Sacramento Urban Levee Reconstruction Project:** A project carried out by USACE, the State and SAFCA between 1990 and 1993 to stabilize the levees along the east bank of the Sacramento River upstream and downstream of the American River.

- **North Area Local Project:** A project carried out by SAFCA to raise and strengthen the levees protecting the Natomas Basin and the North Sacramento area along the lower reaches of the NEMDC/Steelhead Creek, Arcade Creek and Dry/Robla Creek.

- **Folsom Dam Reoperation:** A project initiated by SAFCA and the U. S. Bureau of Reclamation in 1995 to increase the reservoir storage space available for flood control at Folsom Dam until such time as a comprehensive flood control program for the American River is in place.

- **American River Common Features Project:** A project to strengthen and raise the levees along the Lower American River and the upper reaches of the Natomas Basin initially authorized by Congress in 1996 and expanded in 1999.

- **Folsom Dam Modification Project:** A project authorized by Congress in 1999 to increase the discharge capacity of Folsom Dam's low-level river outlets so as to allow more efficient use of the reservoir storage space allocated to flood control.

- **Joint Federal Project:** A project authorized by Congress in 2007 and recently initiated to reorient the Folsom Dam Modification Project to focus on construction of an auxiliary spillway capable of increasing the Dam's low level discharge capacity meeting Federal dam safety standards.

- **Common Features Project GRR:** A project to re-analyze and potentially expand the scope of the Common Features project to address changes in engineering standards affecting the

levees around the Natomas Basin and along the Lower American and Sacramento Rivers. The GRR would be the vehicle for incorporating the early implementation project and the NLIP as whole into the Common Features Project.

Improvements to the Natomas Basin perimeter levee system completed as part of the Sacramento Urban Levee Reconstruction Project and the North Area Local Project have significantly improved flood protection for the area. However, segments of the levee system have insufficient freeboard to provide protection from very large floods, and recent studies indicate the potential for underseepage and through-seepage in many locations, and several sites of substantial bank erosion exist along the Sacramento River east levee.

PURPOSE AND NEED FOR ACTION

The Natomas Basin is presently vulnerable to flooding in a less than 100-year flood event. Uncontrolled flooding in the Natomas Basin floodplain in a flood exceeding a 100-year event could result in $7.4 billion in damage (SAFCA 2007). Depending on the circumstances, flood depths in the Natomas Basins could reach life-threatening levels. Flooding could also result in releases of toxic and hazardous materials, groundwater contamination, and damage to the metropolitan power and transportation grids. The disruption in transportation that would result from a major flood would affect the Airport and interstate and state highways. The day-to-day functioning of the state capital also would be significantly affected by these interruptions.

The need for the early implementation project 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* (July 14, 2006). This evaluation was based on the following engineering studies and reports, which have been included as appendices to the above-referenced report and have been updated as the design of the early implementation project has proceeded:

A. *Design Water Surface Profile for the Sacramento River East Levee and Natomas Cross Canal Levees in Natomas* prepared by MBK Engineers (August 9, 2005)

B. *Problem Identification Report–American River North Levee, Reclamation District 1000, Sacramento County, California* prepared by Kleinfelder (February 1, 2006)

C. *Problem Identification Report–Sacramento River East Levee, Reclamation District 1000, Sacramento and Sutter Counties, California* prepared by Kleinfelder (February 1, 2006)

D. *Problem Identification Report–Natomas Cross Canal South Levee, Reclamation District 1000, Sutter County, California* prepared by Kleinfelder (February 1, 2006)

E. *Preliminary Geotechnical Evaluation–Proposed Secondary Levee for the Sacramento River East Levee, Reclamation District 1000, Sacramento and Sutter Counties, California* prepared by Kleinfelder (February 1, 2006)

F. *Natomas Levee Evaluation Program–Erosion Assessment–Draft Report* prepared by Northwest Hydraulic Consultants (February 2006)

G. *Natomas Levee Evaluation Program–Preliminary Cost Estimate* prepared by Parsons Brinckerhoff (February 2006)

These studies and reports indicate that segments of the Natomas perimeter levee system reflect the following problems for both the FEMA 100-year and "200-year" design water surface elevations:

- inadequate freeboard;
- through-levee seepage and foundation underseepage with excessive gradients;
- embankment instability; and
- susceptibility to erosion and scour.

Although not highlighted in the levee evaluation, 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 proposed remapping the Natomas Basin as an AE zone, with the designation to take effect in December 2008. FEMA defines AE zones as areas with a 1% annual chance of flooding. The designation would result in the requirement that the bottom floor of all new buildings be constructed at or above base flood elevation—as little as 3 feet in some of Natomas but up to 20 feet above the ground level in much of the basin. It is therefore anticipated that this designation would effectively stop any projects that are not issued building permits by the time the new map takes effect.

In formulating plans to address the conditions listed above, it has become clear that the necessary flood control improvements will require a substantial volume of soil borrow material and that this material could be obtained in a manner that could improve aviation safety through grading and recontouring the bufferlands surrounding the Airport and enhance habitat values consistent with the goals of the NBHCP.

PROJECT OBJECTIVES

The following objectives were adopted by SAFCA in connection with the NLIP: (1) provide at least a 100-year level of flood protection to the Natomas Basin as quickly as possible, (2) provide "200-year" protection to the basin over time, and (3) avoid any substantial increase in expected annual damages as new development occurs in the basin. SAFCA's approach to defining level of protection (system performance) differs from that of USACE. References in this document to levels of flood protection are based on SAFCA's deterministic approach (the current FEMA method) and should not be taken as USACE concurrence that such levels will be achieved when the USACE probabilistic approach is utilized to define system performance. In any case, flood risk to the Natomas Basin would be considerably reduced by the proposed project.

The specific purpose of the proposed action analyzed in this EIS is to provide at least 100-year flood protection as quickly as possible while laying the groundwork to achieve at least "200-year" flood protection over time.

Additional project objectives that informed SAFCA's project design were to:

(1) use flood control projects in the vicinity of the Airport to facilitate changes in the management of Airport lands that reduce hazards to aviation safety, and

(2) use flood control projects to increase the extent and connectivity of the lands in Natomas being managed to provide habitat for giant garter snake, Swainson's hawk, and other special-status species.

PLAN FORMULATION PROCESS

Based on these objectives, SAFCA formulated a proposed project and a range of project alternatives intended to achieve the specific project objectives through the following steps:

- Identification of the deficiencies that must be addressed to provide at least 100-year flood protection as quickly as possible,
- 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 control alternatives around the remedial measures,
- Identification of the deficiencies in the Natomas levee system that must be addressed to provide "200-year" flood protection, and
- Addition of measures to ensure that each alternative would improve aviation safety, maintain habitat values, and contribute to the long-term operability of the Natomas Basin's agricultural irrigation and drainage infrastructure.

ALTERNATIVES

Measures Eliminated from Consideration

Two measures that could contribute to addressing the Natomas Basin's flood problems and needs were reviewed and eliminated from further consideration: Yolo Bypass Improvements and Reduced Natomas Urban Levee Perimeter.

The **Yolo Bypass Improvements** would involve lengthening the Fremont Weir and widening the Yolo Bypass, which is estimated to cost more than $700 million (unescalated construction costs) (Cermak, pers. comm., 2008). In addition to its high cost, these improvements would not meet the project purpose of providing at least 100-year flood protection to the Natomas Basin because they would not fully address freeboard deficiencies and would leave substantial underseepage and through-seepage conditions unaddressed. If implemented, these improvements would have to be combined with extensive seepage remediation measures, further adding to cost.

The **Reduced Natomas Urban Levee Perimeter** would involve construction of a cross levee running east to west across the Natomas Basin for a distance of approximately 8 miles about 500 feet north of Elkhorn Boulevard to protect existing developed areas in the City of Sacramento. USACE, as part of the American River Watershed Investigation Feasibility Study, previously analyzed the feasibility of using a Natomas cross levee to limit development to the southern portion of the Natomas Basin but rejected this measure as infeasible (USACE 1991a, 1991b). The concept of a cross levee was reconsidered as part of the present study and again rejected as infeasible. Cost is a major factor in the rejection of this alternative; the results of the previous analysis indicated that it would be significantly more cost effective to protect all of the Natomas Basin than to protect a portion with a cross levee. The study concluded that a levee constructed across the Natomas Basin would cause floodwaters to be considerably deeper than they would be without the cross levee, and that either flowage easements would need to be acquired on all lands in the basin north of the cross levee or a weir and pumping facilities would need to be constructed to

facilitate evacuation of floodwaters from this area. Either concept was determined to be extremely costly. In reconsidering this measure, it was concluded that it is also infeasible because it would strand Federal, State, and local investments made in past NCC south levee and Sacramento River east levee improvements; would present significant barriers to achievement of the NBHCP goals and, therefore, compliance with the Federal Endangered Species Act and California Endangered Species Act; and would require 30%–80% more borrow material than the alternatives carried forward for analysis in this EIS, resulting in increased costs of $30–$90 million, in addition to approximately $70 million in flowage easements and the costs of relocating or providing flood protection to State Route 99/70.

Consequently, improvements to the Natomas Basin perimeter levee system have been determined by USACE, the State, and SAFCA to be the feasible method of providing adequate flood protection to existing development within the basin. Although improving the perimeter levee system would fail to discourage further development within the basin, this action is consistent with efforts by the State of California to comprehensively address floodplain development and flood risk on a regional scale. This comprehensive approach differentiates between flood protection requirements for urbanized and non-urbanized (i.e., agricultural) floodplain areas and will direct urban development away from those floodplains where a “200-year” level of flood protection cannot be achieved while ensuring that this level of protection is provided for already heavily populated areas such as the Natomas Basin. Improving the perimeter levee system and thereby facilitating development of the basin is also consistent with regional planning efforts that aim to concentrate growth in or adjacent to already urbanized areas. Both of these efforts direct development away from currently unpopulated agricultural areas.

Alternatives Carried Forward for Evaluation in This EIS

The **No-Action Alternative** consists of the conditions that would be reasonably expected to occur in the foreseeable future if no 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. The most likely scenario, which is evaluated in this EIS, is that SAFCA would not be authorized by USACE to undertake improvements on the Natomas Basin perimeter levee system. The Natomas area would be designated as a special flood hazard area; new development would be precluded in most areas of the Natomas Basin; and existing residential, commercial and industrial developments in Natomas would remain subject to a significant risk of flooding. However, flood protection in the form of a compartment levee may be constructed by Sacramento County to provide flood protection for the Airport.

Alternatives 1, 2, and 3 consist of levee improvements and associated landscape and irrigation/drainage system improvements that would be completed during 2008–2010. The improvements would be implemented in three phases, initiated in 2008, 2009, and 2010. The elements of these alternatives are summarized below.

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 any of the action alternatives because their proximity to the existing levees places them within the expanded landside levee footprint or adjacent maintenance access under all alternatives. Similarly, woodlands extend into the proposed footprint under any of the action alternatives and would need to be removed and/or relocated. Consequently, effects on waters of the United States and other habitats are very similar among the action alternatives, and the same compensation strategies are proposed for unavoidable effects.

Summary of the Proposed Elements of the Action Alternatives			
Proposed Levee Improvements	**Alternative 1, Adjacent Setback Levee (Preferred Alternative)**	**Alternative 2, Raise Levee in Place with Setback**	**Alternative 3, Adjacent Levee with Setback**
Levee raising and seepage remediation: NCC south levee (2008 construction phase)	Raise and realign the NCC south levee to provide additional freeboard and more stable waterside and landside slopes and to reduce the need for removal of waterside vegetation. Construct a seepage cutoff wall through the levee crown in Reaches 3–7.	Same as Alternative 1	Same as Alternative 1
Levee raising and seepage remediation: Sacramento River east levee (2008 construction phase: Reaches 1–4B; 2009–2010 construction phases: Reaches 5A–20)	Construct an adjacent setback levee from the NCC to the American River north levee, raised where needed to provide adequate freeboard (see **Plate 13**, lower illustration), with a combination of cutoff walls, seepage berms, and relief wells for seepage remediation where required.	Set back 1.5 miles of the Sacramento River east levee by 1,000 feet in Reaches 1 and 2 (from approximately Station 5+00 to Station 88+00) and construct a 100-foot seepage berm along the setback levee. Raise the existing levee from the southern end of the setback levee through Reach 11B, flatten the land side of the existing levee from Reach 12 through Reach 19A, and construct cutoff walls for seepage remediation as required from the southern end of the setback levee through Reach 20.	Set back 1.5 miles of the Sacramento River east levee by 500 feet in Reaches 1 and 2 (from approximately Station 5+00 to Station 88+00) and construct a 100-foot seepage berm along the setback levee. Construct an "adjacent setback levee" (see **Plate 13**) from the southern end of the setback levee to the American River north levee, raised where needed to provide adequate freeboard, with cutoff walls for seepage remediation as required.
Erosion control (2008 or 2009–2010 construction phases)	None	Implement erosion control improvements along approximately 3,710 feet of river bank at the waterside toe of the Sacramento River east levee at River Miles 73.5, 69.8, and 68.8.	None
Levee widening and seepage remediation: PGCC west levee (2009 construction phase)	Widen, flatten waterside and landside slopes, and construct seepage berms along the PGCC west levee (specific berm widths and potential use of cutoff walls in some areas to be determined).	Same as Alternative 1	Same as Alternative 1
Improvements to major irrigation and drainage infrastructure (2008 and 2009	Irrigation: Relocate the highline Elkhorn Main Irrigation Canal (Elkhorn Canal) and Riverside Main Irrigation Canal (Riverside Canal). Drainage: Construct a new canal designed to provide drainage and associated giant garter snake habitat (the "GGS/ Drainage Canal") between the North Drainage Canal and the West	Same as Alternative 1	Same as Alternative 1

Summary of the Proposed Elements of the Action Alternatives			
Proposed Levee Improvements	**Alternative 1, Adjacent Setback Levee (Preferred Alternative)**	**Alternative 2, Raise Levee in Place with Setback**	**Alternative 3, Adjacent Levee with Setback**
construction phases)	Drainage Canal, and modify the West Drainage Canal to improve associated giant garter snake habitat (these features are intended to offset project impacts on giant garter snake canal and ditch habitat). Implement Airport West Ditch improvements in connection with construction of the GGS/Drainage Canal to allow the Airport to decommission the agricultural irrigation function of this facility and eliminate the hazards currently associated with it. The Airport stormwater detention function provided by this ditch would continue. The ditch would therefore be recontoured as a gently sloping swale to facilitate periodic maintenance such as mowing. Remove a deep culvert at the location of Reclamation district (RD) 1000 Pumping Plant No. 2, and reconstruct Pumping Plant No. 2.		
Habitat creation and management (2008 and 2009–2010 construction phases)	Establish giant garter snake habitat features in the new GGS/ Drainage Canal and improved West 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 adjacent setback levee slopes and seepage berms. Install woodland plantings to offset the loss of portions of tree groves within the landside levee footprint.	Same as Alternative 1. In addition, install approximately 140 acres of trees in the levee setback area to offset the removal of trees from the water side of the existing levee to meet USACE design criteria (see below).	Same as Alternative 1. In addition, install woodland plantings in the levee setback area to offset the loss of portions of tree groves in the landside levee footprint.
Additional actions to meet FEMA requirements (2009–2010 construction phases)	Remove encroachments from a portion of the water side and land side of the Sacramento River east levee as needed to ensure that the levee can be certified as meeting the minimum requirements of the National Flood Insurance Program (NFIP) and USACE design criteria.	Remove substantial encroachments (structures and vegetation) from the water side and land side of the Sacramento River east levee to ensure that the levee can be certified as meeting the minimum requirements of the NFIP and USACE design criteria.	Same as Alternative 1
	Modify the SR 99/70 crossing of the NCC as needed to meet FEMA requirements.	Same as Alternative 1	Same as Alternative 1
Right-of-way acquisition	Acquire right-of-way through fee title or easement interest within the project footprint, at the borrow sites, and to prevent encroachments into the flood control system.	Same as Alternative 1	Same as Alternative 1

MAJOR CONCLUSIONS OF THE ENVIRONMENTAL ANALYSIS

Summary of Environmental Effects and Mitigation Measures

The environmental effects of the proposed action and alternatives, and mitigation measures to reduce those effects, are summarized in Table ES-1 for major issues. This table addresses only the impact issues for which there may be significant impacts. Chapter 4, "Environmental Consequences," of the EIS includes a discussion of all potential impacts. The basis of the impact conclusions summarized in the table consists of regulatory thresholds for those resource topics for which such thresholds exist, and qualitative thresholds for other resource topics. The significance thresholds are described for each topic in Chapter 4. It is difficult to compare the effects of the action alternatives against those of the No-Action Alternative because the types of effects associated with the action alternatives are construction- and footprint-related, whereas the effects of the No-Action Alternative are related to flood damages. This fundamental difference does not readily lend itself to meaningful comparison except under the topic of hydrology and flood risk.

Following is a summary of the temporary and permanent effects on waters of the United States, by project alternative.

Effects on Waters of the United States			
	Alternative	**Temporary Effects on Waters of the United States in 2008–2010 (Acres)**	**Permanent Effects on Waters of the United States in 2008–2010 (Acres)**
	No-Action Alternative	0	0
1	Construct an Adjacent Setback Levee (Preferred Alternative)	88.03	38.22
2	Raise Levee in Place with a 1,000-Foot Levee Setback	88.03	45.68
3	Construct an Adjacent Setback Levee with a 500-Foot Levee Setback	88.03	38.24

Proposed mitigation for the above impacts includes the creation of at least 1 acre of irrigation/drainage canal or 1 acre of seasonal wetland for every acre that is lost. The project design provides for a substantially higher replacement ratio for affected aquatic habitats, as follows: creation of approximately 45 acres of jurisdictional habitat resulting from construction of the new GGS/Drainage Canal and expansion of the existing West Drainage Canal; creation of approximately 61 acres of new irrigation canal; creation of 230 acres of managed marsh habitat; and incorporation of seasonal wetland habitat into the marsh creation to offset the potential loss of seasonal wetland.

Overall, because all the action alternatives would include the creation of acreages of waters of the United States that are expected to more than offset the filling and dewatering of waters of the United States included in the project, and because new jurisdictional habitats would be created and managed in a manner that minimizes maintenance disturbance and provides the essential functions of the habitats that would be lost, the project is expected to have a less-than-significant or beneficial effect on overall acreage and quality of waters of the United States in the Natomas Basin.

Significant and Unavoidable Impacts

The action alternatives would have several unavoidable significant impacts, as described below. These impacts would be minimized to the extent feasible.

Because of the volume of borrow material that would be needed to construct each of the project alternatives, the project could result in unavoidable significant temporary increases in traffic on local roadways in Sutter County. (The work in Sacramento County, along the Sacramento River east levee and canals, would be accomplished using haul routes off of public roadways.) Due to the large volume of haul truck traffic and to the operation of a wide range of construction equipment, temporary emissions of ROG, NO_X, and PM_{10} during construction would result in significant and unavoidable air quality impacts. Temporary short-term noise affecting residents along the Garden Highway would also be significant and unavoidable.

The expansive footprint of the project would result in the conversion of a significant amount of important farmland to non-agricultural use. Moreover, because of the existence of known prehistoric resources along the Sacramento River, it is possible that project construction activities will encounter these resources as well as other undiscovered cultural resources and human remains.

The removal of a large number of mature trees from the land side of the Sacramento River east levee would result in an unavoidable significant impact on visual resources under all alternatives. Under Alternative 2, the removal of a substantial acreage of mature trees from the water side of the Sacramento River east levee would add to the significant impact on visual resources and is also likely to result in unavoidable significant long-term impacts on wildlife corridors, Swainson's hawk nesting, and shaded riverine aquatic (SRA) habitat.

Under the No-Action Alternative, construction of a compartment levee around the Airport could result in unavoidable significant effects on Important Farmland, cultural resources, air quality, noise, and transportation similar to the effects of the action alternatives. Under the No-Action Alternative, there would also be an unavoidable significant effect on visual resources caused by the introduction of the compartment levee into the landscape. The No-Action Alternative could also result in numerous unavoidable significant impacts associated with catastrophic flooding of the Natomas Basin in the event of a failure of the perimeter levee system. These could include impacts related to loss of Important Farmland, soil erosion, water supply contamination, loss of habitat and populations of giant garter snake and other special-status species, disruption of transportation systems and utility service, and upset of and exposure to hazardous materials. In addition, the No-Action Alternative would require the removal of a large acreage of mature vegetation from the water side of the Sacramento River east levee and the NCC south levee, which would result in a significant loss of woodland habitats, wildlife movement corridors, and SRA habitat.

AREAS OF CONTROVERSY AND ISSUES TO BE RESOLVED

Areas of Controversy

Scoping comments received by USACE focused on the following issue areas:

- effects of cutoff wall construction on groundwater,
- interruption of irrigation by construction activities,
- hydraulic effects of levee improvements,
- aircraft-wildlife strike impacts,

- regional flood control solutions,
- construction effects on local businesses,
- construction effects on residents (e.g., increases in noise, traffic, dust, etc.),
- giant garter snake habitat quality,
- loss of farmland,
- removal of trees,
- relocation of power poles,
- analysis of an appropriate range of project alternatives,
- global warming,
- adequate compensation for landowners, and
- effects on Native American burial grounds.

Based on these comments and the history of the CEQA process undertaken by SAFCA, the major areas of controversy associated with the project are construction-related effects on Garden Highway residents and concerns about the hydraulic modeling used to analyze the project's hydraulic impacts. These two issues were the subject of a law suit filed by the Garden Highway Community Association against the Environmental Impact Report prepared by SAFCA, which is being settled. Commitments made by SAFCA in the settlement regarding construction practices are reflected, as appropriate, in the mitigation measures in this EIS, and the hydraulic modeling approach has been updated for this EIS.

Issues to be Resolved

USACE will need to determine whether to grant permission for the proposed actions for the 2008 construction phase pursuant to Section 408 and Section 404.

INTENDED USES OF THE EIS

The EIS will be used by USACE in exercising its decision-making authority under Section 404 of the Federal Clean Water Act (33 USC 1344) and Section 408 of the Rivers and Harbors Act of 1999 (33 USC 408).

Table ES-1
Summary of Significant Impacts and Mitigation Measures for Major Topics—2008 Construction Phase

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Agricultural Resources						
Impact 4.1-a: Conversion of Important Farmland to Nonagricultural Uses	No-Action	Permanent conversion	Unknown – footprint of Airport compartment levee	Potentially significant	Mitigation similar to Mitigation Measure 4.1-a if the Sacramento County Airport System (SCAS) constructs a compartment levee	Significant and unavoidable
	1, 2, 3	Permanent conversion	Approx. 400–520 acres	Significant	Mitigation Measure 4.1-a: Minimize Important Farmland Conversion to the Extent Practicable and Feasible	Significant and unavoidable
Hydrology and Hydraulics						
Impact 4.4-a: Hydraulic Effects and Exposure to Flood Risk	No-Action	Permanent	Continued high risk of flooding	Significant	No mitigation is available	Significant and unavoidable
	1, 2, 3	Permanent	Substantially reduced risk of flooding; no hydraulic effects	Less than significant	No mitigation is required	Less than significant
Water Quality						
Impact 4.5-a: Temporary Effects on Water Quality from Stormwater Runoff, Erosion, or Spills	No-Action	Duration cannot be predicted	Magnitude cannot be predicted; dependent on flood effects	Significant	No mitigation is available	Significant and unavoidable
	1, 2, 3	Temporary, during construction	Unknown; dependent on multiple factors	Significant	Mitigation Measure 4.5-a: Implement Standard BMPs, Prepare and Implement a SWPPP, and Comply with NPDES Permit Conditions	Less than significant
Fish and Aquatic Habitat						
Impact 4.6-a: Loss of Fish or Aquatic Habitat Through Increased Sedimentation and Turbidity or	No-Action	Temporary, during a levee failure	Unquantifiable	Potentially significant	No mitigation is available	Significant and unavoidable

Table ES-1
Summary of Significant Impacts and Mitigation Measures for Major Topics—2008 Construction Phase

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Releases of Contaminants	1, 2, 3	Temporary, during construction	Unquantifiable	Significant	Mitigation Measure 4.6-a: Implement Mitigation Measure 4.5-a, described above (Implement Standard BMPs, Prepare and Implement a SWPPP, and Comply with NPDES Permit Conditions)	Less than significant
Impact 4.6-b: Loss of Shaded Riverine Aquatic (SRA) Habitat Associated with Levee Improvement Activities	No-Action	Permanent removal	SRA habitat associated with 45 acres of waterside woodland	Significant	Sufficient mitigation is not available	Significant and unavoidable
	1, 3	Permanent removal	Small amounts of riparian vegetation, potentially providing SRA habitat function	Significant	Mitigation Measure 4.6-b: Restore, Replace, or Rehabilitate Loss of Degraded SRA Habitat Function and Comply with Section 1602, Section 7, and Section 2081 Permit Conditions	Less than significant
	2	Permanent removal	SRA habitat associated with 35 acres of waterside woodland	Significant	Implement Mitigation Measure 4.6-b	Significant and unavoidable
Sensitive Aquatic Habitats						
Impact 4.7-a: Effects on Jurisdictional Waters of the United States	No-Action	Permanent effects	Unknown	Significant	Implement mitigation similar to Mitigation Measure 4.7-a if SCAS constructs a compartment levee	Less than significant
	1	Temporary and permanent effects	Temporary: 64.76 acres Permanent: 15.15 acres	Potentially significant	Mitigation Measure 4.7-a: Minimize Effects on Jurisdictional Waters of the United States, Complete Detailed Design of Habitat Creation Components and Management Agreements to Ensure Compensation for Unavoidable Adverse Effects, and Comply with Section 404, Section 401, and Section 1602 Permit Processes	Less than significant
	2		Temporary: 64.76 acres Permanent: 22.61 acres			
	3		Temporary: 64.76 acres Permanent: 15.17 acres			

Table ES-1
Summary of Significant Impacts and Mitigation Measures for Major Topics—2008 Construction Phase

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Vegetation and Wildlife						
Impact 4.8-a: Effects on Woodland Habitats	No-Action	Permanent	45 acres	Significant	No mitigation is available	Significant and unavoidable
	1, 3	Permanent	<9 acres	Potentially significant	Mitigation Measure 4.8-a: Minimize Effects on Woodland Habitat, Complete Detailed Design of Woodland Creation and Management Agreements to Ensure Compensation for Unavoidable Adverse Effects, and Comply with the DFG Section 1602 Permit Process	Less than significant
	2	Permanent	35 acres + <9 acres	Potentially significant		Significant and unavoidable
Impact 4.8-b: Effects on Wildlife Corridors	No-Action	Permanent	Extensive removal of riparian vegetation	Significant	Implement mitigation similar to Mitigation Measure 4.8-b if SCAS constructs a compartment levee	Significant and unavoidable
	1, 3	Temporary disturbance and permanent loss	Minor woodland effects; adverse aquatic effects would be offset by creation of new canals	Potentially Significant	Mitigation Measure 4.8-b: Implement Mitigation Measure 4.9-c (Minimize the Potential for Direct Loss of Giant Garter Snake Individuals, Develop Detailed Design of Managed Marsh and New Canals and Management Agreements to Ensure Adequate Compensation for Unavoidable Adverse Effects, and Obtain Incidental Take Authorization)	Less than significant
	2	Permanent	Extensive removal of riparian vegetation, but adverse aquatic effects would be offset by creation of new canals	Significant	Implement Mitigation Measure 4.8-b	Significant and unavoidable

Table ES-1
Summary of Significant Impacts and Mitigation Measures for Major Topics—2008 Construction Phase

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Special-Status Terrestrial Species						
Impact 4.9-c: Effects on Giant Garter Snake	No-Action	Permanent and temporary loss and disturbance of potential habitat	Unquantifiable flood effect	Significant	Implement mitigation similar to Mitigation Measure 4.9-c if SCAS constructs a compartment levee	Significant and unavoidable
	1	Permanent and temporary loss and disturbance of potential habitat	250 acres of rice and 1.8 acres of canal habitat	Potentially Significant	Mitigation Measure 4.9-c: Minimize the Potential for Direct Loss of Giant Garter Snake Individuals, Develop Detailed Design of Managed Marsh and New Canals and Management Agreements to Ensure Adequate Compensation for Unavoidable Adverse Effects, and Obtain Incidental Take Authorization	Less than significant
	2		260 acres of rice and 1.8 acres of canal habitat			
	3		255 acres of rice and 1.8 acres of canal habitat			
Impact 4.9-d: Effects on Northwestern Pond Turtle	No-Action	Permanent loss of and temporary disturbance to potential habitat	Unquantifiable flood effect	Potentially significant	No mitigation is available	Significant and unavoidable
	1, 3	Permanent loss of and temporary disturbance to potential habitat	Permanent: 1.8 acres Temporary: 0.5 acre	Potentially Significant	Mitigation Measure 4.9-d: Conduct Focused Surveys for Northwestern Pond Turtles and Relocate Turtles	Less than significant
	2		Slightly lower amount of habitat, compared to Alternatives 1 and 3			

Table ES-1
Summary of Significant Impacts and Mitigation Measures for Major Topics—2008 Construction Phase

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 4.9-e: Effects on Special-status Birds	No-Action	Permanent conversion of suitable foraging habitat	Unquantifiable flood and compartment levee construction effects	Potentially significant	No mitigation is available	Significant and unavoidable
	1, 3	Permanent loss of and temporary disturbance of suitable foraging habitat; temporary disturbance of nesting pairs	780 acres of potential foraging habitat 1 acre of potential nesting habitat	Potentially significant	Mitigation Measure 4.9-e: Minimize Potential Impacts on Burrowing Owls and Other Special-Status Bird Species, Relocate Owls as Needed, Complete Detailed Design of Woodlands and Grasslands and Management Agreements to Ensure Adequate Compensation for Unavoidable Adverse Effects, and Obtain Incidental Take Authorization	Less than significant
	2		Same as Alternatives 1 and 3, plus loss of 35 acres of waterside nesting habitat	Potentially significant	Implement Mitigation Measure 4.9-e	Significant and unavoidable
Impact 4.9-f: Effects on Successful Implementation of the NBHCP	No-Action	Long-term	Unquantifiable flood effect	Significant	No mitigation is available	Significant and unavoidable
	1, 2, 3	See 4.9-c, -d, and -e	Unquantifiable	Significant	Mitigation Measure 4.9-f: Ensure that Compliance with Mitigation Requirements of Established NBHCP Reserves is Not Adversely Affected, and Implement Mitigation Measures 4.7-a and 4.9-a through 4.9-e	Less than significant

Table ES-1
Summary of Significant Impacts and Mitigation Measures for Major Topics—2008 Construction Phase

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Cultural Resources						
Impact 4.10-b: Construction Effects on Other Known Historic-Era Resources	No-Action, 1, 2, 3	Short-term, during construction	Unquantifiable	Potentially significant	Evaluate Resources for Significance in Accordance with the Stipulations of the Programmatic Agreement and, if Any Resource Is Determined Eligible for NRHP Listing, Treat It in Accordance with Measures Stipulated in an HPTP Developed in Consultation between USACE, the SHPO, and SAFCA	Significant and unavoidable
Impact 4.10-c: Potential Construction Effects on Known Prehistoric Resources	No-Action, 1, 2, 3	Short-term, during construction	Unquantifiable	Significant	Mitigation Measure 4.10-c(1): Avoid Ground Disturbance Near Known Prehistoric Archaeological Site CA-Sac-485/H to the Extent Feasible, and Treat the Resource in Accordance with Measures Stipulated in an HPTP Developed in Consultation between USACE, the SHPO, and SAFCA Mitigation Measure 4.10-c(2): Avoid Ground Disturbance near Known Prehistoric Archaeological Sites CA-Sac-15/H, CA-Sac-16/H, CA-Sac-17, CA-Sac-160/H, and CA-Sac-164 to the Extent Feasible, and Treat Resources in Accordance with Measures Stipulated in an HPTP Developed in Consultation between USACE, the SHPO, and SAFCA	Significant and unavoidable
Impact 4.10-d: Damage to or Destruction of Previously Undiscovered Cultural Resources	No-Action, 1, 2, 3	Short-term, during construction	Unquantifiable	Significant	Mitigation Measure 4.10-d: Perform Research and/or Surveys, Brief Workers Before Construction, Monitor Construction, Halt Potentially Damaging Activities, Investigate and Avoid	Significant and unavoidable

Table ES-1
Summary of Significant Impacts and Mitigation Measures for Major Topics—2008 Construction Phase

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
					Resources to the Extent Feasible, and Treat Resources in Accordance with Measures Stipulated in an HPTP Developed in Consultation between USACE, the SHPO, and SAFCA	
Impact 4.10-e: Discovery of Human Remains during Construction	No-Action, 1, 2, 3	Short-term, during construction	Unquantifiable	Significant	Mitigation Measure 4.10-e: Halt Work Within 50 Feet of the Find, Notify the County Coroner and Most Likely Descendant, and Treat Human Remains in Accordance with Measures Stipulated in an HPTP Developed in Consultation between USACE, the SHPO, and SAFCA	Significant and unavoidable
Transportation and Circulation						
Impact 4.12-a: Temporary Increase in Traffic on Local Roadways during Construction	No-Action	Temporary, during a levee failure	Unquantifiable flood effect	Significant	Implement mitigation similar to Mitigation Measure 4.12-a if SCAS constructs a compartment levee	Significant and unavoidable
	1, 2, and 3	Temporary, during construction	475 daily haul truck trips on local roadways	Significant	Mitigation Measure 4.12-a: Prepare and Implement a Traffic Routing Plan for Both Crew Commute Trips to the Work Sites and Construction-Related Truck Trips	Significant and unavoidable
Impact 4.12-b: Temporary Increase in Traffic Hazards on Local Roadways during Construction	No-Action	Temporary, during a levee failure	Unquantifiable flood effect	Significant	No mitigation is available	Significant and unavoidable
	1, 2, 3	Temporary, during construction	Unquantifiable	Significant	Mitigation Measure 4.12-b: Prepare and Implement a Traffic Safety and Control Plan and Implement Measures to Avoid and Minimize Traffic Hazards on Local Roadways during Construction	Less than significant

Table ES-1
Summary of Significant Impacts and Mitigation Measures for Major Topics—2008 Construction Phase

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 4.12-c: Temporary Effect on Emergency Service Response Times and Access	No-Action	Temporary, during a levee failure	Unquantifiable flood effect	Significant	No mitigation is available	Significant and unavoidable
	1, 2, 3	Temporary, during construction	Unquantifiable	Significant	Mitigation Measure 4.12-c: Notify Emergency Service Providers about Project Construction and Maintain Emergency Access or Coordinate Detours with Providers	Less than significant
Air Quality						
Impact 4.13-a: Temporary Emissions of ROG, NO_X, and PM_{10} during Construction	No-Action	Temporary, during construction of an interior compartment levee	Amounts similar to Alternatives 1, 2, and 3, exceeding local thresholds for reactive organic gases (ROG), oxides of nitrogen (NO_X), and particulates (PM_{10})	Significant	Implement mitigation similar to Mitigation Measure 4.13-c if SCAS constructs a compartment levee	Significant and unavoidable
	1, 2, 3	Temporary, during construction	Quantities depend on timing and duration of construction activities: 222–386 pounds per day (lb/day) of ROG, 931–1,214 lb/day of NO_X, and 902–1,839 lb/day of PM_{10}. for 2008 construction, Alternative 2 emissions would be 3% higher and Alternative 3 emissions 8% higher	Significant	Mitigation Measure 4.13-a: Implement District-Recommended Control Measures to Minimize Temporary Emissions of ROG, NO_X, and PM_{10} during Construction	Significant and unavoidable

Table ES-1
Summary of Significant Impacts and Mitigation Measures for Major Topics—2008 Construction Phase

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
			than Alternative 1 emissions			
Noise						
Impact 4.14-a: Generation of Short-Term Construction Noise	No-Action	Temporary, during construction of an interior compartment levee	Unknown	Potentially significant	Implement mitigation similar to Mitigation Measure 4.14-a if SCAS constructs a compartment levee	Unknown, assumed Less than significant
	1, 2, 3	Temporary, during construction	79 to 101 dBA without feasible noise control (50 feet from nearest noise source); highest noise level would be 89.0 dBA L_{eq} (100 feet from pile driving)	Significant	Mitigation Measure 4.14-a: Implement Noise-Reducing Construction Practices, Prepare a Noise Control Plan, and Monitor and Record Construction Noise Near Sensitive Receptors	Significant and unavoidable
Impact 4.14-b: Exposure of Sensitive Receptors to or Generation of Excessive Groundborne Vibration or Noise	No-Action	Temporary, during construction of an interior compartment levee	Unknown	Potentially significant	Implement mitigation similar to Mitigation Measure 4.14-b if SCAS constructs a compartment levee	Less than significant
	1, 2, 3	Temporary, during construction at Pump Station 2	0.076 in/sec PPV or 86 VdB (for haul trucks) to as high as 1.518 in/sec PPV or 112 VdB (for pile driving)	Significant	Mitigation Measure 4.14-b: Implement Measures to Avoid Construction-Related Vibration Effects	Significant and unavoidable for one location

Table ES-1
Summary of Significant Impacts and Mitigation Measures for Major Topics—2008 Construction Phase

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 4.14-c: Exposure of Residents to Increased Traffic Noise Levels from Hauling Activity	No-Action	Temporary, during construction of an interior compartment levee	Unknown	Potentially significant	Implement mitigation similar to Mitigation Measure 4.14-c if SCAS constructs a compartment levee	Unknown, assumed Less than significant
	1, 2, 3	Temporary, during construction	65.0 to 68.8 dBA L_{eq} (50 feet from roadway centerline)	Significant	Mitigation Measure 4.14-c: Implement Noise-Reduction Measures to Reduce the Effects of Haul Truck Traffic Noise	Significant and unavoidable
Visual Resources						
Impact 4.16-a: Changes in Scenic Vistas, Scenic Resources, and Existing Visual Character of the Project Area	No-Action, 1, 2, 3	Temporary, during construction	Unquantifiable	Significant	No mitigation is available	Significant and unavoidable
Hazards and Hazardous Materials						
Impact 4.18-a: Spills of Hazardous Materials	No-Action	Temporary, during a levee failure	Unquantifiable flood effect	Potentially significant	No mitigation is available	Significant and unavoidable
	1, 2, 3	Temporary, during construction	Unquantifiable	Less than significant	No mitigation is required	Less than Significant
Impact 4.18-b: Exposure to Hazardous Materials Encountered at Project Sites	No-Action	Temporary, during construction of an interior compartment levee	Unquantifiable flood effect	Significant	Implement mitigation similar to Mitigation Measure 4.18-b(2) if SCAS constructs a compartment levee	Significant and unavoidable

Table ES-1
Summary of Significant Impacts and Mitigation Measures for Major Topics—2008 Construction Phase

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	1, 2, 3	Temporary, during construction	Unquantifiable	Significant	Mitigation Measure 4.18-b(1): Ensure that Contaminants Are Not Present at Unacceptable Levels on the Yuki Farms Site Near the Location of Project Construction Activities Mitigation Measure 3.18-b(2): Prepare a Worker Health and Safety Plan, and Implement Appropriate Measures to Minimize Potential Exposure to Unknown Hazardous Materials	Less than Significant
Impact 4.18-d: Potential to Result in Higher Frequency of Collisions between Aircraft and Wildlife at Sacramento International Airport	No-Action	Short-term, in the months following flooding and the resumption of Airport operations	Unquantifiable flood effect	Significant	No mitigation is available	Significant and unavoidable
	1, 2, 3	Long-term, during project operation	Unquantifiable	Significant	Mitigation Measure 3.18-d: Implement Measures to Avoid Substantial Increases in Hazardous Wildlife within the Critical Zone or Wildlife Collisions with Aircraft	Less than Significant

1.0 PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

The Sacramento Area Flood Control Agency (SAFCA) is proposing the Natomas Levee Improvement Program (NLIP) Landside Improvements Project, consisting of early implementation (2008–2010) improvements to the perimeter levee system of the Natomas Basin in Sutter and Sacramento Counties, California, and associated landscape and irrigation/drainage infrastructure modifications. SAFCA has initiated this effort in concert with the California Department of Water Resources and the California Central Valley Flood Protection Board (formerly called the Reclamation Board) (State) and with the U.S. Army Corps of Engineers (USACE) with the aim of incorporating the Landside Improvements Project and the NLIP as a whole into the Federally authorized American River Common Features Project (Common Features Project).

To implement the proposed improvements, SAFCA is requesting permission from the USACE pursuant to Section 14 of the Rivers and Harbors Act of 1899 (33 United States Code [USC] 408, hereinafter referred to as "Section 408") for alteration of Federal Project levees, and under Section 404 of the Clean Water Act (33 USC 1344) for the placement of fill in jurisdictional waters of the United States. Permission under Section 10 of the Rivers and Harbors Act (33 USC 403) also would be required where work would be performed in, under, or over navigable waters. The requirement to prepare an Environmental Impact Statement (EIS) to comply with the National Environmental Policy Act (NEPA) is triggered when major Federal actions, including permits and approvals, are considered that may have significant effects on the quality of the human environment. Because the proposed action has the potential to significantly affect the human environment, USACE, as the lead agency for purposes of compliance with NEPA, has prepared this EIS, the *Environmental Impact Statement for the 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project, Sacramento, CA.*

This EIS considers the early implementation project in its entirety, with the 2008 construction phase addressed in detail and the 2009 and 2010 construction phases addressed at a general, programmatic level. The program-level approach for the 2009–2010 construction elements allows for the consideration in this EIS of broad policy-level issues for the project as a whole, including fundamental alternative approaches to meeting the project purpose and the combined effects of all phases of the project, while supporting the specific USACE decisions on whether to grant permission for the 2008 construction phase of the improvements proposed by SAFCA pursuant to Section 408 and Section 404 and to Section 10 if applicable.

1.2 PROJECT LOCATION

The project entails improving the levee system that protects the 53,000-acre Natomas Basin in northern Sacramento and southern Sutter Counties, California, including a portion of the city of Sacramento (**Plate 1**). The Natomas Basin is bounded by leveed reaches of the Natomas Cross Canal (NCC) on the north, the Sacramento River on the west, the American River on the south, and the Pleasant Grove Creek Canal (PGCC) and the Natomas East Main Drainage Canal (NEMDC)/Steelhead Creek on the east (**Plate 2**). The proposed levee improvements consist of correcting freeboard deficiencies and addressing seepage potential along the NCC south levee, the Sacramento River east levee, and the PGCC west levee.

This levee system was originally constructed to promote agricultural development in the Natomas Basin in the early part of the 20th century. Over time, the basin has undergone increasing levels of urbanization. Today, Natomas is the location of the Sacramento International Airport (Airport), which accounts for a little over 10% of the total acreage in the basin, and extensive recent urban development that occupies the

southern 30% of the basin and supports a population of about 83,000. The basin also contains three major public transportation facilities, Interstate 5 (I-5), Interstate 80 (I-80), and State Route (SR) 99/70. The remaining lands (approximately 60% of the basin) are in some form of developed agriculture or open space use in unincorporated areas of Sacramento and Sutter Counties and 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 the remaining agricultural areas is regulated 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 Natomas Basin Conservancy (TNBC), the "plan operator" for the NBHCP, manages 4,000 acres, or one-eighth, of these remaining lands.

1.2.1 Perimeter Levee System

Following are descriptions of the levee system and the channels that border the Natomas Basin. Land uses along the levees proposed by SAFCA for improvements (NCC south levee, Sacramento River east levee, and PGCC west levee) are also generally described.

1.2.1.1 Natomas Cross Canal. The NCC is a 5.3-mile-long channel that carries water from several tributary watersheds in western Placer County and southern Sutter County to the Sacramento River. The NCC 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. During periods of flooding, the Sutter Bypass, Sacramento River, Feather River, and NCC all contribute to raised water elevations that can affect the NCC levees. For plan formulation purposes, the south levee is divided into seven reaches, as shown in **Plate 2**. Much of the south levee contains an existing stability berm with an internal drainage system that was constructed as part of the North Area Local Project (NALP). Levee slopes are approximately 3:1 horizontal to vertical (3H:1V) on the water side and 2H:1V on the land side. There is an approximately 80- to 100-foot maintenance access area on the land side of the levee through most of the NCC's length. Most of the land along the south levee consists of privately owned farmland and habitat owned and managed by TNBC. A few rural residences and ranch buildings associated with a horse training facility are located at the eastern end of the NCC in Reaches 6 and 7.

1.2.1.2 Sacramento River East Levee. An 18-mile-long section of the east levee of the Sacramento River protects the west side of the Natomas Basin between the NCC and the American River. For plan formulation purposes, the levee is divided into 20 reaches, as shown in **Plate 2**. The Garden Highway is located on top of the levee crown within all 20 reaches. A drained, 10-foot-wide stability berm is present on the landside slope of the levee between the NCC and Powerline Road (Reaches 1–11) and cutoff walls have been inserted through the levee in Reaches 12–20. These improvements were constructed as part of the Sacramento Urban Levee Reconstruction Project.

The land uses along the levee vary from north to south. Along the land side, Reaches 1–13 are bordered mainly by private agricultural lands containing a few rural residences, Airport bufferlands, and two farmed parcels owned and managed by TNBC. Teal Bend Golf Club is west of the Airport, adjacent to the levee along Reach 6. The parcels bordering Reaches 14–18 contain more residences, several rural estates, and three TNBC parcels. The land side of Reaches 19 and 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 three restaurants are located along the water side of the levee in Reaches 1–18 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 extends southerly for approximately 3.3 miles from the east end of the NCC south levee to the north end of the NEMDC/ Steelhead Creek levee near the Sankey Road crossing (**Plate 2**). The PGCC west levee protects the Natomas Basin from flood flows from Pleasant Grove Creek and other creeks in western Placer County, as well as from water backed up in the NCC from high river stages in the Sacramento River. Levee slopes are generally 2H:1V on both the water side and land side of the levee. Natomas Road is located on top of the levee crown. No berms support this levee. However, as part of the NALP, SAFCA constructed steel sheetpile walls capped by concrete pavement sections at Howsley, Fifield, and Sankey Roads to provide hardened sections at these roadway crossings where freeboard 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 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/Steelhead Creek West Levee. The NEMDC/ Steelhead Creek extends for approximately 13.3 miles from high ground near Sankey Road to the American River north levee and forms the easterly boundary of the Natomas Basin in this reach (**Plate 2**). The west levee of the NEMDC/Steelhead Creek 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/Steelhead Creek west levee and the Dry Creek north levee. It prevents elevated flood waters in Dry Creek and the southern reach of the NEMDC/Steelhead Creek from entering the northern reach of the NEMDC/Steelhead Creek. The pumping facility also collects local flood runoff from the Natomas East Stream Group and from spills 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/Steelhead Creek 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/ Steelhead Creek.

As part of the NALP, SAFCA raised the west levee of the NEMDC/Steelhead Creek 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/Steelhead Creek 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 protection to the Natomas Basin by providing at least 3 feet of freeboard above the "200-year" design 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" or greater flood along the American River.

1.2.1.5 American River North Levee. The American River north levee extends for about 2.2 miles from its connection with the Sacramento River east levee at the mouth of the American River to its connection with the NEMDC/Steelhead Creek west levee near the mouth of the NEMDC/Steelhead Creek, as shown in **Plate 2**. This levee was constructed as part of the Natomas perimeter levee system and is designed to prevent flood waters 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 freeboard above the maximum water surface elevation likely to be produced at the mouth of the NEMDC/Steelhead Creek by a "200-year" or greater flood along the American River. For plan formulation purposes, this levee has been divided into four reaches, as shown in **Plate 2**. 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. The Garden Highway runs along the levee crown for most of these reaches and ranges from two to four lanes.

1.2.2 Floodflow Conditions

As shown in **Plate 3**, the perimeter levee system around the Natomas Basin is part of an integrated system of levees, overflow bypass channels, and dams that comprises the Sacramento River Flood Control Project (SRFCP). This flood control system was initially designed to improve navigation and reduce the risk of flooding to facilitate agricultural development of the extensive floodplains encompassed by the Sacramento Valley. The design included levees set closely along the rivers that would contain flows generated by common floods and bypasses to carry overflows generated by large floods. The levees along the rivers ensured that velocities in the river would help scour the river bottom and move sediment through the system to reduce dredging costs and sustain navigation. The bypasses were conceived as the primary conduits for flood flows during major floods. Together, the river channels and bypasses were designed to transport a flood of the magnitude of the 1907 and 1909 Sacramento River floods.

Over time, the 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 space. These dams were justified in part by public safety considerations, specifically the need to provide a high level of flood protection to the historical urban settlements that grew up at the confluence of the Feather and Yuba Rivers (Yuba City and Marysville) and the American and Sacramento Rivers (Sacramento and West Sacramento).

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 percent of the flow reaching 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 PURPOSE OF THE PROPOSED ACTION

The following objectives were adopted by SAFCA in connection with the NLIP: (1) provide at least a 100-year level of flood protection to the Natomas Basin as quickly as possible, (2) provide “200-year” protection to the basin over time, and (3) avoid any substantial increase in expected annual damages as new development occurs in the basin. SAFCA’s approach to defining level of protection (system performance) differs from that of USACE. References in this document to levels of flood protection are based on SAFCA’s deterministic approach (the current FEMA method) and should not be taken as USACE concurrence that such levels will be achieved when the USACE probabilistic approach is utilized to define system performance. In any case, flood risk to the Natomas Basin would be considerably reduced by the proposed project.

The specific purpose of the proposed action analyzed in this EIS is to provide at least 100-year flood protection as quickly as possible while laying the groundwork to achieve at least “200-year” flood protection over time.

Additional project objectives that informed SAFCA’s project design were to:

(1) use flood control projects in the vicinity of the Airport to facilitate changes in the management of Airport lands that reduce hazards to aviation safety, and

(2) use flood control projects to increase the extent and connectivity of the lands in Natomas being managed to provide habitat for giant garter snake, Swainson's hawk, and other special-status species.

1.4 NEED FOR ACTION

The Natomas Basin floodplain is occupied by over 83,000 residents and $8.2 billion in damageable property. This area is presently vulnerable to flooding in a less than 100-year flood event. Uncontrolled flooding in the Natomas Basin floodplain in a flood exceeding a 100-year event could result in $7.4 billion in damage (SAFCA 2007). Depending on the circumstances, flood depths in the Natomas Basins could reach life-threatening levels. Flooding could also result in releases of toxic and hazardous materials, groundwater contamination, and damage to the metropolitan power and transportation grids. The disruption in transportation that would result from a major flood would affect the Airport and interstate and state highways. The day-to-day functioning of the state capital also would be significantly affected by these interruptions.

The need for the NLIP Landside Improvements Project 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* (July 14, 2006). This evaluation was based the following engineering studies and reports that were included as appendices to the above-referenced report and have been updated as the design of the early implementation project has proceeded:

A. *Design Water Surface Profile for the Sacramento River East Levee and Natomas Cross Canal Levees in Natomas* prepared by MBK Engineers (August 9, 2005)

B. *Problem Identification Report–American River North Levee, Reclamation District 1000, Sacramento County, California* prepared by Kleinfelder (February 1, 2006)

C. *Problem Identification Report–Sacramento River East Levee, Reclamation District 1000, Sacramento and Sutter Counties, California* prepared by Kleinfelder (February 1, 2006)

D. *Problem Identification Report–Natomas Cross Canal South Levee, Reclamation District 1000, Sutter County, California* prepared by Kleinfelder (February 1, 2006)

E. *Preliminary Geotechnical Evaluation–Proposed Secondary Levee for the Sacramento River East Levee, Reclamation District 1000, Sacramento and Sutter Counties, California* prepared by Kleinfelder (February 1, 2006)

F. *Natomas Levee Evaluation Program–Erosion Assessment–Draft Report* prepared by Northwest Hydraulic Consultants (February 2006)

G. *Natomas Levee Evaluation Program–Preliminary Cost Estimate* prepared by Parsons Brinckerhoff (February 2006)

These studies and reports indicate that segments of the Natomas perimeter levee system reflect the following problems for both the Federal Emergency Management Agency (FEMA) 100-year and the "200-year" design water surface elevations:

- inadequate freeboard,
- through-levee seepage and foundation underseepage with excessive hydraulic gradients,
- embankment instability, and

- susceptibility to erosion and scour.

Although not highlighted in the levee evaluation, 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 formulating plans to address these conditions, SAFCA determined that the necessary flood control improvements will require a substantial volume of soil borrow material, and that much of this material could be obtained in a manner that could improve aviation safety through grading and recontouring of the bufferlands surrounding the Airport, while maintaining consistency with the goals of the NBHCP.

The following subsections describe flood control system problems and other problems and needs related to project implementation.

1.4.1 Flood Problems and Needs

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

1.4.1.2 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. 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 a "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 erodable 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 5** shows a schematic of these two failure mechanisms. **Plate 4** shows the locations around the Natomas Basin where seepage has been identified as a problem at both the FEMA 100-year and "200-year" design water surface elevations.

1.4.1.3 Erosion. As shown in **Plate 6**, approximately 15 sites along the water side 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 bed elevations at the toe, or the local bed has been observed to be lowering; or

- 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 was ranked as moderate.

Moderate-risk sites exhibit one or more of the following characteristics and may be recommended for treatment as part of any "200-year" flood protection improvement program:

- 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; or

- 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, C, D, G, J, and M are considered high-risk sites. Sites B, I, K, and L are considered moderate-risk sites.

Treatment of bank erosion is not an element of the Landside Improvements Project but is a part of SAFCA's overall NLIP. The presence of high-risk sites may affect the ability to provide 100-year or "200-year" flood protection to the Natomas Basin. Discussion of erosion sites is relevant to this EIS, therefore, because the selection and design of improvements along the Sacramento River east levee will influence the extent of the threat that bank erosion sites pose to the integrity of the levee—and, consequently, the need to repair erosion sites.

1.4.1.4 Encroachment. 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. Substantial encroachments are present on the Sacramento River east levee. **Plates 7a** and **7b** 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.

1.4.2 Related Problems and Needs

1.4.2.1 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 8**). 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 vast majority of these bufferlands have been historically leased to tenant farmers as an alternative to active management by Sacramento County maintenance staff.

The Airport has the highest number of reported wildlife 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 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 Federal Aviation Administration (FAA) has required the Airport to maintain and implement a Wildlife Hazard Management Plan (WHMP). The plan relies on a combination of wildlife control and land management strategies and outlines steps for monitoring, documenting, and reporting potential wildlife hazards and birds strikes. The following land management objectives in the WHMP are relevant to the proposed early implementation project:

- Maintain grasslands in the Airport Operations Area to discourage use by hazardous wildlife.
- Reduce aquatic habitat for hazardous wildlife.
- Reduce hazardous wildlife use of ditches in the Airport Operations Area.
- Reduce hazardous wildlife on Sacramento County–owned agricultural land in the 10,000-foot Critical Zone.

1.4.2.2 Habitat Conservation. The Natomas Basin provides habitat for a variety of wildlife species, ranging from those that utilize 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 utilize 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
- giant garter snake
- northwestern pond turtle
- Swainson's hawk
- burrowing owl
- other nesting birds

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 and county 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 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 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 January 2006, nearly 4,000 acres of mitigation property had been acquired in the Natomas Basin. As shown in **Plate 9**, this property is concentrated in three areas: north of the Airport and west of 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 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.

1.4.2.3 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 (NMWC) and a drainage system owned and operated by RD 1000. NMWC 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 Elkhorn Boulevard, and the Riverside Main Irrigation Canal (Riverside Canal), which runs parallel to the east levee from approximately 1 mile north of San Juan Road to approximately Orchard Lane. These NMWC canals are fed by three pumping plants on the Sacramento River (**Plate 10**). These canals are referred to as "highline" canals because they have earthen 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 NMWC also operates two pumps along the NCC south levee that provide irrigation water to agricultural lands in the northern portion of the basin. These NMWC irrigation systems and several other landowner-operated systems along the Sacramento River east levee and the NCC south levee will need to be relocated to accommodate improvements to these levees. The new facilities could provide a sustainable long-term source of agricultural irrigation water in the western and northern portions of the basin that are expected to remain in some form of agriculture or open space use to accommodate the Airport and two of the three major blocks of habitat being assembled by TNBC.

RD 1000 operates several drainage pumping plants along the Sacramento River east levee and the NCC south levee that could be affected by levee improvement activity. As shown in **Plate 10**, Pumping Plant 2, located in Sacramento River Reach 4B, pumps drain water from the lower end of the North Drainage

Canal; Pumping Plant 3, located in Sacramento River Reach 13, pumps drain water from the West Drainage Canal; Pumping Plant 1, located in Reach 20A, pumps drain water from the Main Drainage Canal; and Pumping Plant 4, located in NCC Reach 2, pumps drain water from the upper end of the North Drainage Canal. These pumping facilities include discharge pipelines that will 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.

The City of Sacramento operates the Willow Creek storm water pumping station, which is located in Sacramento River Reach 19B.

1.5 EFFORTS TO PROVIDE INCREASED FLOOD PROTECTION

The NLIP Landside Improvements Project and the NLIP as a whole are part of a larger program of improvements to the flood control 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.

1.5.1 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.

1.5.2 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, as in much of 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 into a drainage ditch to be 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 as a barrier to 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.

1.5.3 ARWI 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 control 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 a "200-year" level of flood protection 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.

1.5.4 North Area Local Project

Relying on the Natomas authorization, SAFCA quickly initiated the NALP. This locally funded project was designed to provide a high level of flood protection 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 under any of the alternatives under consideration, 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 substantially completed in 1996.

1.5.5 Folsom Dam Reoperation

In 1995, SAFCA entered into a five-year agreement with the U.S. Bureau of Reclamation (Reclamation) to initiate a variable space storage operation at Folsom Dam that would allow for an increase in the space available for flood control in the reservoir based on water storage conditions in three large non-Federal reservoirs located in the American River watershed upstream of Folsom Dam. This program was designed to account for the incidental flood control benefits afforded by these non-Federal reservoirs without formally incorporating them into the flood control system and without triggering unacceptable impacts to anadromous fish in the Lower American River or to the water supply, hydropower, and recreational uses dependent on Folsom Dam.

1.5.6 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 reservoir storage space available for flood control along the American River, 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 around 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 freeboard and levee stability improvements, a similarly high level of protection 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 protection, and Congress directed the Secretary of the Army to design and construct them under the auspices of the Common Features Project. The authorization 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 control program for the American River watershed.

1.5.7 1997 Flood

Shortly after the conclusion of the 1996 Federal legislative session, the Sacramento Valley was again visited by 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. Nevertheless, 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 stress that occurred in 1986. On the other hand, 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 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.

1.5.8 Folsom Dam Modification Project and Expansion of the Common Features Project

In 1999, Congress approved a plan for increasing flood protection along the American River by modifying Folsom Dam's outlet works to make the dam's flood control operation more efficient. In addition, Congress expanded the scope of the Common Features Project, calling for 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 freeboard, and directing USACE to raise the south levee of the NCC to provide the same level of flood protection afforded by the authorized improvements to the east levee of the Sacramento River. Finally, 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.

1.5.9 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 control and dam safety issues through construction of a new auxiliary spillway and control gates that will involve excavation of existing high ground southeast of the main dam. The new 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" design flood in the American River watershed. The new flood control 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.

1.5.10 General Re-evaluation of the Common Features Project

Changes in engineering standards affecting the design of the Natomas Basin elements of the Common Features Project have caused USACE to initiate a general re-evaluation of these elements to address underseepage issues that were not identified in the engineering studies that Congress relied on in

authorizing the Common Features Project in 1996 or in modifying the project authorization in 1999. The results of this effort will be reflected in a General Re-evaluation Report (GRR) that will be presented to Congress in 2010 with recommendations as to what scope and cost modifications may be needed to ensure that the project can achieve its authorized flood risk reduction objectives.

A similar effort is getting underway 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. Here, USACE has determined that the Sacramento River east levee between the American River and the town of Freeport may lack adequate freeboard, and may be susceptible to underseepage and erosion in a "200-year" flood event. 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, in order to ensure that levees protecting the City of Sacramento provide the same level of protection as the Folsom Dam improvements, which are already under construction.

SAFCA's early implementation project is running ahead of the GRR submittal date with the expectation that the perimeter levee improvements that are constructed in advance of any Congressional action on the GRR will be found to be consistent with the recommendations contained in the GRR. 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.

1.6 PROJECT AUTHORIZATION

SAFCA is authorized to proceed with the early implementation project under the provisions of its Consolidated Capital Assessment District that was formed in April 2007 following an affirmative vote of property owners occupying the "200-year" floodplain in Sacramento. In October 2007, the State Legislature approved and the Governor signed SB 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 Proposition 1E in November 2006. Federal participation in the project will require additional action by Congress based on the results of the GRR as discussed above.

1.7 RELATED NEPA DOCUMENTS

The following NEPA documents that were previously prepared by the USACE were reviewed by USACE staff in review of this proposed 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

- July 1, 1997, Record of Decision on FSEIS, signed by Director of Civil Works, Major General Russell L. Furman

1.8 PURPOSE OF THIS DOCUMENT

This EIS combines project-level analysis of the 2008 construction phase of the NLIP Landside Improvements Project and program-level analysis of the 2009 and 2010 construction phases. It will facilitate USACE planning and regulatory activities in connection with the NLIP Landside Improvements Project. The EIS describes the existing environmental resources in the project area and evaluates and provides full disclosure of the environmental effects of the project alternatives on these resources. The EIS was prepared in accordance with NEPA of 1969 and the Council on Environmental Quality regulations.

2.0 ALTERNATIVES

This chapter describes the alternatives that were considered to provide additional flood protection to the Natomas Basin consistent with the project flood control objectives. Although they provide contrasting advantages and disadvantages, each of the alternatives is considered feasible based on relevant economic, environmental, social, technological, and legal factors.

2.1 FORMULATION OF ALTERNATIVES

Plan formulation is an iterative process that involves identification, evaluation, and comparison of measures and preliminary alternatives to develop a reasonable range of final alternative plans for consideration by decision makers and the general public. For the Natomas Levee Improvement Program (NLIP) Landside Improvements Project, engineering measures were developed and considered that alone or in various combinations would address the project purpose.

2.1.1 Measures Eliminated from Consideration

Two measures that could contribute to addressing the Natomas Basin's flood problems and needs were reviewed and eliminated from further consideration for the reasons outlined below.

2.1.1.1 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 bypass. Depending on the design of the bypass improvements, this measure could reduce water surface elevations in the Sacramento River channel during very large floods (100-year or greater) by as much as 3 feet at the mouth of the Natomas Cross Canal (NCC) declining to about 0.5 feet downstream of Interstate 5 (I-5). This would reduce the extent of the levee raising and seepage remediation work that is needed along the NCC south levee, the Sacramento River east levee, and the Pleasant Grove Creek Canal (PGCC) west levee. However, this measure would not meet the project purpose of providing at least 100-year flood protection to the Natomas Basin because it would not fully address freeboard deficiencies on the NCC south levee and Sacramento River east levee and it would leave substantial underseepage and through-seepage conditions unaddressed along these levees and the PGCC west levee.

The Yolo Bypass improvements that could be incorporated in this measure include the following:

- redesign and reconstruction of the Fremont and Sacramento Weirs,
- construction of a new setback levee along the eastern edge of the Yolo Bypass extending from the Fremont Weir to the north levee of the Sacramento Bypass,
- construction of a weir and closure structure in the Sacramento Deep Water Ship Channel south of Interstate 80 (I-80),
- removal of existing Sacramento River Flood Control Project (SRFCP) restricted height levees in the lower reach of the Yolo Bypass, and
- strengthening of the remaining levees in the Yolo Bypass to the 1957 design profile.

The Yolo Bypass improvements alone are estimated to cost more than $700 million (unescalated construction costs) (Cermak, pers. comm., 2008). Because some freeboard increases and substantial seepage remediation would still be required for the Natomas Basin perimeter levee system even if these

Yolo Bypass improvements were implemented, to meet the project purpose, this measure would have to be combined with extensive seepage remediation measures on the Natomas perimeter levee system as described for the alternatives presented in Section 2.2, adding to these costs. Moreover, because of the extent and high cost of these improvements, all of which would lie outside SAFCA's jurisdiction, this measure would require an unprecedented degree of State, Federal, and local cooperation and funding, and therefore would not meet the project objective of providing 100-year flood protection to the Natomas Basin as quickly as possible. For this reason, this measure was not considered further for the NLIP but was considered worthy of further evaluation as part of the State's pending update of the State plan of flood protection for the Central Valley.

2.1.1.2 Reduced Natomas Urban Levee Perimeter. This measure would involve construction of a cross levee running east to west across the Natomas Basin about 500 feet north of Elkhorn Boulevard to protect existing developed areas in the City of Sacramento (**Plate 11**). To protect Sacramento International Airport (Airport), the new levee would turn north before reaching Powerline Road and then turn west to connect to the Sacramento River east levee just downstream of Reclamation District (RD) 1000's Pumping Plant No. 2. The new levee would be designed to meet State and Federal 100-year and "200-year" design requirements. It would cover a distance of about 8 miles. Its construction would require 6 to 10 million cubic yards of material in addition to the approximately 4.5 million cubic yards that would be needed for the Sacramento River east levee improvements south of the cross levee (i.e., a total project need of 10.5 to 14.5 million cubic yards of material), and its footprint would cover 435 to 735 acres of land, depending on whether a seepage berm or another seepage remediation measure (cutoff wall or relief wells) would be employed to contain underseepage.

The new levee would make it unnecessary to proceed with approximately 15 miles of levee raising and seepage remediation improvements along the NCC south levee, the PGCC west levee, and reaches 1 to 4A of the Sacramento River east levee. This measure would leave about half the Natomas Basin outside the "200-year" urban levee perimeter, including all of the basin lands that are in Sutter County.

USACE previously analyzed the feasibility of a Natomas cross levee as part of the American River Watershed Investigation Feasibility Study and rejected this measure as infeasible, as described in the study and the associated environmental impact statement/environmental impact report (EIS/EIR) (USACE 1991a, 1991b). Cost was a major factor in the determination that the measure would be infeasible; the results of the analysis indicated that it would be significantly more cost effective to protect all of the Natomas Basin than to protect a portion with a cross levee. The study concluded that a levee constructed across the Natomas Basin would cause floodwaters north of the cross levee to be considerably deeper than they would be without the cross levee, and that either flowage easements would need to be acquired on all lands in the basin north of the cross levee or a weir and pumping facilities would need to be constructed to facilitate evacuation of floodwaters from this area. Either concept was determined to be extremely costly and impracticable.

Having determined that this measure was infeasible, the Chief of Engineers recommended to Congress in 1992 and again in 1996 that the risk of flooding in Natomas should be addressed by raising and strengthening the existing perimeter levee system. Congress approved this approach first in the Defense Appropriations Act of 1993, which called for improvements to the NCC south levee and the PGCC west levee as part of the American River Watershed Natomas Features Project. Later, in the Water Resources Development Act of 1996, Congress approved raising and strengthening the northern 12 miles of the Sacramento River east levee in Natomas as part of the Common Features Project. Finally, as part of the Water Resources Development Act of 1999, Congress called for additional raising and strengthening of the NCC south levee. The California Legislature affirmed each of these Congressional enactments and in each instance committed the State of California to serving as the non-Federal sponsor for improving the

perimeter levee system around the Natomas Basin and providing the non-Federal share of the cost of these improvements.

Although a new cross levee would reduce the length of the urban levee perimeter in the Natomas Basin, this measure is rejected from further analysis for the following reasons:

- As described above, 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 authorizations.

- It would result in the need to raise State Route (SR) 99/70, or otherwise protect SR 99/70 from flooding, in the portion of the Natomas Basin north of the cross levee, or the need to relocate this highway outside the basin.

- It would divide RD 1000 and disrupt several portions of the Natomas Basin irrigation and drainage system (and the associated wildlife dispersal corridors) and require reconfiguration of these systems.

- It would present significant barriers to achievement of the goals of the Natomas Basin Habitat Conservation Plan (NBHCP) and, therefore, compliance with the Federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA) by bifurcating lands subject to the NBHCP and creating a substantial hindrance to the movement of giant garter snakes within the basin by severing a major dispersion corridor east of the Airport.

- It would have substantially greater costs than alternatives to improve the perimeter levee system without achieving any additional flood damage reduction benefit because it:

    - would require the acquisition of flood easements that would retire development rights on the approximately 26,000 acres of Natomas Basin lands north of the cross levee at an estimated cost of $27,000 per acre or a total of $70 million based on current estimates of the value of such easements by SAFCA;

    - would require about 30%–80% more soil borrow material (10.5–14.5 million cubic yards compared to as much as 8 million cubic yards under a perimeter levee improvement alternative carried forward for detailed analysis in this EIS), increasing the cost of the project by $30 million to $90 million depending on the location of the additional soil borrow material; and

    - would include SR 99/70 relocation, raising, or other flood protection.

- It would leave a portion of the basin currently planned for development by Sutter County 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.

As a result, a cross-levee measure would not meet the project objective of providing 100-year flood protection to the Natomas Basin as quickly as possible. For these reasons, it was dropped from further consideration.

2.1.2 Measures Retained for Further Consideration

The following subsections describe the measures that were considered for addressing freeboard deficiencies, seepage potential, and encroachment issues and that could be used in various combinations to improve the Natomas Basin perimeter levee system. These measures were considered in several preliminary combinations for their ability to effectively address the project purpose. As described below, two options for increasing levee freeboard along the Sacramento River east levee—raising the existing levee and constructing a setback levee as much as 5 miles long—were refined during this process in recognition of complications associated with residential uses along the levee, Airport operations, potentially unresolvable conflicts with Federal and California laws for protection of species, other adverse environmental effects, and additional costs. Also, as described later in this chapter (see Section 2.2, "Alternatives Carried Forward in This EIS"), consideration was given to reducing effects on natural resources, including wetlands and other waters of the United States, to the extent feasible while meeting USACE and State criteria for levee design and maintenance. A result of this effort is that the USACE jurisdictional features that would be affected by the project (e.g., agricultural canals, seasonal wetlands) are generally those that are very near the existing landside toe of the NCC south levee, Sacramento River east levee, and PGCC west levee and would be approximately equally affected by any combination of levee improvements described below.

2.1.2.1 Levee Freeboard Remediation. All of the NCC south levee reaches, many of the Sacramento River east levee reaches, and a portion of the PGCC west levee at Sankey Road lack the required 3 feet of freeboard above the "200-year" design water surface profile, and many of these sections lack the required freeboard above the Federal Emergency Management Agency (FEMA) 100-year water surface profile. To meet the NLIP project objectives, the affected levee sections need to be raised to meet the desired minimum of 3 feet of freeboard above the "200-year" design water surface profile. The only freeboard-deficient levee segment that would be maintained at its current elevation is the PGCC west levee at Sankey Road because the flows through this levee segment into the interior of the Natomas Basin during a FEMA 100-year or "200-year" design event are non-damaging and are subject to management as part of the basin's interior drainage system. In all reaches, the final levee configuration would be designed to meet the USACE criteria of a 20-foot-wide minimum crown, a 3:1 horizontal-to-vertical (3H:1V) waterside slope, and a 3H:1V (preferred) or 2H:1V (maximum) landside slope. Because the levees in most of the project reaches currently have landside slopes of 2H:1V, the proposed project includes flattening most of these slopes to a 3H:1V profile.

The measures that could be implemented to accomplish the necessary freeboard increases would be:

- raising the existing levees in their current alignments,
- constructing a new higher levee adjacent to the existing levee along the Sacramento River, and
- constructing a new higher levee set back 500 to 1,000 feet from the existing levee in the northern reaches of the Sacramento River and raising the remaining reaches of the levee in place where necessary.

Each of these measures is described below.

Raising the Existing Levees in Place. This measure would involve increasing the crown elevation of all freeboard-deficient levee segments on the NCC south levee and portions of the Sacramento River east levee to provide at least 3 feet of freeboard above the "200-year" design water surface elevation. Where the required raise is minor (6 inches or less), the raise would be limited to the levee crown area, provided there is enough existing crown width to accommodate the raise without

narrowing the crown to a width that is less than the minimum requirement. For most of the affected levee segments, however, a greater crown raise would be required and/or the levee slopes would need to be flattened. The required crown elevation would be met through a full levee raise. Full levee raises consist of an embankment raise from the landside or waterside toe (or both) upward to the increased crown elevation. This would require partially excavating the levee slope to provide a working platform for equipment, typically 10 feet wide, and rebuilding the levee to the appropriate elevation by benching the new embankment material into the existing embankment material. **Plate 12** illustrates a levee raise and flattening of a landside levee slope from 2H:1V to 3H:1V. **Plate 13 (upper illustration)** shows the improvements in a typical cross section along the Sacramento River east levee.

Raising the existing Sacramento River east levee in place would require applying USACE policy regarding levee encroachments and vegetation removal to this levee, as indicated in **Plate 13 (upper illustration)**. It is likely that a substantial number of encroachments on the water side of the levee may be determined to reduce the integrity of the levee or increase flood risk unacceptably and would need to be removed. An estimated 35 acres of trees also may need to be removed from the water side of the levee and within 15 feet of the waterside levee toe. The Natomas Basin provides important nesting habitat for a substantial portion of the Central Valley population of Swainson's hawks, which are protected under California and Federal law, and most nest sites in the basin are located along the Sacramento River, mainly on the water side of the levee. Removal of waterside trees to meet USACE policy would trigger significant mitigation requirements that could be difficult, if not impossible, to complete. To adequately replace the habitat and aesthetic value of these trees, replacement would need to occur in a similar waterside location along the Sacramento River levee system. It is unknown where sufficient acreage is available to implement such replacement in a manner that would not conflict with USACE policy. In addition, it would be very difficult or impossible to compensate for the likely loss of a number of trees that are preferred Swainson's hawk nest sites along the edge of the Natomas Basin. For these reasons, raising the Sacramento River east levee in place would be considered only in conjunction with a setback levee that would provide substantial acreage for replacement woodland plantings on the water side of the levee in the Natomas Basin. (The setback levee option is described below.)

Constructing a New Adjacent Levee. This measure would involve construction of a new levee adjacent to and adjoining the existing levee as shown in **Plate 13 (lower illustration)**. This "adjacent setback levee" or "adjacent levee" measure is considered feasible for all reaches of the Sacramento River east levee except Reaches 19B and 20, where urban subdivisions would preclude expansion of the existing levee footprint. The new adjacent levee would be constructed with a crown elevation at least 3 feet above the "200-year" design water surface profile. In the northern reaches, where the existing levee has freeboard deficiencies of as much as 3 feet, the crown of the adjacent levee would be higher than the existing levee and Garden Highway roadway. In the lower reaches, where the existing levee has sufficient freeboard, the new adjacent levee would be the same height as the existing levee. Constructing an adjacent levee would move the hypothetical waterside slope of the levee (the "levee template") landward. As illustrated in **Plate 13 (lower illustration)**, this landward shift would significantly reduce the conflict between the substantial encroachments that are present on the waterside slope and the applicable USACE levee operation and maintenance requirements (see Section 1.4.1.4, "Encroachments," and "Encroachment Management" in Section 2.2.2.5). It also would increase the distance between the toe of the bank and the levee template, thereby reducing the risk to the stability of the levee resulting from bank erosion as identified in Section 1.4.1.3, and thus would likely render near-term repair of bank erosion sites less critical. Construction of an adjacent levee along the Sacramento River east levee also would eliminate the need to degrade and then reconstruct Garden Highway (on the levee crown) during the period of levee underseepage improvements and would reduce disturbance of and access problems for the residential uses along the water side of the levee.

Constructing a New Setback Levee. This measure would involve construction of a new levee along an alignment parallel to the existing levee alignment but set back from the existing alignment by 500 to 1,000 feet and degradation of the existing levee in the setback levee reaches. A levee setback could be implemented along the northern reaches of the Sacramento River east levee. SAFCA previously considered constructing a setback levee of 500 to 1,000 feet wide and as much as 5 miles long in the northern reaches of the Sacramento River east levee. However, a levee setback extending south of the northern 1.5 miles of this area (Reach 1 and a portion of Reach 2) is likely infeasible because of (1) the presence of waterside residences along the existing levee from approximately Station 90+00 in the north to the American River north levee in the south, and the need to maintain access to these residences from the Garden Highway; and (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. The Sacramento County Airport System (SCAS) has previously expressed objections to consideration of a levee setback within the 10,000-foot Airport Critical Zone because of the potential that the setback area, which would likely be subject to shallow flooding from Sacramento River flows during winter and spring, could attract birds that would increase hazards to aircraft. In addition to this concern, utility relocations (power poles) and flood control improvements could encroach into runway approach surface slopes. Therefore, a setback levee of more than approximately 1.5 miles is not being considered further.

For these reasons, any new setback levee would extend for approximately 1.5 miles within Reaches 1 and 2 of the Sacramento River east levee. The new levee would be constructed with 3H:1V waterside and landside slopes and with sufficient freeboard to contain the “200-year” design flood. A seepage berm or cutoff wall would run along the entire length of the new levee, and the Garden Highway would be moved to the land side of the levee, east of any seepage berm and maintenance access. The landside section of roadway would reconnect to Garden Highway in the north at the proposed realignment of the Sankey Road intersection (Station 5+00), and in the south at the end of the setback levee (Station 88+00).

The setback levee would be designed such that it would not alter the flow split between the Yolo Bypass and the Sacramento River and therefore would not alter river hydraulics. Preliminary modeling has shown that “cross levees,” consisting of levee sections constructed perpendicular to the main levee, would prevent additional flows from being conveyed through the levee setback area and down the Sacramento River channel, altering the hydraulic balance of the system. **Plate 14** illustrates the setback levee concept with three cross levees forming four cells. Once the setback levee is constructed, the existing levee would be breached in several places between the cross levees to allow the cells to fill with shallow water in winter and spring, creating backwater areas that could enhance fish habitat and riparian habitat. Riparian plantings within the levee setback area could be used to enhance the woodland corridor along the Sacramento River east levee.

Construction of a 500-foot or 1,000-foot setback levee would eliminate the need to repair bank erosion sites along the corresponding segment of the existing Sacramento River east levee in Reaches 1 and 2 (shown in **Plate 6**).

2.1.2.2 Seepage Remediation. Levee underseepage and, to a lesser extent, levee through-seepage and stability problems, have been identified at many locations around the Natomas perimeter levee system. Underseepage problems can be corrected through the use of cutoff walls, seepage berms, and relief wells. Through-seepage can be corrected by constructing cutoff walls or stability berms. There are two known areas of through-seepage instability potential in the project area: at the westerly end of the NCC south levee where it meets the Sacramento River east levee and at the easterly end of the NCC south levee where it meets the PGCC west levee. The use of cutoff walls in these locations would address both through-seepage and underseepage. Therefore, the following discussion focuses exclusively on underseepage remediation.

Seepage Berms. Seepage berms are wide embankments placed outward from the levee landside toe to lengthen the underseepage path and thereby lower the exit gradient of seepage through permeable layers under the levees to acceptable levels (**Plate 15**). Berms typically extend from 80 feet (a minimum berm width) to 300 feet from the landside toe of the levee. The thickness of the berm depends on the severity of the seepage flow but generally begins at 5 feet near the landside levee toe for a 100-foot berm and 7.5 feet for a 300-foot berm and tapers to a thickness of 3 feet at the end of the berm.

Relief Wells. Relief wells provide protection against excessive levee underseepage by providing a lower resistance pathway for underseepage to exit to the ground surface at the landside toe of the levee without creating sand boils or piping levee foundation materials. Relief wells are an option for addressing underseepage only in reaches where continuous sand and gravel layers have been identified by the geotechnical explorations and analyses.

Relief wells are constructed near the landside toe of the levee or the toe of a seepage berm to provide pressure relief beneath surficial fine-grained soils (clay or silt "blanket") (**Plate 16**). The wells are constructed using drilling equipment to bore a hole vertically through the fine-grained blanket layer and into the coarse-grained aquifer layer beneath. Pipe casings and filters are installed to allow the pressurized water to flow to the ground surface, thereby relieving the pressures beneath the clay blanket. A collection pipe or ditch is used to carry seepage water to a surface drain. The wells require regular maintenance to ensure proper operation.

Relief wells generally are spaced at 50- to 100-foot intervals. They can be used to avoid obstructions on the land side of the levee toe (such as buildings or trees) that otherwise would have to be removed for the construction of seepage berms. Although during elevated river stages relief wells conduct water to the surface without pumping (artesian flow), pumping costs are incurred to convey the collected water back into the river. Additional maintenance costs associated with the wells include periodic video surveying, well performance testing, cleaning, and miscellaneous repairs. Monitoring wells (piezometers) are installed between relief wells to allow monitoring of the wells to ensure that hydraulic pressure is being relieved.

Cutoff Walls. Cutoff walls reduce underseepage by providing a barrier of low-permeability material through the levee and levee foundation where sandy or gravelly soils of higher permeability can transmit seepage during high water stages. The cutoff wall depths necessary to limit underseepage at the design water surface elevation are determined by geotechnical analysis. Cutoff walls are generally installed to depths that will tie in with existing impervious or lower permeability soil layers beneath the levee foundation.

Cutoff walls can be constructed by a number of methods to suit site conditions and schedule requirements. The most common methods include the installation of cutoff walls consisting of a soil-cement-bentonite (SCB) mix, a cement-bentonite (CB) mix, or a soil-bentonite (SB) mix using conventional trench methods, deep soil mixing (DSM), or trench remixing deep (TRD). The SCB mix is used where the cutoff wall is inserted through a levee that has been constructed with potentially unstable soil materials. In that case, the SCB wall can provide structural stability if the encapsulating material begins to slough. SB walls can be installed through levees constructed of stable soils materials or through an oversized or adjacent levee structure where the mass of the soil material significantly reduces the potential for instability.

Plate 12 illustrates a typical cutoff wall through a levee centerline. Cutoff walls are typically constructed using an excavator with a long-stick boom capable of digging a trench to a maximum depth of approximately 80 feet. However, use of clam shell excavators can extend this distance by as much as 30 feet to reach depths as great as 110 feet. Bentonite slurry is pumped into the trench during trench

excavation to prevent caving. The soil and bentonite or soil, cement, and bentonite are mixed to achieve the required cutoff wall strength and permeability, and the mixture is backfilled into the trench. Construction of a conventional slurry cutoff wall through the center of the levee typically requires that the existing levee be degraded as much as one-third of the levee height to prevent hydraulic fracturing. Select fill is used to rebuild the levee.

DSM cutoff walls can reach depths of 200 feet. They are constructed by parallel augers drilling vertically through the levee and substrate. Cement and bentonite are pumped into the interconnected holes as the augers are inserted and withdrawn. The levee is normally degraded as necessary to create a 30-foot flat top width on which the equipment operates.

TRD cutoff walls can be constructed to depths similar to those of DSM walls. The TRD method uses a cutter chain on a wide shaft (similar to a large chain saw) set vertically into the foundation soil. Cement and bentonite are pumped into the shaft at various depths as the cutters move along the wall alignment. Again, the levee is normally degraded as necessary to create a 30-foot flat top width on which the equipment operates.

2.2 ALTERNATIVES CARRIED FORWARD IN THIS EIS

Several alternatives were developed for consideration that include improvements to the NCC south levee, the Sacramento River east levee, and the PGCC west levee and landscape and irrigation/drainage system modifications associated with these improvements. Development of the alternatives included substantial planning based on consideration of effects on wetlands and other waters of the United States, woodlands, giant garter snake habitats, and other habitats. Accordingly, levee improvements were designed to avoid or minimize such effects where practicable. However, several agricultural canals or portions of canals and small seasonal wetlands are present near the levee toe along the NCC south levee, Sacramento River east levee, and PGCC west levee, and these would require filling under any of the levee improvement alternatives because their proximity to the existing levees places them within the expanded landside levee footprint or adjacent maintenance access under all alternatives. Similarly, portions of several woodland groves extend into the proposed footprint of the flood control features along the land side of the Sacramento River east levee under any of the action alternatives and would need to be removed and/or relocated. Consequently, effects on wetlands and other waters of the United States and on other habitats along the land side of the levees are very similar among the action alternatives, and the same compensation strategies are proposed for unavoidable effects.

In terms of flood control system design, the alternatives differ in terms of how they would achieve the required freeboard increases along the Sacramento River east levee. Therefore, the differences between alternatives, including effects on habitats, are the result of these Sacramento River east levee design differences. The following alternatives were carried forward for detailed analysis in this EIS and are described below:

- No-Action Alternative
- Alternative 1 (Preferred Alternative)—Construct an Adjacent Setback Levee along the Sacramento River East Levee
- Alternative 2—Raise Levee in Place with a 1,000-Foot Levee Setback in the Northern 1.5 Miles along the Sacramento River East Levee
- Alternative 3—Construct an Adjacent Setback Levee with a 500-Foot Levee Setback in the Northern 1.5 Miles along the Sacramento River East Levee

As described below in Sections 2.2.2, 2.2.3, and 2.2.4, Alternatives 1, 2, and 3 are proposed to be completed during 2008–2010 in three construction phases, which would be initiated in 2008, 2009, and 2010. The "2008 construction phase" would likely be initiated in summer or fall 2008 and concluded in the 2009 construction season, thus overlapping in part with the proposed "2009 construction phase." As noted in Section 1.1, "Introduction," this EIS will be used to support USACE decisions on whether to grant Section 408 permission and issue a permit pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act, as appropriate, for the 2008 construction phase while providing for consideration of broad policy-level issues involving all phases of the project, including fundamental alternative approaches to meeting the project purpose. Consequently, the following sections and other chapters of the EIS describe the project in its entirety, with the 2008 construction phase addressed in detail and the 2009 and 2010 construction phases addressed at a more general, programmatic level.

2.2.1 No-Action Alternative

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 no permissions to alter the existing levees or discharge dredged or fill material into waters of the United States would be granted.

Under one no-action scenario, SAFCA would not be authorized by USACE to undertake improvements on the Natomas Basin perimeter levee system. However, given the known deficiencies in these levees and their inclusion as part of the Federal flood control system, it can be assumed that USACE and/or the State of California would repair the Natomas levee system at some time in the future to meet the Federal and/or State flood protection obligations associated with the Federal flood control system. As discussed in Section 1.5.10, "General Re-evaluation of the Common Features Project," USACE is preparing a General Re-evaluation Report (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 reauthorized USACE project could begin would be 2011 or 2012. Therefore, it is assumed that USACE and/or the State of California would begin repairs on the Natomas Basin levee system in 2011 at the earliest and would complete the improvements providing 100-year flood protection no sooner than 2013. Based on the criteria that SAFCA, in coordination with USACE and the State, has used to select alternatives for detailed analysis, it is reasonable to assume that one of the three action alternatives described below would be implemented by USACE and/or the State 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. In the period before implementation of flood protection improvements 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).

To meet the intent that the environmental analysis provide the basis for comparing the impacts of implementing an action alternative with the impacts of no action being taken, the No-Action Alternative in this analysis consists of the conditions that would likely prevail in the Natomas Basin if no action at all were taken by SAFCA, the State, or USACE to further improve the basin's perimeter levee system beyond the accomplishments of the Sacramento Urban Levee Reconstruction Project and the North Area Local Project (NALP). Under this scenario, no further action would be taken to improve the State/Federal levee system protecting the Natomas Basin. Key segments of this system would continue to provide less than 100-year flood protection, and the entire Natomas Basin would be designated as a special flood hazard area subject to development restrictions and mandatory flood insurance requirements pursuant to the regulations of the National Flood Insurance Program (NFIP). SAFCA would not provide the Natomas

Basin with at least a 100-year level of flood protection by the end of 2010 and would not be able to facilitate achieving a "200-year" level of protection by the end of 2012.

Federal and State floodplain regulations would prevent new development in most of the Natomas Basin. The footprint of 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 expansion; alternatively, the Airport may construct its own limited flood control structure (i.e., a ring levee) to protect existing facilities and its expansion area. Some new development could occur along the eastern fringe of the basin where existing high ground could support new structures elevated above the 100-year base flood elevation. 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 (SACOG) and Valley Vision in 2006 (**Plate 17**). Up to 60,000 dwelling units and associated commercial and industrial developments that the blueprint anticipates will be located in the Natomas Basin would 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 uncontrolled flooding in the urbanized portion of the basin would remain relatively high.

2.2.2 Alternative 1 – Adjacent Setback Levee Alternative (Preferred Alternative)

Alternative 1 consists of levee improvements and associated landscape and irrigation/drainage system improvements that would be completed during 2008–2010. The improvements would be implemented in three phases, initiated in 2008, 2009, and 2010. The elements of this alternative can be summarized as follows:

- **Levee raising and seepage remediation: NCC south levee**—Raise and realign the NCC south levee to provide additional freeboard and more stable waterside and landside slopes and to reduce the need for removal of waterside vegetation. Construct a seepage cutoff wall through the levee crown in Reaches 3–7. (2008 phase)

- **Levee raising and seepage remediation: Sacramento River east levee**—Construct an adjacent setback levee from the NCC to the American River north levee, raised where needed to provide adequate freeboard, with a combination of cutoff walls, seepage berms, and relief wells for seepage remediation where required. (2008, 2009, and 2010 phases)

- **Levee widening and seepage remediation: PGCC west levee**—Widen, flatten waterside and landside slopes, and construct seepage berms along the PGCC west levee (specific berm widths and potential use of cutoff walls in some areas to be determined). (2009 phase)

- **Improvements to major irrigation and drainage infrastructure**—Irrigation: Relocate the highline Elkhorn Main Irrigation Canal (Elkhorn Canal) and Riverside Main Irrigation Canal (Riverside Canal). ("Highline" canals are conveyances with bottoms roughly equal to the surrounding ground elevation.) Drainage: Construct a new canal designed to provide drainage and associated giant garter snake habitat (the "GGS/Drainage Canal") between the North Drainage Canal and the West Drainage Canal, and modify the West Drainage Canal to improve associated giant garter snake habitat (these features are intended to offset project impacts on giant garter

snake canal and ditch habitat). Implement Airport West Ditch improvements in connection with construction of the GGS/Drainage Canal to allow the Airport to decommission the agricultural irrigation function of this facility and eliminate the hazards currently associated with it. The Airport stormwater detention function provided by this ditch would continue. The ditch would therefore be recontoured as a gently sloping swale to facilitate periodic maintenance such as mowing. Remove a deep culvert at the location of RD 1000 Pumping Plant No. 2 on the Sacramento River east levee, and reconstruct Pumping Plant No. 2. (2008, 2009, and 2010 phases)

- **Habitat creation and management**—Establish giant garter snake habitat features in the new GGS/Drainage Canal and improved West 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 adjacent setback levee slopes and seepage berms. Install woodland plantings to offset the loss of portions of tree groves within the landside levee footprint. (2008 and 2009 phases)

- **Additional actions to meet FEMA requirements**—Remove encroachments from a portion of the water side and land side of the Sacramento River east levee as needed to ensure that the levee can be certified as meeting the minimum requirements of the NFIP and USACE design criteria. Modify the SR 99/70 crossing of the NCC as needed to meet FEMA requirements. (2010 phase)

- **Right-of-way acquisition**—Acquire right-of-way through fee title or easement interest within the footprint of the project features, at the borrow sites, and to prevent encroachments into the flood control system. (2008, 2009, and 2010 phases)

Plate 18 shows the phasing of the major construction components (levee and canal construction) for Alternative 1, by year of initiation (i.e., 2008, 2009, and 2010 construction phases).

The elements of Alternative 1, Adjacent Setback Levee Alternative (Preferred Alternative), are described below in the following categories:

- flood protection components;
- aviation safety components;
- habitat conservation components;
- irrigation and drainage components;
- additional actions to meet FEMA requirements;
- lands, easements, relocations, and rights-of-way;
- construction details;
- operation and maintenance considerations; and
- additional investigations to aid project planning and design

2.2.2.1 Flood Protection Components. Flood protection components of Alternative 1 would consist of levee raises and seepage remediation using the methods described in Sections 2.1.2.1 and 2.1.2.2, respectively. Construction of the adjacent levee would reduce the potential for bank erosion to undermine levee stability; therefore, achievement of the project flood protection objective under this alternative is not expected to require associated repair of erosion sites. This section provides general descriptions of the flood protection components; construction details are provided in Section 2.2.2.7, "Construction Details."

Levee Raises. As described in Section 2.1.2.1, all of the NCC south levee and many reaches of the Sacramento River east levee need to be raised to meet the desired minimum of 3 feet of freeboard above the "200-year" design water surface profile. The freeboard-deficient segment of the PGCC at Sankey Road would be maintained at its current elevation because the flows through this levee segment into the interior of the Natomas Basin during a FEMA 100-year or "200-year" design event are non-damaging and are subject to management as part of the basin's interior drainage system. In all reaches, the final levee configuration would be designed to meet the USACE criteria of a 20-foot-wide minimum crown, a 3H:1V waterside slope, and a 3H:1V (preferred) or 2H:1V (maximum) landside slope. The freeboard increases would be accomplished through a raise of the existing NCC south levee and construction of the raised adjacent setback levee along the land side of the existing Sacramento River east levee:

- **Raise of existing NCC south levee—**On the NCC south levee, the required crown elevation would be met through a full levee raise (**Plate 12**) of the entire levee a distance of approximately 5.3 miles (from Station 0+00 to Station 287+50). This would require partially excavating the levee slope to provide a working platform for equipment, typically 10 feet wide, and rebuilding the levee to the appropriate elevation by benching the new embankment material into the existing embankment material. The NCC south levee raise is proposed for the 2008 construction phase.

- **Adjacent setback levee along the Sacramento River east levee—**An adjacent setback levee is proposed in lieu of modifying the existing Sacramento River east levee, which has substantial structural and vegetation encroachments along its water side. The adjacent levee raise would involve the construction of a new embankment adjoining the Sacramento River east levee (**Plate 13**). The adjacent levee would be constructed in Reaches 1–19A (a distance of more than 16 miles) with a crown elevation at least 3 feet above the "200-year" design water surface profile. In Reaches 19B and 20, urban subdivisions would allow only minor expansion of the existing levee footprint. In Reaches 1–11B, where the existing levee has freeboard deficiencies of as much as 3 feet, the crown of the adjacent setback levee would be higher than the existing levee and Garden Highway roadway. In Reaches 12–19A, where the existing levee has sufficient freeboard, the adjacent setback levee would be the same height as the existing levee.

  A minimum 5-foot-wide shoulder would extend from the landside edge of the crown of the existing levee to the water side of the new adjacent setback levee embankment. A 3H:1V slope would extend up to the crown of the adjacent setback levee. The crown would be at least 20 feet wide and would be topped with an aggregate base access road for inspection and maintenance. The adjacent setback levee would have a 3H:1V to 5H:1V landside slope. It would be constructed of compacted random fill material from borrow sources and from the excavation of the existing landside stability berm.

  The 2008 construction phase includes an adjacent setback levee along Reaches 1 through 4B. The remainder of the adjacent setback levee is proposed for the 2009 and 2010 construction phases.

Seepage Remediation. As described in Section 2.1.2.2, excessive underseepage gradients can be corrected through the use of cutoff walls, seepage berms, and relief wells. The choice of seepage remediation is influenced by the depth and continuity of pervious soil layers, adjacent land use, environmental constraints, construction cost, construction schedule, and long-term maintenance considerations. Of the three remediation methods, fully penetrating cutoff walls are generally preferred because they are the least costly (particularly if an SB mix is feasible); 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, cause little

construction disturbance outside the levee footprint. In reaches where the high depth to the impervious soil layer beneath the levee foundation precludes the use of a cutoff wall, seepage berms are preferred.

On the NCC south levee, an SB, CB, or SCB seepage cutoff wall would be constructed from the eastern terminus of the NCC South Levee Phase 1 Improvements (NCC Phase 1 Improvements) constructed in 2007 to the eastern end of the NCC south levee, a distance of approximately 4 miles (from approximately Station 54+00 to Station 287+50). These improvements to the NCC south levee are proposed as part of the 2008 construction phase.

Along the Sacramento River east levee, SB walls would be constructed through the adjacent levee in some reaches where seepage remediation is required, and 100- to 300-foot-wide earthen seepage berms would be constructed in others. Although portions of this reach of the Natomas perimeter levee system are considered susceptible to seismically induced ground shaking, such a condition would likely not cause deformation of the SB walls in the adjacent levee because of their malleability and location farther away from the river channel, where levee failure is more likely to occur in association with seismically induced collapse of the river bank. Additionally, because an SB seepage cutoff wall is constructed low in the levee section, it is likely not to be affected by failure of the levee itself if the levee were to collapse.

Along the PGCC, where liquefaction due to ground shaking is not a concern because of the hardpan nature of the soils, soil material is readily available, and there is adequate space to construct seepage berms without compromising environmental values, an 80- to 100-foot-wide landside berm is expected to be used for seepage remediation. Seepage remediation along the PGCC west levee would be included in the 2009 construction phase.

Borrow Sources for Flood Protection Components. Borrow sites are areas from which earthen materials would be removed for use in construction. The sites would be recontoured and developed as either managed marsh or grassland habitat or would be returned to agricultural cultivation following excavation for this use. Where borrow sites would be used over more than one construction season, the work would progress in cells that would be incrementally developed as habitat or returned to agricultural use as the borrow activities are completed.

The improvements to the NCC south levee, which would be initiated in 2008 and completed in 2009, would require as much as approximately 880,000 cubic yards of soil borrow. Improving the Sacramento River east levee and relocating irrigation facilities currently located along the landside toe of this levee would require approximately 6.5 million cubic yards of material in 2008–2010. The PGCC west levee improvements, which would be initiated in 2009 and completed in 2009 or 2010, would require approximately 415,000 cubic yards of material. The identification of the borrow sites that could provide this material was based on several criteria:

(1) Preference was given to sites nearest to the construction areas. The use of borrow sites near the construction areas would reduce the potential costs and environmental effects (e.g., air emissions) of hauling material. In addition, scrapers rather than trucks may be used in some instances to move soil material from a borrow site to a construction area when the borrow site is within approximately 1 mile of the point of use, thereby reducing the amount of material handling required and further associated construction costs and air pollutant emissions.

(2) Sites were selected to maximize the achievement of SAFCA's multiple project objectives to the extent feasible:

- Airport bufferland parcels were identified as potential borrow sources because borrow operations on these lands would supply material for levee improvements and include a

reclamation strategy that would be designed to reduce wildlife attraction and associated hazards to aviation safety.

- Private parcels historically used for rice cultivation were considered as potential borrow sources to provide for (a) additional conversion of suitable land to marsh that would be managed specifically as higher-quality giant garter snake habitat, and/or (b) the retention of land in rice production under public agency or habitat management agency control.

- Preference was given to sites adjacent to parcels already managed to provide special-status species habitat (parcels managed by The Natomas Basin Conservancy [TNBC] and the Airport's Prichard Lake mitigation site). Developing these sites for their habitat value following borrow activity would provide for larger contiguous blocks of managed habitat in the Natomas Basin.

- TNBC parcels already planned for development in the near term were considered for their borrow potential.

SAFCA has identified the following borrow sources for the flood control and irrigation infrastructure modifications (**Plate 19**):

- **Airport bufferlands north of the Airport complex (2008 phase preferred, 2009 phase preferred, 2010 phase potential):** Sacramento County property north of Elverta Road and mostly west of Powerline Road. These lands would provide soil for use along the middle reaches of the Sacramento River east levee in the 2008 and 2009 construction phases. They could also provide material for construction in the lower reaches of the levee in the 2010 phase, if needed. After the removal of borrow material, the areas north of the North Drainage Canal would be converted to managed marsh suitable as giant garter snake habitat between existing TNBC and Airport managed habitats, and the remainder would be reclaimed as managed grassland.

- **Fisherman's Lake area (2010 phase preferred):** TNBC-owned and privately owned parcels between TNBC-managed habitat areas. Several parcels may be suitable sources of borrow material for use in the lower reaches of the Sacramento River east levee and are strategically situated for creation of habitat that would link existing TNBC parcels (the specific parcels have not yet been identified; therefore, only the general area is called out in **Plate 19**).

- **Brookfield property (2008 phase preferred, 2009 phase preferred, 2010 phase potential):** Located west of the PGCC at Fifield Road, this private property was in rice cultivation in 2007. Material from this property would be used for improvements to the NCC south levee and along the northern reaches of the Sacramento River east levee in the 2008 construction phase (2008 and 2009) and on the PGCC west levee in 2009 and 2010. After the removal of borrow material, it is expected that the land would be returned to rice cultivation.

- **RD 1001 site (2008 potential, 2009 potential, 2010 potential):** Located about 5 miles northeast of the Natomas Basin along Pacific Avenue, this site owned by RD 1001 was in rice cultivation in 2007. The site is an alternative borrow source for the NCC south levee improvements that would be initiated in 2008 and completed in 2009 and for the PGCC west levee improvements that would be initiated in 2009 and completed in 2009 or 2010. In accordance with an agreement with RD 1001, SAFCA would assist in obtaining permits for the development of this site as a borrow source for the NLIP and for future use by RD 1001 for future flood control improvements.

2.2.2.2 Aviation Safety Components. The Airport experiences a high rate of aircraft bird strikes, which pose a substantial hazard to flight safety, and has been directed by the Federal Aviation Administration (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. 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 are aviation safety components of Alternative 1, which are described in Section 2.2.2.3:

- The construction of the GGS/Drainage Canal, modifications to the irrigation distribution system, and infrastructure repairs related to the Airport West Ditch would allow for dewatering of this ditch. This is expected to substantially reduce its attraction of wildlife and the associated potential for bird aircraft strikes.

- The conversion of land cover types on Airport lands as part of borrow and reclamation operations is expected to reduce the level of bird attraction to the Airport bufferlands north of the Airport Operations Area (and therefore would reduce aviation hazards) through the replacement of rice and fallowed rice fields with managed grassland and managed marsh. The managed marsh that would be established on the northernmost portion of the bufferlands parcels is expected to result in less bird attraction than rice cultivation because of the focused management regime that would be employed.

- A large area of rice land used for borrow operations would be reclaimed as managed grassland, which is expected to provide moderate-quality foraging habitat for Swainson's hawk. In addition, other areas of Airport-managed grassland and levee slopes and berms would be managed specifically to provide foraging value for Swainson's hawk, within the constraints of the management requirements for Airport safety and maintenance of the flood control system.

2.2.2.3 Habitat Conservation Components. Following are the habitat creation and conservation components of Alternative 1:

- the new GGS/Drainage Canal,
- managed marsh creation and rice preservation,
- managed grassland on levee slopes and seepage berms,
- managed grasslands on land owned by Sacramento County, and
- woodlands.

New GGS/Drainage Canal. A new drainage canal would be constructed to provide connectivity of aquatic habitat between Fisherman's Lake south of I-5 and the North Drainage Canal in the northern Natomas Basin to improve opportunities for giant garter snake movement within the basin. The length of the entire GGS/Drainage Canal, including a portion of the West Drainage Canal that is proposed for improvements, is approximately 44,000 linear feet (8.3 miles). A series of water-control structures would be constructed along the length of the canal to maintain consistent water levels in the low-flow channel of the canal during the snake's active season (April–October). Supplemental water would be provided as needed from Natomas Mutual Water Company's (NMWC's) irrigation system. The low-flow channel would have a top width of approximately 50 feet and a water depth of approximately 4–5 feet. The canal would be part of the RD 1000 drainage system.

The GGS/Drainage Canal has been designed so that management of the canal would result in less disturbance to giant garter snake habitat than existing standard canal management practices in the Natomas Basin. A typical existing RD 1000 canal has a narrow channel and right-of-way, and steep side

slopes. Some canals have a maintenance road on one side only. The steep side slopes are prone to erosion and earth slope failures, filling the canal bottom with sediment annually. Sedimentation exacerbates the maintenance problem of aquatic weed invasions, and accretion of sediment (which is costly to remove and disruptive to habitat) reduces the capacity of the canals to direct storm flow, resulting in the need for frequent disturbance by heavy equipment of vegetation and soil on canal banks.

The side slopes of the new GGS/Drainage Canal would be gradual and consistent (3H:1V), resulting in greatly reduced erosion and sedimentation. Vegetation on the banks could easily be mowed to a specified stubble height using cutter blades instead of the existing, high-disturbance practice of flail mowing or scraping vegetation from the banks and canal with a drag bucket. These improved canal maintenance practices would substantially reduce disturbance and incidental mortality of giant garter snakes that use bank and shoreline vegetation as cover and feeding habitat.

The GGS/Drainage Canal north of Teal Bend Golf Club would be managed primarily as a linear high-quality giant garter snake habitat and movement corridor, with stormwater drainage a secondary function during major storm events. South of Teal Bend Golf Club, the canal would also serve as a primary giant garter snake habitat area and movement corridor, but the volume of stormwater drainage would increase in a southerly direction because of the natural slope of the basin. Winter storm–related runoff exceeding the capacity of the West Drainage Canal south of I-5 would be pumped into the Sacramento River using Pumping Plant No. 3, consistent with existing stormwater management practice.

The shoreline and lower bank of the GGS/Drainage Canal (including the improved West Drainage Canal) would be planted or managed to promote tule/cattail vegetation as suitable cover and foraging habitat for giant garter snake. However, management of the canal would also require removal of noxious aquatic weeds that obstruct the flow of water. A secure water supply would ensure that water of a suitable quality is present and flowing at low velocity in the canal during the active season of the giant garter snake, and that the water surface would be managed within a range of approximately 1 foot to provide consistent cover from predators along the tule fringe of canal banks. Input of supplemental canal water would begin at a diversion point on the North Drainage Canal at the north end of the new GGS/Drainage Canal. Other points of inflow may occur at downstream locations.

The portion of the canal north of Teal Bend Golf club would be constructed as part of the 2008 phase, and the remainder would be constructed in the 2009 phase. Details on construction of the new GGS/Drainage Canal are provided in Section 2.2.2.7, “Construction Details.”

Managed Marsh Creation and Rice Preservation. Some soil borrow areas would be finish graded and planted with native riparian and marsh vegetation by SAFCA after the completion of borrow activities to create managed seasonal and perennial marsh habitat that would benefit giant garter snake. Design of the 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 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 precise water levels at different times of the year. Marshes would have perimeter fences to control and protect grazing animals, such as goats; grazing by goats is a successful management technique 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.

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 to be 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's active season of April–October. Created marshes on the Airport's northern properties and Fisherman's Lake area parcels would be situated adjacent to existing TNBC marsh preserves, thereby providing for greater contiguous management areas and increasing the overall habitat value of the adjacent preserves.

Portions of properties that SAFCA obtains for borrow operations would likely not be needed for borrow extraction and could be retained in rice cultivation through an arrangement with the owner or TNBC.

Managed Grassland on Levee Slopes and Seepage Berms. The levee improvements implemented as part of Alternative 1 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 a nearly flat slope (50H:1V or less). Parallel to the landside toe of enlarged levees and seepage berms would be maintenance access roads and seepage relief wells in some locations. Additional setback bufferland would flank some of these features, and property acquisition for the proposed project may leave SAFCA with remnant portions of acquired parcels that are nonessential to flood control uses. With the exception of the crown of the levee, these areas would be managed as grassland. Most grassland would be mowed or grazed throughout the growing season, with an emphasis on mowing procedures and stubble height to optimize these areas for Swainson's hawk foraging habitat. However, the primary purpose and management priority of levees and seepage berms would continue to be flood protection, for which RD 1000 has principal management and maintenance responsibility.

Managed Grasslands on Land Owned by Sacramento County. Much of the existing cropland in the Airport bufferlands that would be used by SAFCA as a source of soil borrow would be converted to managed grassland after the completion of borrow operations. Managed grasslands have been determined to be the most effective, feasible option for reducing hazardous wildlife populations that currently exist on these lands while minimizing adverse effects on giant garter snake and Swainson's hawk. Managed grasslands are expected to attract substantially less hazardous wildlife than the current land uses because they do not provide waste grain, as do cereal crops, or standing water, as does rice. Grasslands can be managed through a variety of practices to further reduce hazardous wildlife use, including modifying the selection of plants and grazing animals, and varying the amount and timing of tillage, irrigation, grazing, and cutting to create opportunities to adaptively manage land.

The primary management objective on managed grasslands would be to reduce hazardous wildlife populations to the extent necessary to comply with Title 14, Part 139 of the Code of Federal Regulations and FAA advisory circulars that address hazardous wildlife. All management practices on managed grasslands would be consistent with the implementation measures in the current version of the *Airport Wildlife Hazard Management Plan* (Sacramento County Airport System 2007).

Managed grassland within 10,000 feet of the Airport runways (the Airport Critical Zone) would be managed primarily to reduce the attractiveness to wildlife considered hazardous to aircraft safety. Within this zone, FAA provides specific recommendations for reducing hazardous wildlife. Certain grassland parcels, particularly those outside of the Airport Critical Zone, would be managed more flexibly to provide foraging opportunities for Swainson's hawk, which is able to find small rodent prey in low-stature grasslands that provide only low-quality habitat for many species of hazardous wildlife. It is anticipated that some of the managed grasslands would be identified as future mitigation for actions on other lands under SCAS management that adversely affect Swainson's hawk habitat.

Woodlands. Woodlands consisting of native riparian species would be established at several sites as a component of Alternative 1. Woodland tree and shrub species would be acquired and planted on approximately 125 acres of existing cropland or fallow or currently unused sites. Approximately 30 acres would be planted east of the maintenance corridor along the Sacramento River east levee improvements

in Reaches 1–4B in the construction phase initiated in 2008. Selection of the locations of created woodlands would depend on the availability of suitable parcels as land is acquired for levee improvements and setbacks, relocated canal corridors, and borrow sites. Tree groves would be distributed throughout the project area. Priorities for woodland site selection would be to have tall tree species in groves adjacent to hawk foraging fields but distant from the Airport runways.

Groves would be established throughout the project area. Groves would generally 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 or wider 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 grassland savanna vegetation types.

Planting sites would require suitable soil conditions, water supply 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. A mixture of native riparian species would be planted, but 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. Establishment of woody vegetation would likely require more than one technique, including seeding in winter, flood irrigation, drip or agricultural-scale spray heads, cuttings, and acorn planting. 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.

Some of the larger and higher quality existing groves of mostly valley oak woodland would be retained where stands can be avoided near but just outside the toe of the proposed adjacent setback levee. Where trees would be removed from existing groves to make way for the proposed flood control system features, they would be transplanted in new locations, including newly planted groves, to the extent feasible. The woodland planting areas could also provide locations for transplanting any elderberry shrubs that would need to be moved from the proposed footprint of flood control improvements.

Wherever possible, groves would be bordered by controlled-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 (campfires, smoking, arson).

2.2.2.4 Irrigation and Drainage Components. This section provides general descriptions of the irrigation and drainage components of Alternative 1; construction details are provided in Section 2.2.2.7, "Construction Details."

There are two major canal systems in the Natomas Basin: an irrigation system owned and operated by NMWC and a drainage system owned and operated by RD 1000 (**Plate 10**). NMWC pumps water into the basin to provide irrigation water to its shareholders for agriculture 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 river and perimeter canals via RD 1000's drainage system. In the southern part of the Natomas Basin, the City of Sacramento also operates several drainage pump stations that serve residential areas.

As a result of the planned levee improvements in the Natomas Basin, the irrigation canals currently at the toe of the Sacramento River east levee (the Elkhorn Canal and the Riverside Canal) would be replaced

with new irrigation canals set back from the existing levee farther to the east. The existing and proposed irrigation canals are highline canals, which means that the bottom of the canal is roughly equal to the surrounding ground elevation. The proposed irrigation canals would be constructed high enough to raise water levels above the levels of the adjacent fields to allow for gravity flow into the fields. The proposed GGS/Drainage Canal (described above in Section 2.2.2.3, "Habitat Conservation Components") would be constructed with the top of bank roughly at existing ground level to facilitate drainage. Material excavated to construct the GGS/Drainage Canal would generally be used to construct the embankments of the adjacent highline irrigation canals. Some import of soil materials and export of materials to levee construction would be required to accommodate the phasing of the activities.

To avoid interruptions in service along the existing Elkhorn and Riverside Canals, the relocated canals would be constructed and operational before construction of planned levee improvements that would result in filling of the existing irrigation canals. Thus, in any particular reach, the new canal would be constructed before the levee improvements in that same reach. In preparation for the levee improvements planned for construction in Reaches 4B–6A, approximately half of the new Elkhorn Canal (North Drainage Canal to Elkhorn Reservoir) is planned for construction in 2008 so that it can be in operation before the levee improvements in those reaches are constructed either later in 2008 or in 2009. The remainder of the Elkhorn Canal and the Riverside Canal relocations would be constructed in the 2009 and 2010 phases such that the entire irrigation system could be watered and operational before the existing canals are abandoned and filled as part of the levee improvements in the corresponding reaches. The GGS/Drainage Canal from the North Drainage Canal to Elkhorn Reservoir (described in Section 2.2.2.3) also would be constructed in 2008 because this section would run parallel to and within the same right-of-way as the proposed Elkhorn Canal in this area. Concurrent construction of these new irrigation and drainage facilities would facilitate the use of excavated material from the GGS/Drainage Canal excavation for use as embankment material along the proposed Elkhorn Canal.

To take advantage of the common construction practices and to maximize the use of common facilities, the rearrangement of irrigation and drainage facilities required to provide for rerouting of flows that contribute to the Airport West Ditch would be undertaken in conjunction with these proposed NLIP improvements in 2009. This work would include modifications and extension of existing irrigation infrastructure and modification of some local drainage conveyance facilities.

The NMWC pumping facilities that provide water to the Elkhorn and Riverside Canals would need to be modified to accommodate the new height of the Sacramento River east levee. NMWC pumping and irrigation facilities along the NCC south levee would also need to be modified to accommodate the new height of that levee. In addition, Alternative 1 would include modifications to RD 1000's pumping facilities along the Sacramento River east levee and the NCC south levee. These modifications would include the removal of a deep culvert beneath the levee section at the Pumping Plant No. 2 location and the replacement of the pumping plant, which was removed from the western end of the North Drainage Canal in response to underseepage observed during extended winter storms in January 2006.

2.2.2.5 Additional Actions to Meet FEMA Requirements. Additional actions to meet FEMA requirements include encroachment management and addressing bridge crossings.

Encroachment 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 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. One of the objectives of constructing an adjacent setback levee along the Sacramento River east levee is to facilitate acceptable management of existing vegetation and structural encroachments along the water side of this levee. By

moving the hypothetical waterside slope of the levee (the "levee template") landward, the adjacent levee would significantly reduce most of the conflict between these encroachments and applicable USACE levee operation and maintenance requirements. Should any of these existing encroachments be determined to reduce the integrity of the levee or increase flood risk unacceptably, 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 Federal criteria for the 100-year level of protection. Along the land side of the proposed adjacent setback levee, only minor encroachment removal is anticipated. This would include the relocation of power poles that are on the existing landside slope of the levee.

Bridge Crossings. Under applicable Federal requirements, the plane of the northbound and southbound bridge crossings of SR 99/70 over the NCC must be 4 feet above the 100-year water surface elevation in the NCC. The 100-year water surface elevation is 44.4 North American Vertical Datum of 1988 (NAVD 88). The soffit (underside) elevation of the northbound crossing is 44.9 NAVD 88, and the soffit elevation of the southbound crossing is 42.9 NAVD88. Accordingly, the following options must be considered for implementation in conjunction with California Department of Transportation (Caltrans) in 2009–2010: (1) raise both bridge crossings as necessary to meet minimum FEMA clearance requirements, (2) provide for installation of a closure structure across the southbound crossing in the event of a 100-year or greater flood, or (3) replace the bridge rail structures on the east and west sides of the bridge crossings and modify the levees connecting to these structures to provide at least 4 feet of freeboard above the 100-year water surface elevation. Under any of these options, at least the northbound crossing could remain open for use during a 100-year flood event.

2.2.2.6 Lands, Easements, Relocations and Rights-of-Way. Several of the measures described above would require substantial land acquisition to accommodate the expanded footprint of the flood control system. The acquired lands would support construction of an adjacent setback levee along the Sacramento River east levee and flattening of the landside slopes of the NCC south levee and PGCC west levee. In addition, sufficient land would be acquired to establish a 50- to 100-foot-wide access and maintenance corridor at the landside toes of all the improved levees to prevent encroachment into the flood control system and preserve the land for possible future expansion of flood control facilities using funding generated through future development fees.

In addition, land would be acquired to establish a woodland corridor to replace trees that are removed from the levee footprint, from maintenance access areas, and from irrigation and drainage canal construction (see "Woodlands" in Section 2.2.2.3). SAFCA also would acquire adjacent land as necessary for relocation of roadways and power poles. 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 overlie land owned and managed by TNBC, SAFCA may either purchase the land in fee or obtain easements.

Finally, as discussed above, Alternative 1 would require relocation of many existing irrigation and drainage facilities, a number of power poles serving residences along the Garden Highway, several rural roadway intersections, including the intersection at Garden Highway/Sankey Road, and 10 to 15 private residential and non-residential structures.

2.2.2.7 Construction Details. Construction details are described below for the following elements of Alternative 1:

- NCC south levee (2008 construction phase, ending in 2009),
- Sacramento River east levee Reaches 1–4B (2008 construction phase, ending in 2009),
- Sacramento River east levee Reaches 5A–20A (2009–2010 construction phases),

- PGCC west levee (2009 construction phase, ending in 2009 or 2010),
- relocation of the Elkhorn and Riverside Canals (2008 and 2009 construction phases),
- new GGS/Drainage Canal (2008 and 2009 construction phases),
- Airport West Ditch (2009 construction phase), and
- Pumping Plant No. 2 improvements (2008, 2009, and 2010 construction phases).

Table 2-1 summarizes the timing of construction of these elements. As noted in Section 1.1, "Introduction," and above, the project includes 2008 construction phase components, which are analyzed in this EIS at a project level of detail, and 2009–2010 construction phase elements, which are analyzed at a general, program level of detail. The USACE decisions about whether to grant SAFCA permission to implement the project pursuant to Section 408 of the Rivers and Harbors Act and Section 404 of the Clean Water Act will pertain only to the 2008 construction phase.

Table 2-1
Summary of the Major Construction Elements of Alternative 1

Project Element	Timing
2008 Construction Phase (Evaluated at a Project Level in This EIS)	
NCC south levee improvements: Levee raising and seepage remediation	August–November 2008 and April–November 2009
Sacramento River east levee Reaches 1–4B: Levee raising and seepage remediation	August–November 2008 and April–November 2009
Relocation of the Elkhorn Canal (highline irrigation canal) between the North Drainage Canal and Elkhorn Reservoir (Reaches 4B–6A)	August–November 2008
Construction of new GGS/Drainage Canal between the North Drainage Canal and Elkhorn Reservoir (Reaches 4B–6A)	August–November 2008
Removal of a deep culvert at the location of Pumping Plant No. 2	August–November 2008
2009 and 2010 Construction Phases (Evaluated at a Program Level in This EIS)	
Sacramento River east levee Reaches 5A–20A: Levee raising and seepage remediation	April–November 2009 and April–November 2010
PGCC west levee: Seepage remediation	April–November 2009 and April–November 2010 if needed
Relocation of Elkhorn Canal below Elkhorn Reservoir and of Riverside Canal (highline irrigation canals)	April–November 2009 and April–November 2010
Construction of new GGS/Drainage Canal between Elkhorn Reservoir and West Drainage Canal, and associated improvements to West Drainage Canal and Airport West Ditch	April–November 2009
Pumping Plant No. 2 improvements	April–November 2009 and April–November 2010

Aspects of the 2009–2010 construction phases that would be defined further to support project-level environmental analysis of these elements include the following:

- seepage remediation methods for Sacramento River east levee reaches south of 4B, and identification of specific borrow sites in the Fisherman's lake area for 2010 construction along the Sacramento River east levee;
- specific alignments of the new GGS/Drainage Canal in the area of the Teal Bend Golf Club, the relocated Elkhorn Canal, and the Riverside Canal;
- locations of woodland plantings in Sacramento River east levee reaches south of 4B;
- application of the USACE encroachment removal policy; and
- preferred method to address FEMA requirements for the SR 99/70 bridge crossing of the NCC.

In addition, if geotechnical testing determines that improvements are needed to the west levee of the Natomas East Main Drainage Canal (NEMDC)/Steelhead Creek or the portion of the north levee of the American River that protects the Natomas Basin to meet the flood control objectives of the project, improvements to these levees may be included in the 2009 or 2010 construction phases.

NCC South Levee (2008 Construction Phase). Alternative 1 would include raising the entire NCC south levee and continuing the construction of a seepage cutoff wall from the eastern terminus of the NCC Phase 1 Improvements constructed in 2007 to the eastern end of the NCC south levee, a distance of approximately 4 miles (approximately Station 58+00 to Station 287+50). Construction is anticipated to take place over two construction seasons: between August 1 and November 1, 2008, and between April 15 and November 1, 2009. Local irrigation/drainage canals are present approximately 100 feet south of the toe of the NCC south levee through much of Reach 2 and through Reaches 4 and 5, and the area within 200 feet of these canals is considered giant garter snake upland habitat. Construction activities would be sequenced to avoid potential disturbance of giant garter snake upland habitat during the species' inactive season (October 1–May 1) to the extent possible while allowing for the completion of the NCC south levee improvements; however, continued disturbance within some areas of upland habitat may be necessary through October of 2008 or 2009. **Plate 20a** shows the NCC south levee construction extent. The construction crew size during its peak is estimated at about 95 people.

Cutoff Wall Construction along the Natomas Cross Canal South Levee. A 36-inch-wide SB or CB slurry cutoff wall would be constructed along the new levee centerline, with a levee degrade equal to one half of the levee height (as measured to the landside levee toe). It is expected that a contractor would use three construction headings (i.e., construction conducted in three locations) operating daily on one 10-hour shift for installation of the cutoff wall.

Approximately 195,000 cubic yards of imported material may be required to provide suitable material for the cutoff wall (this estimate assumes that 100% of the existing material would be replaced with borrow material meeting the SB cutoff wall specification). The unsuitable material would be used in areas outside the levee prism where random fill would be acceptable. **Table 2-2** outlines the schedule and equipment anticipated for each phase of the work. The durations shown encompass both construction seasons.

The information in **Table 2-2** includes stripping of the levee to support both cutoff wall construction and levee raising operations, which would generate approximately 13,500 cubic yards of material that would not be suitable for reuse elsewhere and would be disposed of off-site. During the cutoff wall construction

Table 2-2 Anticipated Equipment Types and Duration of Use for Construction of the Natomas Cross Canal South Levee Cutoff Wall (2008 Construction Phase, Ending in 2009)		
Construction Phase	**Equipment Types and Number of Each Type**	**Duration (days)**
Clearing and grubbing/stripping	Elevating scrapers (3)	20
	Water trucks (2)	20
	Front-end loader (1)	20
	Haul trucks (12)	20
Levee degrading (lags clearing and grubbing/ stripping by 10 days)	Bulldozers (4)	135
	Scrapers (4)	135
	Loader (2)	135
	Water truck (1)	135
Cutoff wall construction (lags levee degrading by 14 days)	Long-reach hydraulic excavators (3)	150
	Front-end loaders (3)	150
	Extended-boom pallet loaders (3)	150
	300-kW generators (3)	150
	Slurry pumps (3)	150
	Pickup trucks (10)	150
	Haul trucks (4)	150
Compaction of degraded material to support levee raising (concurrent with levee degrading)	Loader (3)	135
	Water truck (2)	135
	Sheepsfoot rollers (3)	135
Borrow site excavation (concurrent with cutoff wall construction)	Excavator (1)	150
	Water truck (1)	150
	Haul trucks (4) (assume material is imported on the return trip of trucks disposing unsuitable cutoff wall excavation material)	0
Demobilization/cleanup (follows cutoff wall construction)	Water trucks (2)	14
	Hydroseeding truck (1)	14
	Haul trucks (2)	14
Source: Data provided by Wood Rodgers in 2008		

phase, the top 4 inches of the existing operating road surfacing (5,000 cubic yards) would be salvaged for installation after levee raising is completed. To complete this operation, an additional 2,500 cubic yards of gravel surfacing would be imported.

Raising of the Natomas Cross Canal South Levee. Levee raising would occur along the entire length of the NCC south levee to provide 3 feet of freeboard over the design water surface profile (this requires raising the levee approximately 3 feet). Along most of the levee, this would be accomplished by

setting the levee back toward the land side, such that there would be a theoretical 3:1 waterside slope extending from the existing waterside toe to the new waterside top. Following degrading of the levee and construction of the cutoff wall, the new levee crown would be constructed such that the actual waterside slope extends to meet the point of degrade on the waterside slope. This actual slope would be 3:1 or flatter. The new levee crown would have a minimum width of 20 feet and the new landside slope would be 3:1. Where an existing stability berm is present, it would be stripped and incorporated into the new levee prism. Any portion of the berm outside of the limits of new fill would be trimmed back to conform to the new landside 3:1 slope. Where the berm is fully incorporated, it would be stripped and trimmed as necessary to accommodate placement of new fill material around it. Existing drain pipes exiting the berm would be extended to daylight landward of the new levee landside toe.

Vegetation would be removed from the waterside slope in all locations above the elevation corresponding with the projection of the landside levee toe on the waterside slope. However, between Stations 0+00 and 54+00 (the westernmost mile of the levee), where there is significant vegetation on the waterside slope above this elevation, the levee would be set back landward an additional 15 feet to provide a "root zone" on the levee slope, and the vegetation would remain.

Throughout Reaches 6 and 7, Sutter County infrastructure (Howsley Road and related features) and private residences are close to the NCC south levee. To minimize impacts on the infrastructure and residences, between Stations215+00 and 245+00 (a distance of 3,000 linear feet, or approximately 0.6 mile) the levee would be raised waterward, encroaching on the NCC channel approximately 30 feet.

Between Stations 245+00 and 279+50 (a distance of 3,450 linear feet or 0.65 mile), the levee would be raised on the land side, similar to Stations 54+00 through 215+00. Smooth transition distances of up to 200–500 feet would link the waterward and landward raises.

Approximately 685,000 cubic yards of imported soil borrow material would be required for the levee raising. Additionally, there are two areas where 18–36 inches of fill would be placed at the landside levee toe, for a distance of up to 130 feet landward of the levee toe, as described below under "Utility Modifications and Miscellaneous Work for Improvements to the Natomas Cross Canal South Levee." The material used in these areas would be levee degrade material or cutoff wall excavation material that is not suitable for reuse in the reconstructed levee section.

Table 2-3 lists the equipment and number of days it would be used for the major construction activities associated with levee raising.

Utility Modifications and Miscellaneous Work for Improvements to the Natomas Cross Canal South Levee. Pipelines penetrate the NCC south levee at the following four locations:

- Odysseus Farms (Bolen Ranch), 18-inch pump discharge line levee penetration;
- NMWC's waterside Bennett Pumping Plant, one 42-inch and one 36-inch penetration;
- NMWC's Northern Pumping Plant, three 30-inch and two 42-inch penetrations; and
- RD 1000's landside Pumping Plant No. 4, three 48-inch penetrations.

None of these penetrations comply with current USACE regulations; therefore, they would be raised to have their inverts above the "200-year" design water surface elevation and would be equipped with waterside shutoff valves. If pipes are corroded, they may have to be replaced down the waterside slope of the levee.

Table 2-3 Anticipated Equipment Types and Duration of Use for Raising the Natomas Cross Canal South Levee (2008 Construction Phase, Ending in 2009)		
Construction Phase	**Equipment Types and Number of Each Type**	**Duration (days)**
Levee raising	Dozer (1)	150
	Water trucks (2)	150
	Sheepsfoot compactors (4)	150
	Water trucks (2)	150
Borrow site excavation (concurrent with levee raising)	Excavators (5)	150
	Dozer with Ripper (1)	150
	Water truck (1)	150
	Haul trucks (30)	150
Finish grading (follows levee raising)	Motor graders (3)	10
	Water trucks (2)	10
Operating road construction (follows finish grading)	Haul trucks (10)	10
	Smooth drum rollers (4)	10
	Motor graders (2)	5
Source: Data provided by Wood Rodgers in 2008		

As part of raising the pump station discharge pipelines that cross the NCC south levee, canals south of the levee would need to be relocated farther from the levee toe in the following locations: the RD 1000 Vestal Drain and NMWC Bennett Canal between Station 55+50 and Station 61+50 and the NMWC North Main Canal between Station 120+00 and Station 123+50 and between Station 216+00 and 218+00. The ditch segments would be moved about 100 feet farther away from the levee toe. Some of this work may be accomplished by NMWC as part of its Sankey Diversion Fish Screen Project, but the timing of this NMWC project is uncertain. If the work is not accomplished by NMWC, SAFCA would conduct the canal relocations at the time the pipelines are raised.

Along the westernmost one-third mile of the NCC south levee, between Station 0+00 and Station 19+00, SAFCA intends to obtain a landside levee maintenance access area to match the 80- to 100-foot maintenance access area already established for the levee. This area is currently in active rice fields. Once the maintenance access area is established, this area would be filled with 18–36 inches of material to be above the agricultural field grade to prevent encroachment by farming operations into the maintenance access area and to provide an operating road at the levee toe.

Between Station 99+00 and Station 124+00, along a distance of approximately one-half mile, a low-lying area between the levee landside toe and an operating road for TNBC's Lucich North Habitat Preserve where water seasonally ponds would be filled with 18–36 inches of material to raise the grade of the levee operating road at the landside levee toe.

In 1996, as part of SAFCA's NCC and PGCC Levee Project, 200 feet of floodwall was installed to raise the NCC levee around the SR 99/70 NCC bridges. The top of wall for this floodwall is at elevation 44.80 feet (National Geodetic Vertical Datum [NGVD] 29). To conform to current levee criteria, the

floodwall would need to be raised to elevation 49.3 feet. This raising would require approximately 150 cubic yards of concrete.

Total Borrow and Hauling for Improvements to the Natomas Cross Canal South Levee. Combining the supplemental soil volumes given above for cutoff wall construction and levee raising, the total borrow quantity is 880,000 cubic yards. The truck counts for hauling this material are included in **Tables 2-2** and **2-3** above. Approximately 475 truck haul trips per day would be required to deliver borrow material to the construction sites. The Brookfield site and/or the RD 1001 borrow site described in Section 2.2.2.1 would be permitted and used for the NCC levee improvements. The potential haul routes from these sites are shown in **Plate 21**.

Construction Staging Areas for Improvements to the Natomas Cross Canal South Levee. Construction staging would take place in areas adjacent to the NCC south levee, within the maintenance access areas between Stations 0+00 and 56+00, 61+00 and 96+50, 99+00 and 216+00, and 251+00 and 281+00. Cutoff wall construction would require temporary establishment of three on-site slurry batch plants that would occupy about 1–2 acres each. Each batch plant site would likely contain tanks for water storage, a pug mill mixer, bulk bag supplies of bentonite, bentonite and cement storage silos, cyclone mixers, pumps, and generators. The sites would also include slurry tanks to store the blended slurries temporarily until they are pumped to the work sites. Slurry constituents would be mixed with water at the batch plant and the mixture would be pumped from the tanks through pipes to the cutoff wall construction work sites.

Traffic Control for Improvements to the Natomas Cross Canal South Levee. At SR 99/70, it is anticipated that the cutoff wall would be constructed by the DSM method. SR 99/70 is a major thoroughfare with high traffic volumes. The highway consists of two lanes in each direction separated by a 45-foot median. Coordination with Caltrans would be required so that portions of the highway could be shut down to allow for the installation of the cutoff wall. Traffic control could be accomplished by constructing a temporary median detour for either the northbound or southbound traffic, which would run all lanes into a single lane in each direction on one side of the separated highway. This detour would occur in two stages and would alternate northbound and southbound directions in each stage. Alternatively, the existing shoulders could be used to restrict traffic flow to a single lane in one direction and provide enough separation between traffic and the work to avoid detouring traffic across the median. This would require investigations into the condition of the existing structural sections of mainline and shoulder pavement for staged construction of traffic. A third alternative is to use the existing at-grade intersections of Catlett Road and SR 99/70, and Sankey Road and SR 99/70 to reroute traffic to either northbound or southbound lanes of SR 99/70. The appropriate detour configuration would be finalized as part of the project design.

Postconstruction Site Condition. After construction, the levee slopes and any previously vegetated areas disturbed during construction would be seeded with a grass mix that meets California Department of Fish and Game (DFG) criteria. To the extent that they do not interfere with flood control inspection and operations, maintenance practices for the grassland cover of the levee slopes would be conducted to promote the value of these areas as foraging habitat for Swainson's hawk.

Sacramento River East Levee Reaches 1–4B (2008 Construction Phase). The 2008 construction phase for the Sacramento River east levee would include improvements from the northern end of Reach 1 at the NCC south levee through Reach 4B (Station 0+00 to Station 228+70, a distance of approximately 4.3 miles). They would include construction of an adjacent levee in all reaches, installation of cutoff walls in Reaches 2 and 3 of the proposed adjacent levee, construction of a 100-foot seepage berm in Reach 4A and a 300-foot seepage berm in Reach 4B, planting of woodland groves in areas between the southern end of Reach 1 through Reach 4A, and reconstruction of the intersections of Sankey

Road and Riego Road with the Garden Highway. **Plates 20b and 22** show these project features in plan view.

General Construction Plan. It is assumed that a main construction staging area would be located on approximately 1 acre near Riego Road. The area would be fenced and would be used for the contractor's and engineer's construction trailers, parking for personnel, machine maintenance tool and parts, possibly water trucks, and the storage of fuels and other materials to be used for construction. The project right-of-way along the construction area also would be used for staging of construction materials and equipment.

The levee improvements for this phase are anticipated to be constructed between August 1, 2008, and November 1, 2008 and between April 15, 2009 and November 1, 2009. Some related activities, such as utility relocations and removal or relocations of residential or agricultural structures, may be conducted before August 1, and site restoration and demobilization would extend through November.
The construction crew size during its peak is estimated at 60 people per shift working 12-hour shifts. The construction sequence would be divided into four different headings.

Personnel, equipment, and imported materials would reach the project site via SR 99, Sankey Road, Riego Road, and Elverta 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.

Construction Sequence for Improvements to Sacramento River East Levee Reaches 1–4B. The construction activities would be sequenced as follows:

- **Power pole relocation:** 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 poles would be relocated beyond the landside levee toe or berms, and a secondary line of distribution poles would be relocated to the drainage swale area between the existing levee and the adjacent levee. Some poles may need to be relocated to the water side of the existing levee; however, no new utility poles would be located on the water side of the levee in the vicinity of existing waterside residences unless there is no feasible alternative for providing service to these residences. Tree pruning would likely be required in some locations to accommodate the power poles and wires. The relocations would be conducted in coordination with the utility companies and the construction operations.

- **Construction mobilization:** Mobilization would include setting up construction offices and transporting heavy earthmoving equipment to the work site, and may also include borrow site preparation. One or more construction staging areas would be established temporarily on the land side of the levee within the project right-of-way at locations determined by the contractor based on contractor preference and environmental and land use constraints.

- **Site preparation (tree removal, clearing, grubbing, and stripping):** Site preparation, conducted in two headings (i.e., starting from two locations), would entail removing trees and other large vegetation from the construction area and stripping the top 6 inches of material from the landside slope of the existing levee, the footprint of the adjacent setback levee, and the permanent maintenance access corridor. Large roots and deleterious material would then be grubbed from the working area. To the extent feasible, trees that must be removed from within the footprint of the adjacent setback levee would be relocated outside of the footprint to new woodland planting areas, where a substantial number of new trees would also be planted. Excess earth materials (organic soils, roots, and grass from borrow areas and the adjacent levee

foundation and excavated material that does not meet levee embankment criteria) would be used in the reclamation of borrow areas or hauled off-site to landfills. Cleared vegetation (i.e., trees, brush) would be hauled off-site to landfills.

- **Relocation of irrigation ditch and removal of landside structures and other facilities:** A private irrigation ditch is situated along the top of an existing berm in Reach 1 within the proposed footprint of the adjacent setback levee. Before filling of the existing ditch, a new ditch would be constructed in Reach 1 to serve irrigation needs for agricultural uses of the land along this reach. The new ditch would be constructed from Station 0+00 to Station 25+00 (2,500 feet) and would be elevated, similar to the existing canal, to allow for gravity flow southward from the NCC. The relocated ditch would cross under Sankey Road through a culvert and meet the existing canal lateral at Station 25+00. The existing ditch would be drained and any unsuitable material from the ditch bottom would be excavated and hauled off-site.

  Residences and other farm structures that are within the proposed footprint of the flood control facilities (including maintenance areas) at Station 35+00 in Reach 1 (house, barn, and shed) and Station 63+00 in Reach 2 (two houses, garage, sheds, barns) would have to be removed or relocated farther from the flood control facilities before the start of levee construction in those areas (the structures in Reach 2 would not be removed/relocated until before the start of the 2009 construction season). Irrigation facility collection/distribution boxes, wells, and standpipes within the footprint of the flood control 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.

- **Excavation of stability berm and inspection trench:** The existing stability berm along the levee would be excavated and the soil and drain rock would be stockpiled for use in the construction of the adjacent setback levee. The geotextile fabric from the drain layer would be discarded. A 3-foot-deep inspection trench would also be excavated along the foundation of the adjacent levee raise area after stripping has occurred. The purpose of this trench is to expose or intercept any undesirable underground features such as old drain tile, water or sewer lines, other debris, animal burrows, buried logs, or pockets of unsuitable material (e.g., sand lenses). After inspection, the trench would backfilled and compacted as part of the embankment construction. This work would be performed in four headings.

- **Construction of adjacent levee raise, cutoff walls, and seepage berms:** Borrow material from the northern Airport bufferlands and possibly the Brookfield borrow site would be delivered to the levee construction sites by scrapers or haul trucks where it would be spread by motor graders and compacted by sheepsfoot rollers to build the adjacent levee. In Reaches 2 and 3, the adjacent levee would be built up to a height equal to about two-thirds of the height of the existing levee. This would create a working platform for cutoff wall installation using an excavator with a long-stick boom capable of digging a trench to a maximum depth of approximately 80 feet. Bentonite slurry would be pumped into the trench during excavation to prevent caving. The soil excavated from the trench would be mixed with bentonite and backfilled into the trench to create the cutoff wall. In Reaches 4A and 4B, borrow material would be spread and compacted for construction of the seepage berms.

- **Installation of relief wells and monitoring wells:** Along Reach 4B, relief wells would likely be required in addition to the seepage berms that are proposed for this reach. Relief wells would be spaced at 100-foot intervals approximately 20 feet beyond the toe of the berm.

- **Reconstruction of Garden Highway at intersections:** The Garden Highway intersections at Sankey and Riego Roads would require reconstruction to accommodate the raised adjacent setback levee. It is anticipated that the Garden Highway would be extended up and onto the widened adjacent levee at these locations to meet with the secondary roads. Approach embankments at the intersections would be enlarged and the entire intersections would be repaved. Intersecting roads would be raised at a slope of 15H:1V, extending the approach embankment approximately 350 feet outward from the levee. The side slopes of the raised embankments would be at a 3H:1V slope. Traffic control and detours would be required during this phase of construction. This work would be conducted in two headings.

- **Installation of surface drainage outlets across Garden Highway:** Between the adjacent setback levee and the Garden Highway pavement, new storm drainage collection facilities would be constructed to convey surface water beneath Garden Highway and toward the Sacramento River. A surface collection system (drainage swale) would convey runoff water to drop inlets, and new pipe laterals would convey the water beneath Garden Highway to new outfalls in the berm along the east bank of the Sacramento River. In most locations, the outfalls would be placed above the 2-year water surface elevation. The location of the cross culverts would be selected to minimize impacts on existing residential properties. These discharge pipes would require minor landscape improvements to prevent erosion and ensure that applicable water quality standards are met. Excavation of a trench across Garden Highway would be required, and those segments where excavation occurs would have to be reconstructed. Single-lane traffic controls and through-traffic detours would be required during this phase of construction. This work would be conducted in two headings.

- **Site restoration and demobilization:** Upon completion of construction activities, the levee slopes and the tops of the seepage berms would be hydroseeded. An aggregate base road would be constructed on the crown of the new levee. 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.

- **Reclamation of borrow areas:** The northern Airport bufferlands would be finished graded and planted with grasses after the completion of borrow activities.

Borrow Quantities and Material Hauling for Improvements to Sacramento River East Levee Reaches 1–4B. **Table 2-4** shows the quantity of each fill type needed and the expected source. The random fill quantity includes a 25% shrinkage factor to account for volume loss during placement. Note that for some locations, it may be possible to use a scrape-and-place method that would reduce the need for haul trucks. The possibility of using scrapers would be investigated further during design. Potential haul routes from the borrow sources to the Sacramento River east levee work area for the 2008 construction phase are shown in **Plate 21**. Except for the portion of the Airport north bufferlands borrow site that is east of Powerline Road, hauling from the site would take place off local roadways, through the borrow areas to the levee maintenance area and construction sites.

Table 2-4 Quantities of Fill Required for Alternative 1 Improvements to the Sacramento River East Levee in Reaches 1–4B (2008 Construction Phase, Ending in 2009)		
Material Type	**Quantity**	**Source (Average Round-Trip Haul Distance)**
Soil type 1 – select fill	398,000 cu. yd.	Airport north bufferlands (3 miles)
Soil type 2 – random fill	1,200,000 cu. yd.	Airport north bufferlands (3 miles)
Seepage berm fill	324,000 cu. yd.	Airport north bufferlands (3 miles)
Seepage berm fill – reusable fill	111,000 cu. yd.	Inspection trench excavation (0.1 mile)
Impervious fill – clay cap	23,000 cu. yd.	Commercial source (30 miles)
Aggregate base	23,000 tons	Commercial source (30 miles)
Total	**2,056,000 cu. yd. 23,000 tons**	

Notes:
cu. yd. = cubic yards
Source: Data provided by HDR in 2008

Delivery of the material listed in **Table 2-4** could require as many as 1,100–1,200 haul trips per day in 2008 and as few as 350 trips per day in 2009. These estimates are based on the assumption (conservative for environmental analysis purposes) that 60% of the work would be performed during a 3-month 2008 construction season and 40% during a 6-month 2009 season. Alternatively, if the timing of project approvals for the 2008 construction phase were to result in most or all of the work along the Sacramento River east levee being delayed until the 2009 construction season, the daily truck trips would average about 900–950 per day over a 6-month construction period (but would overlap temporally with haul trips for the 2009 construction phase). These estimates are based on conservative assumptions of truck capacity of 14 cubic yards and the use of haul trucks for moving all borrow material from the Airport north bufferlands (rather than a combination of haul trucks and scrapers).

Construction Equipment for Improvements to Sacramento River East Levee Reaches 1–4B. **Table 2-5** summarizes the types of equipment that may be used throughout the construction sequence, along with an approximation of the duration of each activity.

Traffic Control for Construction in Reaches 1–4B. Single-lane traffic control and detours would be required during reconstruction of Garden Highway at intersections and installation of surface drainage outlets along this roadway. Examples of traffic control measures to be considered include use of flaggers to maintain alternating one-way traffic while work is proceeding on one-half of the 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 minimize inconvenience to the driving public. If detours are required for through traffic, local traffic would be allowed, subject to minor delays during critical operations.

Postconstruction Site Condition. Following construction, the levee slopes, seepage berms, maintenance access right-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

Table 2-5
Anticipated Equipment Types and Duration of Use for Alternative 1 Improvements to Sacramento River East Levee Reaches 1–4B
(2008 Construction Phase, Ending in 2009)

Construction Phase	Equipment Type and Number of Each Type	Work Days
Mobilization	–	27
Site preparation (tree removal, clearing, grubbing, stripping)	Scrapers (2) Front-end loaders (2) Crawler/tractors (tree pushers) (2) Water trucks (1) Motor graders (2) Chippers/grinders (2) Haul trucks (5)	27–54 27–54 27–54 27–54 27–54 27–54 54
Relocation of canal and removal of landside structures and other facilities	Excavators (2) Haul trucks (2) Front-end loaders (1)	48 48 48
Excavation of stability berm and inspection trench	Excavators (4) Scrapers (20) Haul trucks (4) Bulldozers (3) Graders (3) Water trucks (2)	28 28 28 28 28 28
Construction of adjacent levee raise and seepage berms (includes borrow site activities)	Scrapers (15) Excavators (4) Front-end loaders (4) Haul trucks (14 cu. yd.) (90) Bulldozers (4) Sheepsfoot compactors (6) Motor graders (6) Water trucks (5)	108 108 108 108 108 108 108 108
Cutoff wall construction	Long-reach hydraulic excavators (2) Front-end loaders (2) Mixing excavators (2) Bulldozers (2) Extended-boom pallet loaders (2) 300-kW generators (2) Slurry pumps (2) Pickup trucks (8) Haul trucks (2)	44 44 44 44 44 44 44 44 44
Installation of relief wells and monitoring wells	Truck-mounted auger (3) Support trucks (3) Cement trucks (2)	30 30 30
Reconstruction of Garden Highway at two intersections	Backhoes (2) Smooth drum compactors (2) Asphalt pavers (2) Haul trucks (8) Striping trucks (2) Truck-mounted augers (2)	27 27 27 27 27 27
Installation of surface drainage outlets across Garden Highway	Backhoes (2) Front-end loaders (2) Concrete trucks (3) Roller compactors (2) Asphalt paver (1) Haul truck (1)	27 27 27 27 27 27
Site restoration and demobilization	Hydroseeding trucks (3) Water trucks (3) Haul trucks (3)	34 34 34

Notes:
cu. yd. = cubic yards
Source: Data provided by HDR in 2008

control inspection and operations, maintenance practices for the areas of grassland cover within the footprint of the flood control facilities would be conducted to promote the value of these areas as foraging habitat for Swainson's hawk.

Sacramento River East Levee Reaches 5A–20A (2009 and 2010 Construction Phases). The 2009–2010 improvements to the Sacramento River east levee would extend from Reach 5A (Station 228+70) through Reach 20A (Station 925+50), a distance of about 13 miles. It is anticipated that construction of improvements to the Sacramento River east levee generally would encompass Reaches 5A–11B in 2009 and Reaches 12–20A in 2010. The construction season is assumed to be April 15–November 1 for both the 2009 and 2010 construction phases, with construction mobilization occurring in the first two weeks. The 2009 construction phase is expected to be conducted concurrently with some or all of the construction in Reaches 1–4B described above. **Plates 20b and 20c** show these project features in plan view.

General Construction Plan. Levee crown raises are needed to provide adequate freeboard above the 100-year design water surface elevation in Reaches 5A–10 and above the "200-year" design water surface elevation in Reaches 11A and 11B. The levee crown raises in all these reaches would be designed to the "200-year" design water surface elevation. Downstream of Reach 11B (Powerline Road), there is adequate freeboard above the "200-year" design water surface elevation, and levee crown raises are not required. Substantial structural encroachments and large amounts of woody vegetation are present on the waterside slope of the existing levee, and the adjacent setback levee is proposed to extend through Reaches 5A–19A to avoid the need for extensive removal of the existing vegetation and encroachments on the waterside slope to meet USACE criteria. The existing levee in Reaches 19A–20B already has a wide crown, and extensive residential development is also located along the landside levee toe; therefore, construction of the adjacent setback levee is not proposed for these reaches. The adjacent setback levee would extend outward at least 11 feet from the landside edge of the existing levee crown and would have a 3H:1V landside slope.

Sacramento River East Levee Reaches 5A–20A (2009 and 2010 Construction Phases). The 2009–2010 improvements to the Sacramento River east levee would extend from Reach 5A (Station 228+70) through Reach 20A (Station 925+50), a distance of about 13 miles. It is anticipated that construction of improvements to the Sacramento River east levee generally would encompass Reaches 5A–11B in 2009 and Reaches 12–20A in 2010. The construction season is assumed to be April 15–November 1 for both the 2009 and 2010 construction phases, with construction mobilization occurring in the first two weeks. The 2009 construction phase is expected to be conducted concurrently with a portion some or all of the construction in Reaches 1–4B described above. **Plates 21b 20b and 21c 20c** show these project features in plan view.

General Construction Plan. Levee crown raises are needed to provide adequate freeboard above the 100-year design water surface elevation in Reaches 5A–10 and above the "200-year" design water surface elevation in Reaches 11A and 11B. The levee crown raises in all these reaches would be designed to the "200-year" design water surface elevation. Downstream of Reach 11B (Powerline Road), there is adequate freeboard above the "200-year" design water surface elevation, and levee crown raises are not required. Substantial structural encroachments and large amounts of woody vegetation are present on the waterside slope of the existing levee, and the adjacent setback levee is proposed to extend through Reaches 5A–19A to avoid the need for extensive removal of the existing vegetation and encroachments on the waterside slope to meet USACE criteria. The existing levee in Reaches 19A–20B already has a wide crown, and extensive residential development is also located along the landside levee toe; therefore, construction of the adjacent setback levee is not proposed for these reaches. The adjacent setback levee would extend outward at least 11 feet from the landside edge of the existing levee crown and would have a 3H:1V landside slope.

Underseepage remediation is required in many of the reaches from 5A through 20A. Reach 20B has sufficient freeboard for the "200-year" design water surface elevation, and a cutoff wall that meets current design criteria was constructed in 2000 by the USACE. Because this wall was constructed to an adequate depth, this reach does not need additional seepage remediation. Based on the results of geotechnical investigations, engineering and cost considerations, and land use constraints, a combination of cutoff walls beneath the adjacent setback levee and landside seepage berms is anticipated for Reaches 5A–20A.

Construction Sequence for Improvements to Sacramento River East Levee Reaches 5A–20A. The general plan and sequence of activities for construction of the adjacent setback levee would be as described in above under "Sacramento River East Levee Reaches 1–4B (2008 Construction Phase)."

Removal of some residences, other structures, and woodland vegetation, including mature trees, would be required to create ample space for the adjacent setback levee, berms, and maintenance access corridor. It is anticipated that residences would be removed at Station 245+00 in Reach 5A, Station 368+00 in Reach 8, Station 436+50 in Reach 9A, and Station 468+00 in Reach 10. Modifications of roadway intersections with Garden Highway, utility relocations, removal of pumps and wells, and private canal relocation would be similar to these activities as described for the improvements to Sacramento River east levee Reaches 1–4B.

Borrow Quantities and Material Hauling for Improvements to Sacramento River East Levee Reaches 5A–20A. **Table 2-6** shows the anticipated fill quantities for the adjacent setback levee and proposed seepage remediation measures.

Table 2-6
Material Quantities Anticipated for Alternative 1 Improvements to the Sacramento River East Levee in Reaches 5A–20A (2009 and 2010 Construction Phases)

Material Type	Quantity	Source (Average Round-Trip Haul Distance)
Soil type 1 – select fill	1,335,000 cu. yd.	Airport bufferlands (5 miles) Fisherman's Lake area (4 miles)
Soil type 2 – random fill	2,115,000 cu. yd.	Airport bufferlands (5 miles) Fisherman's Lake area (4 miles)
Seepage berm fill	623,000 cu. yd.	Airport bufferlands (5 miles) Fisherman's Lake area (4 miles)
Seepage berm fill – reusable fill	349,000 cu. yd.	Inspection trench excavation (0.1 mile)
Excavated stability berm	250,000 cu. yd.	—
Aggregate base	66,000 tons	Commercial source (30 miles)
Total	**4,672,000 cu. yd.** **66,000 tons**	

Notes:
cu. yd. = cubic yards
Source: Data provided by HDR in 2008

Based on the assumption that 60% of the work would be performed during a 6-month 2009 construction season and 40% during a 6-month 2010 season, delivery of the material listed in **Table 2-6** would require approximately 1,100 haul trips per day in 2009 and 700 trips per day in 2010. If the 2009 and 2010 work were more equally divided between the two construction years, the estimated haul trips range from 950 to 1,050 for each year. These estimates are based on conservative assumptions of truck capacity of 14 cubic

yards and the use of haul trucks for moving all borrow material from the Airport north bufferlands (rather than a combination of haul trucks and scrapers). During calendar year 2009, when truck trips for conclusion of the 2008 construction phase would be occurring simultaneously with haul trips for the 2009 construction phase, the number of trips could range from 1,400 to 1,900 per day to and from several different locations along about 14 miles of the Sacramento River east levee.

Construction Equipment for Improvements to Sacramento River East Levee Reaches 5A–20A. The types of construction equipment used in Reaches 5A–20A would be the same as described for construction in Reaches 1–4B.

Traffic Control for Construction in Reaches 5A–20A. Single-lane traffic control and detours would be required during reconstruction of Garden Highway at intersections and installation of surface drainage outlets along this roadway, as described for Reaches 1–4B.

Postconstruction Site Condition. As described for Reaches 1–4B, after construction, the levee slopes, seepage berms, maintenance access right-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 flood control facilities would be conducted to promote the value of these areas as foraging habitat for Swainson's hawk.

Pleasant Grove Creek Canal West Levee (2009 Construction Phase). Alternative 1 includes improvements to 17,400 feet of the PGCC west levee, beginning at the east end of the NCC improvements at Howsley Road and extending southerly to Sankey Road. Construction is anticipated to proceed in 2009 on this component of the NLIP and be completed in 2009 or 2010. The improvements would consist of the following:

- widening of the levee to provide a minimum top width of 26 feet to accommodate safe lane widths for Natomas Road,
- flattening the water side of the levee to a 3H:1V slope,
- reconstructing the landside levee slope with new, select material to create a 3H:1V slope (the existing slope ranges from 2:1 to 2.5:1), and
- constructing a 100-foot-wide seepage/stability berm.

An irrigation canal at the landside toe of the existing levee would need to be relocated to the west to accommodate the berm construction. Several structures associated with the industrial facility near the southern end of the PGCC would need to be relocated.

The anticipated borrow source for soil material is the Brookfield site, which is adjacent to the PGCC, or the RD 1001 site northeast of the Natomas Basin. Construction of the PGCC west levee improvements is anticipated to require approximately 85,000 cubic yards of select borrow material, 330,000 cubic yards of random fill, and 42,000 cubic yards of drain rock. Hauling may require 100–200 trips per day using a combination of scrapers and haul trucks for soil borrow.

Relocation of the Elkhorn and Riverside Canals (2008 and 2009 Construction Phases). Approximately 22,300 feet of the Elkhorn Canal and 18,600 feet of the Riverside Canal would be relocated and constructed several hundred feet east of the landside toe of the Sacramento River east levee. The bottoms of these canals would be high enough to raise irrigation water levels above the levels of

adjacent fields so that these fields could be fed by gravity flow. The canals would be confined by earthen embankments designed to provide one foot of freeboard above irrigation water levels. To provide for stable banks, the side slopes of the canals would be 3H:1V and the invert of canals would be lined with concrete to control vegetation and to allow for maintenance with minimal disturbance of aquatic habitat along the water's edge.

The final alignment of the canals south of Reach 6B is under study. The Elkhorn Canal is expected to be routed along the levee toe approximately 220 feet from the existing centerline of Garden Highway (**Plates 20b and 20c**). This alignment may infringe on the existing golf course greens and fairways along Garden Highway. To minimize the impacts to the existing golf course, a buried pipeline could be utilized in place of constructing a new open canal. For maintenance purposes, it is assumed that parallel pipelines would be required so that flow could be maintained in one pipeline while the other is being maintained. An alternative alignment is through Teal Bend Golf Club along Walnut Road. The Riverside Canal alignment could avoid conflicts with existing trees and residences by following the eastern property line of the rural residential parcels along the landside toe of the levee south of San Juan Road.

2008 Construction Phase. The 2008 construction plan would include the new Elkhorn Canal from the North Drainage Canal to Elkhorn Reservoir, between Reach 4B and Reach 6B. On the north end, the new canal would be connected with the existing Prichard Pumping Plant outfall and an outlet to the North Drainage Canal would be constructed. An outfall to provide for connection to RD 1000 Pumping Plant No. 2, during its 2009 construction, would be incorporated into the 2008 canal construction to eliminate the need for future canal disturbance. The discharge pipes from the Prichard Pumping Plant would be extended to the relocated canal. The outlet to the North Drainage Canal would be combined with the GGS/Drainage Canal outfall with a gated control structure in the irrigation canal and a piped outlet to the North Drainage Canal.

At the southern end, the new Elkhorn Canal would connect into a concrete-lined sediment basin with an area of approximately 50,000 square feet. The proposed sediment basin would be connected to Elkhorn Reservoir with a temporary pipe and outfall structure. During the 2009 construction phase (see below), Elkhorn Reservoir would be dewatered and piping from the Elkhorn Pumping Plant would be extended to the new sediment basin, at which time Elkhorn Reservoir would be abandoned and filled.

The materials to construct the new Elkhorn Canal would come primarily from the construction of the new RD 1000 GGS/Drainage Canal. The import of some additional fill material and concrete would be required to complete construction of the canal embankment and line the bottom of the canal. Once the newly constructed canal is completed and operable, irrigation flows would be rerouted to the new canal and the existing Elkhorn Canal would be dewatered and abandoned.

The 2008 work would begin in August 2008 and continue over a 4-month period through November 2008. The anticipated construction labor force would consist of 15–20 people working 8- to 10-hour shifts, 5 days per week. A smaller crew would perform maintenance activities on Saturdays. The major construction stages are described below. Because the 2008 portion of the relocated Elkhorn Canal and the GGS/Drainage Canal would be constructed parallel within the same right-of way, they would be constructed concurrently. This approach would facilitate the use of material from the GGS/Drainage Canal excavation for use as embankment material along the Elkhorn Canal.

2009 Construction Phase. The 2009 construction phase would include relocation of the remainder of the Elkhorn Canal (south of Elkhorn Reservoir) and relocation of the Riverside Canal. This effort would include the same construction activities as described for the 2008 construction. Timing of the new canal construction would be critical to avoid interruptions in irrigation service. The remainder of the new

Elkhorn Canal, from Elkhorn Reservoir south, and the new Riverside Canal would be constructed before existing canals are filled in as part of the levee improvements in Reaches 6B–9A and 12–20B.

Table 2-7 lists the construction phases and estimated construction equipment requirements for 2008 and 2009 construction of the relocated Elkhorn and Riverside Canal segments.

New GGS/Drainage Canal (2008 and 2009 Construction Phases). The new GGS/Drainage Canal would provide connectivity of aquatic habitat between the North Drainage Canal and Fisherman's Lake and provide a migration corridor for giant garter snake between these areas. In addition to providing giant garter snake habitat, the GGS/Drainage Canal would intercept flows from non-Airport property sources. Irrigation and drainage water currently flowing into the Airport West Ditch from non-Airport property would flow into the GGS/Drainage Canal.

The GGS/Drainage Canal would generally extend parallel to the Sacramento River east levee, between the North Drainage Canal at the RD 1000 Pumping Plant 2 in the north and tying into the West Drainage Canal in the south approximately 1,000 feet south of Elkhorn Boulevard. The GGS/Drainage Canal construction would include reconstruction of the West Drainage Canal to a point approximately 3,000 feet east of Power Line Road. The length of the entire GGS Canal, including the reconstruction, would be approximately 44,000 linear feet.

North of Reservoir Road, the canal would be set back a minimum of 200 feet from the projected levee toe to minimize concerns of excessive seepage exit gradients in the bottom of the canal. The canal in this location would have a 10-foot bottom width and 3H:1V side slopes (**Plate 23**). The depth would be sufficient to provide a minimum water depth of 4.5 feet with allowance for 1 foot of water level variance and a minimum of 1 foot of freeboard. A 20-foot right-of-way would separate the proposed GGS/ Drainage Canal from the proposed relocated Elkhorn Canal.

The alignment in the area of Teal Bend Golf Club is under study. This reach of canal would have a 10-foot bottom width and 3H:1V side slopes. The alignment is expected to run east along Reservoir Road north of the golf course and then south along the golf course's eastern boundary (**Plate 20b**). An alternative alignment is through the golf course, along Walnut Road. South of Teal Bend Golf Club and north of I-5, the GGS/Drainage Canal would be set back a minimum of 2,000 feet from the levee to minimize concerns of excessive seepage exit gradients in the bottom of the canal. In this reach, a 15-foot-wide bench would be included on each side of the low-flow channel (**Plate 24**). Overbank areas would have the potential for flooding during 10-year or greater storm events.

South of I-5, the existing RD 1000 West Drainage Canal would be modified to provide improved snake habitat value in the reach between I-5 and Fisherman's Lake. This reach of the GGS/Drainage Canal would include a 10-foot-wide bench on the north side. Tules would be planted on the slope adjacent to the bench and would typically be inundated with water. This would allow the existing channel section to remain open for conveyance capacity, while increasing available refugia for the snake. The normal water level for this reach would be 6–7 feet in winter and 7–8 feet in summer. A 20-foot-wide patrol road would flank each side of the GGS/Drainage Canal and would be slightly elevated above adjacent land.

2008 Construction Phase. The 2008 construction plan would include the construction of the GGS/ Drainage Canal from the North Drainage Canal to the slough east of Elkhorn Reservoir (**Plate 20b**), between Reach 4B and Reach 6B. The GGS/Drainage Canal would tie into the North Drainage Canal east of the proposed replacement RD 1000 Pumping Plant No. 2 location. The tie-in at the North Drainage Canal would be made by piping the GGS/Drainage Canal under the access road at the North Drainage

Table 2-7
Construction of the Relocated Elkhorn and Riverside Canal Segments Anticipated Equipment Requirements and Duration of Use in 2008 and 2009

Construction Phase	Equipment Types and Number of Each Type	Work Days (2008)	Work Days (2009)
Clearing and grubbing/stripping	Dozers (4)	6	15
	Water trucks (2)	6	15
	Front-end loaders (4)	6	15
Utility relocation	Dozers (2)	12	30
	Excavators (2)	12	30
	Compactor (1)	6	15
Water control facility construction	Backhoes (2)	16	45
	Flatbed trucks (2)	16	45
	Generators (2)	16	45
	Compactors (2)	6	15
Embankment and access road construction	Dozers (2)	55	145
	Sheepsfoot rollers (2)	55	145
	Water trucks (2)	55	145
	Smooth drum rollers (2)	3	8
	Motor graders (2)	55	145
Canal lining	Boom trucks (2)	8	22
	Concrete pump (1)	8	22
Irrigation interconnections	Excavators (2)	4	12
	Water truck (1)	4	12
	Motor grader (1)	4	12
Pump discharge pipe extension	Excavators (2)	8	22
	Front-end loaders (2)	8	22
	Welders (2)	8	22
	Crane (1)	8	22
	Small compactor (1)	8	22
	Water truck (1)	8	22
Erosion control	Hydroseeding truck (1)	1	3
	Water truck (1)	15	15
Irrigation canal abandonment	Loaders (2)	8	22
	Compactors (2)	8	22
Demobilization/cleanup	Truck (1)	1	3
	Front-end loader (1)	1	3

Source: Data provided by Mead & Hunt in 2007

Canal. The tie-in at the south end would be a temporary connection at the slough by piping under the Moody Canal into the slough. The connections into both the North Drainage Canal and the slough would be constructed with concrete headwalls, control structures, and erosion protection at outlets.

The GGS/Drainage Canal and Elkhorn Canal would be parallel and separated by a 20-foot right-of-way access. The two canals would cross each other approximately 350 feet north of Elkhorn Reservoir in the adjacent agricultural field. Because the GGS/Drainage Canal would be lower in elevation, approximately 3.5–5.5 feet below existing grade, it would be piped underneath the Elkhorn Canal.

Because the 2008 portion of the GGS/Drainage Canal and the Elkhorn Canal would be constructed parallel within the same right-of way, they would be constructed concurrently. This approach would facilitate the use of material from the GGS/Drainage Canal excavation for use as embankment material along the Elkhorn Canal.

2009 Construction Phase. The 2009 construction plan would include the construction of the GGS/ Drainage Canal from the slough east of Elkhorn Reservoir to the West Drainage Canal, improvements to the West Drainage Canal to enhance habitat value for giant garter snake, and abandonment of the temporary connection of the GGS/Drainage Canal at the slough adjacent to Elkhorn Reservoir. Reclamation would include planting tules on the sloped banks. In the portion of the canal below I-5, tules would be planted above the canal bench. Backhoes would be used to prepare the planting areas and a water truck would be used to control dust.

Table 2-8 lists the construction phases and estimated construction equipment requirements for construction of the GGS/Drainage Canal between the North Drainage Canal and the slough to the east of Elkhorn Reservoir in 2008.

Airport West Ditch (2009 Construction Phase). As part of a safety survey conducted by the FAA for the Airport, the FAA expressed concern that the Airport West Ditch provides habitat for wildlife that potentially create a hazard to aircraft. The FAA recommended relocation of the ditch to alleviate the hazard. Additionally, a longstanding problem has existed with leakage from a 24-inch pipeline, resulting in marshy conditions along its route, approximately 11,000 feet between the intake structure and delivery point at the Airport pumps. During the past year the Airport began receiving all of its domestic (drinking) water supply from the City of Sacramento via a pipeline and storage tank project. Two of the on-Airport water wells previously used to provide domestic water were connected to the Airport landscape irrigation piping system, and the water supply to the “leaky underground pipe” was deactivated. All of the Airport’s landscape irrigation needs are now provided on-site, and there is no need for the leaky pipe to remain in place. Irrigation water provided by NMWC still flows south through the Airport West Ditch, however, whereupon it is pumped to privately owned farms west of the Airport. The proposed project would include the construction of canal improvements to allow for decommissioning of the agricultural irrigation function of the ditch. During storms the Airport West Ditch receives stormwater runoff from a portion of the impervious surfaces on the west side of the Airport. Depending on the water volume, some of the stormwater is retained in the ditch until it can drain off-site to the Sacramento River. Therefore, the stormwater detention function of the Airport West Ditch must still continue. In addition to the habitat-related safety issues, the ditch presents a physical obstruction hazard to planes that may leave the runway during adverse takeoff or landing situations. Therefore, the final stage of this project component would consist of regrading of the Airport West Ditch to a gently sloping swale that can be easily maintained

Table 2-8 Anticipated Equipment Requirements and Duration of Use for Construction of the New GGS/Drainage Canal Segment in 2008 and 2009			
Construction Phase	**Equipment Types and Number of Each Type**	**Duration – 2008 (days)**	**Duration – 2009 (days)**
Clearing and grubbing/stripping	Dozers (4)	18	28
	Water trucks (2)	18	28
	Front-end loaders (10)	18	28
Utility relocations	Dozers (2)	16	24
	Excavators (2)	16	24
	Compactor (1)	8	12
Excavation and trenching	Scrapers (4)	10	55
	Excavators (2)	14	76
	Water trucks (2)	14	76
Facility construction	Backhoes (2)	24	36
	Flatbed trucks (2)	24	36
	Generators (2)	24	36
	Compactor (1)	8	12
Embankment and access road construction	Dozers (2)	8	12
	Sheepsfoot rollers (2)	8	12
	Water trucks (2)	8	12
	Smooth drum rollers (2)	4	6
	Motor graders (2)	8	12
Reclamation	Backhoes (2)	16	24
	Water trucks (2)	16	24
Drainage interconnections	Excavators (2)	6	9
	Water truck (1)	6	9
	Motor grader (1)	6	9
Erosion control	Hydroseeding truck (1)	1	2
	Water truck (1)	15	15
Demobilization/cleanup	Truck (1)	1	2
	Front-end loader (1)	1	2
Source: Data provided by Mead & Hunt in 2007			

through mowing or other means. The more gradual gradient would also pose a lower threat to aircraft that may unexpectedly exit the runway.

To take advantage of the common construction practices and to maximize the use of common facilities, the rearrangement of irrigation and drainage facilities required to provide for rerouting of flows that contribute to the Airport West Ditch would be accomplished along with SAFCA's flood control improvements and related irrigation and drainage infrastructure modifications. The proposed GGS/ Drainage Canal would intercept many of the Airport West Ditch's offsite irrigation and drainage sources and reroute flows outside of the Airport Operations Area. The intent is to reroute year-round flows through the GGS/Drainage Canal. Additional irrigation infrastructure modifications required to reroute these flows would be implemented along with the GGS/Drainage Canal construction.

Pumping Plant No. 2 Improvements (2008 and 2009 Construction Phases). As part of Alternative 1, SAFCA would undertake levee repairs, facility removal, and reconstruction of RD 1000 Pumping Plant No. 2 site at the west end of the North Drainage Canal. The first phase of this effort included installation of a sheet pile cutoff wall along the waterside levee slope to a depth of approximately 110 feet below the top of the existing ground and other minor site improvements to temporarily stabilize the site for the winter of 2006–2007. This work constituted an emergency action that fell within the scope of the Governor's February 24, 2006, Emergency Declaration and Executive Order S-01-06.

2008 Construction Phase. The 2008 construction phase would include: (1) excavating and removing approximately 400 feet of the existing levee section adjacent to the Pumping Plant No. 2 site to expose a deep culvert and possible voids under the levee; (2) removing the deep culvert; (3) reconstructing the levee adjacent to the pumping plant sump with levee embankment fill; and (4) demolishing, removing, and relocating the pumping plant remnants within the project footprint. The project-related work would be confined to an area of approximately 2.3 acres. A stockpile and staging area of approximately 4.5 acres would be established near the work area. Garden Highway would be closed to through traffic during construction, with traffic rerouted along Powerline Road or SR 99/70 via Riego Road and Elverta Road. Local access to businesses and the RD 1000 pump tender's building would be maintained.

Excavation limits would be extended to reconstruct the levee section adjacent to the sump and to reach areas where anomalies were identified during a geophysical investigation of the site. An area on the water side of the sheet pile wall would be excavated to lower the ground surface so as to reduce the loading on the sheet pile and excavation shoring system as the excavation takes place on the landside of the sheet piles. The waterside elevation would not be reduced below elevation 33 feet (NAVD 88). During excavation, the remnants of the pumping plant would be demolished and removed. This work includes relocation of a 36-inch irrigation supply pipe that is within the excavation limits. Thereafter, the levee section would be reconstructed with an engineered fill and suitable levee embankment soil from the excavation stockpile would be reused for levee reconstruction.

2009 and 2010 Construction Phase. In 2009, Pumping Plant No. 2 would be reconstructed and relocated as part of the proposed project at the western end of the North Drainage Canal, approximately 900 feet east of the centerline of the levee in the vicinity of the intersection with the P6 Drain. Long discharge pipes would extend over the levee to the Sacramento River. The work is expected to take place in 2009. Critical sizing for Pumping Plant No. 2 is based on the capacity to pump drainage water from the Natomas Basin during a 100-year base flood event. To maintain the equivalent capacity, some additional pumping horsepower would be needed to overcome the losses associated with longer discharge lines.

Two 42-inch steel discharge pipes, approximately 850 feet long, would connect the two 300-horsepower pumps from the pump station to a new concrete outfall structure in the Sacramento River. The new outfall structure would be constructed close to the location of the original Pumping Plant No. 2 outfall structure. A separate 36-inch pipe would be constructed parallel to the landward section of the discharge pipes to

restore the connection between NMWC's Central Main Irrigation Canal (land side of the levee) and the North Drainage Canal (approximately 600 linear feet). Based on anticipated loose foundation soils in the backfill area, it is anticipated that pipelines and structures would be pile supported. The invert of discharge pipes would cross over the levee above the "200-year" design flood elevation in the Sacramento River to maintain the design level of flood protection.

2.2.2.8 Operation and Maintenance Considerations. Agencies and organizations that would have management responsibility for proposed project features are SAFCA, RD 1000, NMWC, SCAS, and TNBC.

Sacramento Area Flood Control Agency. SAFCA would be responsible for the design and construction of all levee improvements, maintenance access and inspection roads and rights-of-way, replacement canals and associated drainage and irrigation structures, and habitat creation sites. In addition, SAFCA 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 responsibility would be conferred by SAFCA to the other management entities described below. Memoranda of agreement, land ownership transfers, or management endowments and contracts would be used by SAFCA to transfer land management responsibility to the appropriate public agency or nonprofit 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 protection 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, the new GGS/Drainage Canal, and reconstructed Pumping Plant No. 2. Typical maintenance activities include mowing grassland along levee slopes and berms, canal banks, and rights-of-way; managing canal bank vegetation, including noxious weeds; periodically removing sediment from drainage canals; and maintaining and repairing canal and levee patrol roads.

Natomas Central Mutual Water Company. NMWC is a nonprofit mutual water company with the primary focus of keeping the water conveyance functioning in order 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 NMWC. NMWC would be responsible for maintaining and managing the relocated Elkhorn and Riverside Canals 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 Elkhorn and Riverside Canals, the relocated canals would have improved levees, better water control structures, and wider roads and right-of-ways. These improvements are expected to ease annual canal management efforts, allowing for a proportionately greater focus on maintenance and operations and less need for system repair and dredging.

Sacramento County Airport System. SCAS manages the Sacramento County–owned bufferlands outside the Airport Operations Area. All project components on land under SCAS management would remain in public ownership.

The Natomas Basin Conservancy. TNBC acquires and manages land for the purpose of meeting the objectives of the NBHCP. To meet the mitigation goals of the NBHCP, 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 4,500 acres. Private land acquired by SAFCA and converted to managed marsh or used for woodland establishment may be conveyed to TNBC after creation of permanent habitats as marsh, woodlands, and habitat buffer zones. RD 1000 or SAFCA may also contract with TNBC for management elements of some habitat features (e.g., the GGS/Drainage Canal).

2.2.2.9 Additional Investigations to Aid in Project Planning and Design. Both geotechnical and cultural resource investigations will be an ongoing element of all construction phases, to assist in refinement of project design and identification of construction constraints.

Geotechnical Investigations. Additional exploration of geotechnical conditions is anticipated to be required in 2008–2010 along the NCC south levee, Sacramento River east levee, PGCC west levee, NEMDC/Steelhead Creek west levee, and American River north levee to facilitate refinement of design for flood facility improvements. Exploration of subsurface conditions would primarily be conducted by drilling borings. Borings along the levees would generally be drilled to depths of 60–120 feet below the ground surface using either a rubber-tire truck-mounted drill rig or an all-terrain drill rig equipped with an 8-inch-diameter hollow-stem auger and a 4-inch-diameter rotary wash drill bit. Hollow-stem augers would generally be used to drill through the levee fill and would be left in place to act as temporary casing and protection against hydraulic fracturing of the levee. Rotary wash drilling methods would used below the augers. Borings located at and landward of the levee toe would be drilled using rotary wash drilling methods.

Exploration of potential borrow sites will also be required to assess suitability of the material. Such exploration could include boring methods similar to those described above but to much shallower depths (10–12 feet below grade). Test pit excavation would be conducted using a tire-mounted backhoe to depths of 10–12 feet below grade. The test pits would likely be 1–3 feet wide along dirt roadways and 3–6 feet wide in agricultural fields by about 10 feet long. Samples would be obtained by hand with shovels from the excavated materials. When the bottom depth has been reached, the test pits would be loosely backfilled with the excavated material with minor compaction effort. In the dirt roadways, the backfilled materials would be compacted with more effort to keep the roads driveable and safe.

Cultural Resources Investigations. Archeological surveys within potential flood control facility improvement footprints and potential borrow sites are also required to facilitate project planning in 2008–2010 and satisfy requirements under Section 106 of the National Historic Preservation Act. The surveys would include up to three phases of work. All archaeological excavation work in Phases 1 and 2 would be conducted with hand tools, such as shovels and trowels. Phase 1 entails digging shovel test pits 15 inches in diameter and up to 3 feet deep to evaluate the characteristics of subsurface material; these test pits would be backfilled immediately. Depending on archeological evidence found within the shovel test pits, Phase 2 work may be initiated to allow for more thorough site investigations. This phase would include excavation of 1-meter-square and 5-foot-deep test units. These test units may need to remain open for several days until examination can be completed. Any sites requiring deeper excavation to further investigate subsurface features identified in the first two phases would be included in Phase 3. This phase would require the use of machinery, such as a backhoe.

2.2.3 Alternative 2 – Raise Levee in Place with Setback

All elements of Alternative 2 – Raise Levee in Place with Setback for the 3 years of construction (2008–2010) would be the same as described above for Alternative 1 – Adjacent Setback Levee except for levee raising and seepage remediation with respect to the Sacramento River east levee, proposed habitat creation, and removal of encroachments from the Sacramento River east levee (differences from Alternative 1 are shown in italicized text):

- Levee raising and seepage remediation: NCC south levee—Same as for Alternative 1.

- Levee raising and seepage remediation: Sacramento River east levee—*Set back 1.5 miles of the Sacramento River east levee by 1,000 feet in Reaches 1 and 2 (from approximately Station 5+00 to Station 88+00) and construct a 100-foot seepage berm along the setback levee. Raise the existing levee and flatten the landside slope from the southern end of the setback levee through Reach 11B, flatten the landside slope of the existing levee from Reach 12 through Reach 19A, and construct cutoff walls and seepage berms for seepage remediation as required from the southern end of the setback levee through Reach 20B.*

- *Erosion Control—To meet the project flood protection objective, erosion control improvements would also need to be implemented along approximately 3,710 feet of river bank at the waterside toe of the Sacramento River east levee at River Miles 73.5, 69.8 and 68.8 (Sites G, J, and M) (Reaches 6A, 10, and 11A, respectively).*

- Levee widening and seepage remediation: PGCC west levee—Same as for Alternative 1.

- Improvements to major irrigation and drainage infrastructure—Same as for Alternative 1.

- Habitat creation and management—Establish habitat in the new GGS/Drainage Canal and improved West Drainage Canal. Recontour and create managed marsh and grassland on lands used as borrow sources. Establish grassland on the adjacent setback levee slopes and seepage berms. Install woodland plantings to offset the loss of portions of tree groves in the landside levee footprint. *In addition, install approximately 140 acres of trees in the levee setback area to offset the removal of trees from the water side of the existing levee to meet USACE design criteria (see below).*

- Additional actions to meet FEMA requirements—*Remove substantial encroachments from the water side and land side of the Sacramento River east levee to ensure that the levee can be certified as meeting the minimum requirements of the NFIP and USACE design criteria.* Modify the SR 99/70 crossing of the NCC as needed to meet FEMA requirements.

- Right-of-way acquisition—Same as for Alternative 1.

Plate 25 illustrates the features of Alternative 2 proposed for construction in the 2008 construction phase that differ from those of Alternative 1 (**Plate 22**).

2.2.3.1 Flood Protection Components. This alternative would predominantly involve the same flood protection components as Alternative 1 except that the Sacramento River east levee would be raised in place and a new setback levee would be constructed to replace this levee in its northern reach. These differences are outlined below. In addition, because an adjacent levee would not be constructed along the Sacramento River east levee under this alternative and, instead, most of the Sacramento River east levee

would be raised in place, erosion protection would also need to be undertaken at three high-priority sites (G, J, and M) along the water side of this levee south of the setback levee reach; treatment of three other high-priority sites in the northern reaches (A, C, and D) would be rendered unnecessary by construction of the setback levee in those reaches. (See **Plate 6** for the locations of erosion sites.) The associated erosion control requirement and methods are described below as well.

Levee Raising. The Sacramento River east levee would be raised from approximately Station 88+00 in Reach 2 through Station 635+00 at the southern end of Reach 11B, a distance of approximately 10.4 miles, to provide sufficient freeboard to contain the "200-year" design flood. The levee raise would consist of an embankment raise from the landside or waterside toe (or both) upward to the increased crown elevation. This would require partially excavating the levee slope to provide a working platform for equipment, typically 10 feet wide, and rebuilding the levee to the appropriate elevation by benching the new embankment material into the existing embankment material. The landside levee slope would be flattened from 2H:1V to 3H:1V.

As described in Section 2.1.2.1, improving the existing Sacramento River east levee in place would result in the need to remove a substantial acreage of trees from the water side of the levee to comply with USACE encroachment policy. Consequently, such an action would have significant mitigation requirements that could be difficult, if not impossible, to complete unless conducted in conjunction with setting back the northern portion of the levee and planting waterside trees in the levee setback area to offset the removal of existing trees.

Setback Levee. As described in Section 2.1.2.1, a levee setback of more than the northernmost approximately 1.5 miles of the Sacramento River east levee was rejected from detailed consideration in the formulation of alternatives because of complications arising from the presence of waterside residences along the existing levee from approximately Station 90+00 south to the American River north levee and because of 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. Under Alternative 2, a new setback levee approximately 1.5 miles long with a 100-foot-wide seepage berm would be constructed from approximately Station 5+00 in Reach 1 to Station 88+00 in Reach 2. The setback levee would be located approximately 1,000 feet east of the existing levee alignment at its farthest point (**Plate 14**). The setback levee would be constructed with 3H:1V waterside and landside slopes and with sufficient freeboard to contain the "200-year" design flood. Raising the existing levee would also include flattening the landside slope to a 3H:1V backslope. A maintenance road would extend along the land side of the levee. The Garden Highway would be moved to the land side of the setback levee, east of the seepage berm and maintenance access. The landside section of roadway would reconnect to Garden Highway in the north at the proposed realignment of the Sankey Road intersection (Station 5+00), and in the south at the end of the setback levee (Station 88+00).

The setback levee would need to be designed such that it would not alter the flow split between the Yolo Bypass and the Sacramento River and therefore would not alter river hydraulics. Preliminary modeling has shown that "cross levees," consisting of levee sections constructed perpendicular to the main levee, would prevent additional flows from being conveyed through the levee setback area and down the Sacramento River channel, altering the hydraulic balance of the system. Once the setback levee is constructed, the existing levee would be breached in several places between the cross levees to allow the cells to fill with shallow water in winter and spring, creating backwater areas that could enhance fish habitat and riparian habitat.

Seepage Remediation. The seepage remediation components of this alternative would be the same as those of Alternative 1 except along the Sacramento River east levee where it would likely not be

feasible to employ SB cutoff walls. In lieu of this measure, a combination of SCB or CB walls, seepage berms, and relief wells would be employed.

Erosion Control. Setting back the northern 1.5 miles of the Sacramento River east levee 1,000 feet inland would eliminate the need to address ongoing erosion problems at high-risk sites A, C, and D (**Plate 6**). However, because this alternative would raise the existing levee in place, rather than widening it with an adjacent setback levee as under Alternatives 1 and 3, it would create a higher risk for further bank erosion to shorten the seepage path beneath the water side and land side of the levee. Therefore, this alternative includes bank protection improvements to three high-risk sites along the Sacramento River east levee: Site G at River Mile 73.5 (1,430 linear feet), Site J at River Mile 69.8 (690 linear feet), and Site M at River Mile 68.8 (1,590 linear feet). These improvements would include the following measures as shown in **Plate 26**:

- Placement of rock riprap on the existing or restored levee-foundation slope from the channel bed to about the average summer water level on the bank, with toe protection as required to resist and accommodate scour of the channel bed.

- Construction of cobble-covered soil slopes extending from the riprap up the slope to about the average winter water surface elevation. Among the affected bank protection sites, the maximum slope of the surface of the soil fill would be 3H:1V and the minimum would be 10H:1V. A layer of cobbles and filter material would be placed on the top of the soil to provide protection of the levee foundation from catastrophic scour and erosion protection of the soil surface. Riparian vegetation would be planted through the cobbles, with species varying according to the elevation above the average summer water surface elevation.

- Retention of existing riparian vegetation above the cobble slope (i.e., above the average winter water level) as a result of limiting the height of the structure up the bank. Providing construction access by barge rather than clearing vegetation on the berm to provide construction access from the Garden Highway will further limit the removal of riparian vegetation where this construction method is practical. Where larger-diameter trees are present near where the cobble slope joins the natural upper-bank slope, they will be marked and avoided during construction to the extent feasible. Where trees exist within the area of the proposed cobble slope and the thickness of the soil-cobble layers is less than 2 feet, the existing trees may be retained.

- Inclusion of instream woody material (IWM) structures in the design of the bank protection improvements to enhance habitat mitigation. These structures would consist of whole-tree and/or rootwad clusters anchored into the revetment on the lower portion of the cobble-covered soil slope, such that portions of the IWM typically would be submerged even during the low-flow season.

2.2.3.2 Aviation Safety Components. The aviation safety components of this alternative would be the same as for Alternative 1.

2.2.3.3 Habitat Conservation Components. The primary difference between the habitat conservation components this alternative and those of Alternative 1 would be the installation of woodland plantings in the levee setback area to offset habitat losses associated with removal of trees from the water side of the existing levee. These plantings could provide shaded riverine aquatic (SRA) habitat for salmon and steelhead migrating along the Sacramento River and would be in addition to the woodland plantings installed on the land side of the levee to offset the loss of portions of tree groves in the landside levee footprint.

2.2.3.4 Irrigation and Drainage Components. The irrigation and drainage components of this alternative would be the same as described for Alternative 1.

2.2.3.5 Additional Actions to Meet FEMA Requirements. Encroachment management and road closures associated with raising the Sacramento River east levee would differ from the activities described for Alternative 1, as specified below.

Encroachment Management. To meet USACE requirements, a substantial number of structural features may need to be removed from the water side of the existing levee. In addition, implementation of this alternative would require the removal of trees from the water side of the levee, totaling as much as approximately 35 acres, in addition to 10–12 acres of trees that would need to be removed from the levee and berm footprint on the land side, for a total loss of 45 acres of woodland. Approximately 270 acres of trees would be planted as replacements at an approximately 6:1 ratio, with about 140 acres planted in the levee setback area (i.e., between the setback levee and the existing levee alignment) and another 130 acres planted along the land side of the levee, as described conceptually for Alternative 1.

Garden Highway Closures. Raising the existing Sacramento River east levee in place would require lane or road closures along portions of Garden Highway for prolonged periods during construction, causing traffic and access delays and necessitating an extensive traffic control plan.

2.2.3.6 Land, Easements, Relocations and Rights of Way. Right-of-way acquisition would be similar to acquisition for Alternative 1, except along the Sacramento River east levee where more land would be needed in the upper 1.5 miles of this reach to accommodate the levee setback and less land would be needed to accommodate the narrower levee footprint outside the setback area.

2.2.3.7 Construction Details. The general construction activities for this alternative and the sequence of construction activities would be the same as described for Alternative 1 for the NCC south levee improvements, PGCC west levee improvements, improvements to major infrastructure, and habitat creation at borrow sites and in the GGS/Drainage Canal.

Construction of the improvements to the Sacramento River east levee would require a substantially different set of activities. Construction activities for Alternative 2 would include raising approximately 63,500 feet of the levee from the western terminus of the NCC south levee to Powerline Road (Station 0+00 and Station 635+00) and constructing seepage remediation, including cutoff walls at multiple sites, extending from approximately Station 60+00 to approximately Station 900 +00. The timing of construction of the Alternative 2 elements would be the same as shown in **Table 2-1** for Alternative 1.

Cutoff Wall Construction in the Existing Sacramento River East Levee. Preparation for construction of the cutoff wall would begin with using scrapers (or other suitable equipment, depending on the slope) to clear and grub/strip the surface to a depth of 2 inches to remove low-growing vegetation, loose stone, and surface soils. This material would be hauled off-site. The top 4 inches of aggregate base from the operating road also would be removed and stockpiled for later reuse. Waste material would be hauled to an off-site location.

Construction of the cutoff wall would include degrading the existing levee to a depth equal to one-third its total height (approximately 6 feet). This would require extensive detouring of traffic on the Garden Highway and temporary relocation of driveways and other residential access areas to accommodate construction activities. The depth of the cutoff wall would vary from about 70 feet to about 110 feet, with the method of installation at the contractor's discretion. Material degraded to support cutoff wall construction would be compacted at the landside toe of the levee to support the levee raising operation described below.

The crew size for this work is estimated at 45–55 people working on three fronts (i.e., starting from three locations) during two 12-hour shifts, 6 days a week, Monday through Saturday. Equipment maintenance activities would be conducted on Sundays and would require a minimal crew. Cutoff wall construction is expected to require 24-hour-per-day construction.

Levee Raising. To obtain a minimum of 3 feet of freeboard above the "200-year" design water surface, the levee would be raised in place by approximately 1 to 2.5 feet between Station 88+00 and Station 635+00, a distance of approximately 10 miles, using imported material meeting USACE requirements for levee fill. Levee raising activities would occur immediately following cutoff wall construction to limit Garden Highway closures and complete residential access relocations. To accommodate the higher levee, the Garden Highway would be slightly widened and several existing Garden Highway intersections (Riego Road, Elverta Road, Elkhorn Boulevard, and Powerline Road) would be redesigned and reconstructed. In all locations, the levee would be raised on the land side and, where the existing landside levee slope is currently steeper than 3H:1V, the levee would be flattened to the landside to achieve a 3H:1V slope. Approximately 800,000 cubic yards of imported soil borrow material would be required for the levee raising. Hauling of material from the borrow site is anticipated to occur during a single 10-hour shift each day.

In the setback area (approximately Station 5+00 to Station 88+00), construction of the setback levee and relocation of Garden Highway along the land side of the setback levee would be completed before portions of the existing levee in the levee setback reaches would be degraded.

Table 2-9 shows the estimated material quantities for the Sacramento River east levee modifications under Alternative 2.

Table 2-9
Estimated Material Quantities Required
for Alternative 2 Improvements to the Sacramento River East Levee in Reaches 1–20A
(2008, 2009, and 2010 Construction Phases)

Material Type	Quantity	Source (Average Round-Trip Haul Distance)
Soil type 1 – select fill	1,357,000 cu. yd.	2008: Airport bufferlands (3 miles) 2009: Airport bufferlands (4 miles) 2010: Fisherman's Lake area (4 miles)
Soil type 2 – random fill	2,278,000 cu. Yd	2008: Airport bufferlands (3 miles) 2009: Airport bufferlands (4 miles) 2010: Fisherman's Lake area (4 miles)
Reusable fill	264,000 cu. Yd	—
Aggregate base[1]	204,000 tons	Commercial source (30 miles)
Asphalt concrete[1]	102,000 tons	Commercial source (30 miles)
Temporary aggregate base[2]	74,000 tons	Commercial source (30 miles)
Temporary asphalt concrete[2]	19,000 tons	Commercial source (30 miles)
Total	**3,899,000 cu. yd.** **399,000 tons**	

Notes:
cu. yd. = cubic yards
[1] For relocation of Garden Highway along the land side of the 1,000-foot setback levee and rebuilding Garden Highway on the reconstructed levee crown south of the setback levee.
[2] For temporary relocation of sections of Garden Highway during improvements to the existing levee.
Source: Estimates provided by HDR in 2008

If the same overall proportions of construction work would be completed each year as calculated for Alternative 1 (with a large part of the 2008 construction phase taking place in 3 months of 2008 and the remainder in 2009), delivery of the material listed in **Table 2-9** would require approximately 750 haul trips per day in 2008, 950 trips per day in 2009, and 500 trips per day in 2010 (compared to 1,100–1,200 trips per day in 2008, 1,450 trips per day in 2009, and 700 trips per day in 2010 under Alternative 1). Alternatively, if most of the 2008 construction phase for the Sacramento River east levee improvements were delayed until calendar year 2009, haul trips for both the 2008 construction phase and the 2009 construction phase would total approximately 650 per day for a combined total of approximately 1,300 trips per day in calendar year 2009, compared with 1,900 trips per day under Alternative 1. As under

Alternative 1, these estimates are based on conservative assumptions of truck capacity of 14 cubic yards and the use of haul trucks for moving all borrow material from the Airport north bufferlands (rather than a combination of haul trucks and scrapers).

Because the raised existing levee under Alternative 2 would have a narrower footprint than the adjacent setback levee in Alternative 1, the Sacramento River east levee improvements under this alternative would require less borrow material and fewer haul trips than Alternative 1.

Erosion Control. Bank protection improvements at River Miles 69.8 and 68.8 would be constructed from the water side of the levee. Construction materials, including 58,000 cubic yards of rock and soil, would be delivered by tugboat and barge and placed by clamshell crane and on shore dozers and loader/excavators at the project sites. Construction would be completed in one season.

2.2.3.8 Operations and Maintenance Considerations. Agencies and organizations that would have management responsibility for proposed project features are SAFCA, RD 1000, NMWC, SCAS, and TNBC, as described for Alternative 1.

2.2.3.9 Additional Investigations to Aid in Project Planning and Design. Additional investigations would be as described for Alternative 1.

2.2.4 Alternative 3 – Adjacent Levee with Setback

All elements of Alternative 3–Adjacent Levee with Setback for the 3 years of construction (2008–2010) would be the same as described for Alternative 1–Adjacent Setback Levee except for levee raising and seepage remediation with respect to the northern portion of the Sacramento River east levee, and proposed habitat creation (differences from the proposed project are shown in italicized text):

- **Levee raising and seepage remediation: NCC south levee**—Same as for Alternative 1.

- **Levee raising and seepage remediation: Sacramento River east levee**—*Set back 1.5 miles of the Sacramento River east levee by 500 feet in Reaches 1 and 2 (from approximately Station 5+00 to Station 88+00) and construct a 100-foot seepage berm along the setback levee. Construct an adjacent setback levee from the southern end of the setback levee to the American River north levee, raised where needed to provide adequate freeboard, with cutoff walls and seepage berms for seepage remediation as required.*

- **Levee widening and seepage remediation: PGCC west levee**—Same as for Alternative 1.

- **Improvements to major irrigation and drainage infrastructure**—Same as for Alternative 1.

- **Habitat creation and management**—Establish habitat in the new GGS/Drainage Canal and improved West Drainage Canal. Recontour and create managed marsh and grassland on lands used as borrow sources. Establish grassland on the adjacent setback levee slopes and seepage berms. Install woodland plantings *in the levee setback area and on the land side of the levee* to offset the loss of portions of tree groves in the landside levee footprint.

- **Additional actions to meet FEMA requirements**—Same as for Alternative 1.

- **Right-of-way acquisition**—Same as for Alternative 1.

Plate 27 illustrates the 500-foot setback levee concept. **Plate 28** illustrates the features of Alternative 3 proposed for construction in the 2008 construction phase that differ from those of Alternative 1 (**Plate 22**).

2.2.4.1 Flood Protection Components. Alternative 3 would involve the same flood protection components as Alternative 1 except that a new setback levee would be constructed in the northern reach of the Sacramento River east levee. This difference is outlined below. Construction of the setback levee and the adjacent levee would reduce the potential for bank erosion to undermine levee stability; therefore, achievement of the project flood protection objective under this alternative would not require repair of erosion sites.

Levee Raising. The adjacent levee would be constructed along the Sacramento River east levee from the southern end of the setback levee through Reach 20A and would be raised for about 10 miles from approximately Station 88+00 in Reach 2 through Station 635+00 at the southern end of Reach 11B.

Setback Levee. As described in Section 2.1.2.1, a levee setback of more than the northernmost 1.5 miles of the Sacramento River east levee was rejected from detailed consideration in the formulation of alternatives because of complications arising from the presence of waterside residences along the existing levee from approximately Station 90+00 south to the American River north levee and because of 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. Under Alternative 3, a new setback levee with a 100-foot-wide seepage berm would be constructed from approximately Station 5+00 in Reach 1 to Station 88+00 in Reach 2 that would be approximately 500 feet east of the existing levee alignment at its farthest point (**Plate 27**). The setback levee would be constructed with 3H:1V waterside and landside slopes and with sufficient freeboard to contain the “200-year” design flood. Raising the existing levee would also include flattening the landside slope to a 3H:1V backslope. A maintenance road would extend along the land side of the levee. The Garden Highway would be moved to the land side of the setback levee, east of the seepage berm and maintenance access. The landside section of roadway would reconnect to Garden Highway in the north at the proposed realignment of the Sankey Road intersection (Station 5+00), and in the south at the end of the setback levee (Station 88+00).

As described for Alternative 2, the setback levee would need to be designed with features such as cross levees such that it would not alter the flow split between the Yolo Bypass and the Sacramento River and therefore would not alter river hydraulics. Once the setback levee is constructed, the existing levee would be breached in several places between the cross levees to allow the cells to fill with shallow water in winter and spring, creating backwater areas that could enhance fish habitat and riparian habitat.

Seepage Remediation. The seepage remediation components of this alternative would be the same as those of Alternative 1 below the setback levee. A 100-foot seepage berm would be constructed along the land side of the setback levee.

2.2.4.2 Aviation Safety Components. The aviation safety components of this alternative would be the same as those of Alternative 1.

2.2.4.3 Habitat Conservation Components. The primary difference between this alternative and the Alternative 1 would be the installation of approximately 60 acres of woodland plantings in the levee setback area to offset trees removed from the waterside of the existing levee. This planting would be in addition to the landside planting of approximately 70 acres and could provide SRA habitat for salmon and steelhead migrating along the Sacramento River.

2.2.4.4 Irrigation and Drainage Components. The irrigation and drainage components of this alternative would be the same as those of Alternative 1.

2.2.4.5 Additional Actions to Meet FEMA Requirements. Encroachment management and bridge crossings requirements would be the same as the Adjacent Levee Alternative.

2.2.4.6 Land, Easements, Relocations and Rights of Way. Right-of-way acquisition and relocations of facilities and structures for this alternative would be similar to those described for Alternative 1 for the areas of the construction footprint and to prevent encroachments into the flood control system. In addition, approximately 90 acres would be acquired to accommodate the levee setback.

2.2.4.7 Construction Details. The general construction activities for Alternative 3 and the sequence of construction activities would be similar to those described for Alternative 1. Construction of the NCC south levee improvements, PGCC west levee improvements, and improvements to major infrastructure would be the same as described for Alternative 1, and habitat creation at borrow sites and in the GGS/ Drainage Canal would be the same or very similar (the area of disturbance for borrow would differ somewhat and, therefore, the acreage of subsequent habitat creation may differ). The timing of construction of the Alternative 3 elements would be the same as shown in **Table 2-1** for Alternative 1.

Construction material quantities and equipment use for the Sacramento River east levee improvements would be similar to those described for Alternative 1. **Table 2-10** shows the quantities of each material type that would be used for construction of the Sacramento River east levee improvements under Alternative 3. Some of the random fill for the setback levee and cross levees would be available from degradation of the existing levee in Reaches 1 and 2.

If the same overall proportions of construction work would be completed each year as calculated for Alternative 1 (with a large part of the 2008 construction phase taking place in 3 months of 2008 and the remainder in 2009), delivery of the material listed in **Table 2-10** would require approximately 1,100 haul trips per day in 2008, 1,400 trips per day in 2009, and 700 trips per day in 2010 (compared to 1,100–1,200 trips in 2008, 1,450 trips in 2009, and 700 trips in 2010 under Alternative 1). Alternatively, if most of the 2008 construction phase for the Sacramento River east levee improvements were delayed until calendar year 2009, haul trips for both the 2008 construction phase and the 2009 construction phase would range between 900 and 1,050 for a combined total of approximately 1,900 trips per day in calendar year 2009, as under Alternative 1. As under Alternative 1, these estimates are based on conservative assumptions of truck capacity of 14 cubic yards and the use of haul trucks for moving all borrow material from the Airport north bufferlands (rather than a combination of haul trucks and scrapers).

Because the setback levee under Alternative 3 in Reaches 1 and 2 would have a greater footprint than the adjacent setback levee under Alternative 1 in these reaches, the Sacramento River east levee improvements under this alternative would require somewhat more material. However, some of the random fill for the setback levee and cross levees would be available from degradation of the existing levee in Reaches 1 and 2.

Table 2-10 Estimated Material Quantities Required for Alternative 3 Improvements to the Sacramento River East Levee in Reaches 1–20A (2008, 2009, and 2010 Construction Phases)		
Material Type	**Quantity**	**Source (Average Round-Trip Haul Distance)**
Soil type 1 – select fill	1,532,000 cu. yd.	2008: Airport bufferlands (3 miles) 2009: Airport bufferlands (4 miles) 2010: Fisherman's Lake area (4 miles)
Soil type 2 – random fill	3,724,000 cu. yd.	2008: Airport bufferlands (3 miles) 2009: Airport bufferlands (4 miles) 2010: Fisherman's Lake area (4 miles)
Seepage berm fill	736,000 cu. yd.	2008: Airport bufferlands (3 miles) 2009: Airport bufferlands (4 miles) 2010: Fisherman's Lake area (4 miles)
Seepage berm fill – reusable fill	671,000 cu. yd.	Inspection trench excavation (0.1 mile)
Excavated stability berm	314,000 cu. yd.	--
Aggregate base	95,000 tons	Commercial source (30 miles)
Asphalt concrete[1]	9,000 tons	Commercial source (30 miles)
Total	**6,977,000 cu. yd.** **104,000 tons**	

Notes:
[1] For relocation of Garden Highway to the land side of the 500-foot setback levee.
Source: Estimates provided by HDR in 2008

2.2.4.8 Operation and Maintenance Considerations. Agencies and organizations that would have management responsibility for proposed project features are SAFCA, RD 1000, NMWC, SCAS, and TNBC, as described for Alternative 1.

2.2.4.9 Additional Investigations to Aid in Project Planning and Design. Additional investigations would be as described for Alternative 1.

2.3 COMPARISON OF THE EFFECTS OF THE ALTERNATIVES

The potential environmental effects of the proposed action and alternatives are described in Chapter 4, "Environmental Consequences." See Sections 4.1 through 4.18 for detailed descriptions of the analysis of effects. This section provides a brief descriptive overview of how the significant effects of the alternatives compare to one another. **Table 2-11** provides a summary of the impacts of each alternative for purposes of comparison.

As described in Section 2.2.1, "No-Action Alternative," two scenarios are included in the No-Action Alternative. Either (1) no further action would be taken to improve the Federal/State levee system protecting the Natomas Basin, or (2) SCAS would construct a flood protection system (e.g., compartment levee) to protect the Airport. Under the first scenario, no construction, and therefore no direct construction-related effects, would occur. However, in the absence of proposed levee improvements, a substantial risk of levee failure and flooding of the Natomas Basin would remain, resulting in multiple unavoidable significant adverse effects to environmental resources (refer to **Table 2-11**).

Under the second No-Action Alternative scenario, the potential environmental impacts of constructing an interior compartment levee would be generally similar to those described for the action alternatives, because this scenario, like the action alternatives, would involve a large construction effort in the Natomas Basin. Without detailed design, it is not possible to quantify impacts at this time, but they would generally be similar to those of the proposed action. However, even with construction of an interior compartment levee, the risk of a perimeter levee failure would remain, the consequences of which would include the unavoidable significant effects identified for the first No-Action scenario (refer to **Table 2-11**).

As described under Section 2.2, "Alternatives Carried Forward in this EIS," 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 any of the action alternatives because their proximity to the existing levees places them within the expanded landside levee footprint or adjacent maintenance access under all alternatives. Similarly, woodlands extend into the proposed footprint under any of the action alternatives and would need to be removed and/or relocated. Consequently, effects on waters of the United States and other habitats are very similar among the action alternatives, and the same compensation strategies are proposed for unavoidable effects.

The primary difference in effects is that Alternative 2 could result in significant and unavoidable effects on shaded riverine aquatic (SRA) habitat function (Impact 4.6-a), woodland habitats (Impact 4.8-a), wildlife corridors (Impact 4.8-b), and special-status birds (Impact 4.9-e) associated with the removal of as much as 35 acres of riparian vegetation, on the water side of the Sacramento River east levee, that would be needed to conform with USACE guidance regarding levee encroachments. In addition, Alternative 2 would require reconstruction of the existing Garden Highway in accordance with currently applicable roadway standards. Construction of the adjacent levee under Alternatives 1 and 3 would preclude the need for this extensive vegetation removal and roadway reconstruction. The primary difference in effects between Alternatives 1 and 3 is cost. Alternative 3 would have an estimated first cost of $388.6 million, whereas Alternative 1 would have a cost of $353.6 million (a difference of $35 million or approximately 10% more) (SAFCA 2008).

Table 2-11
Summary of the Environmental Effects of the Alternatives

Environmental Effect	No-Action Alternative		Alternative 1, Proposed Action	Alternative 2	Alternative 3
	Continued Risk of Levee Failure	Airport Compartment Levee and Continued Risk of Perimeter Levee Failure			
Agricultural Resources					
Conversion of Important Farmland to Nonagricultural Uses	LTS	SU	SU	SU	SU
Land Use and Socioeconomics					
Conflicts with Land Use Plans and Policies	SU	SU	SU	SU	SU
Topography, Geology, and Soils					
Potential Localized Soil Erosion	LTS	LTS (m)	LTS (m)	LTS (m)	LTS (m)
Hydrology and Hydraulics					
Hydraulic Effects and Exposure to Flood Risk	SU	SU	B	B	B
Alteration of Local Drainage	-	LTS (m)	LTS (m)	LTS (m)	LTS (m)
Effects on Groundwater Recharge	-	-	LTS (m)	LTS (m)	LTS (m)
Water Quality					
Temporary Effects on Water Quality from Stormwater Runoff, Erosion, or Spills	SU	SU	LTS (m)	LTS (m)	LTS (m)
Fish and Aquatic Habitat					
Loss of Fish or Aquatic Habitat Through Increased Sedimentation and Turbidity or Releases of Contaminants	SU	SU	LTS (m)	LTS (m)	LTS (m)
Loss of SRA Habitat Associated with Levee Improvement Activities	SU	SU	LTS (m)	SU	LTS (m)
Sensitive Aquatic Habitats					
Effects on Jurisdictional Waters of the United States	-	LTS (m)	LTS (m)	LTS (m)	LTS (m)
Vegetation and Wildlife					
Effects on Woodland Habitats	SU	SU	LTS (m)	SU	LTS (m)
Effects on Wildlife Corridors	SU	SU	LTS (m)	SU	LTS (m)
Special-Status Terrestrial Species					
Effects on Special-Status Plants	-	LTS (m)	LTS (m)	LTS (m)	LTS (m)
Effects on Valley Elderberry Longhorn Beetle	-	LTS (m)	LTS (m)	LTS (m)	LTS (m)
Effects on Giant Garter Snake	SU	SU	LTS (m)	LTS (m)	LTS (m)
Effects on Northwestern Pond Turtle	SU	SU	LTS (m)	LTS (m)	LTS (m)
Effects on Special-Status Birds	SU	SU	LTS (m)	SU	LTS (m)
Effects on Successful Implementation of the NBHCP	SU	SU	LTS (m)	SU	LTS (m)

Table 2-11
Summary of the Environmental Effects of the Alternatives

Environmental Effect	No-Action Alternative		Alternative 1, Proposed Action	Alternative 2	Alternative 3
	Continued Risk of Levee Failure	Airport Compartment Levee and Continued Risk of Perimeter Levee Failure			
Cultural Resources					
Changes to Elements of Reclamation District 1000	-	LTS (m)	LTS (m)	LTS (m)	LTS (m)
Construction Effects on Other Known Historic-Era Resources	-	SU	SU	SU	SU
Potential Construction Effects on Known Prehistoric Resources	-	SU	SU	SU	SU
Damage to or Destruction of Previously Undiscovered Cultural Resources	-	SU	SU	SU	SU
Discovery of Human Remains	-	SU	SU	SU	SU
Paleontological Resources					
Disturbance of Unknown Unique Paleontological Resources during Earthmoving Activities	-	LTS (m)	LTS (m)	LTS (m)	LTS (m)
Transportation and Circulation					
Temporary Increase in Traffic on Local Roadways	SU	SU	SU	SU	SU
Temporary Increase in Traffic Hazards on Local Roadways	SU	SU	LTS (m)	LTS (m)	LTS (m)
Temporary Effect on Emergency Service Response Times and Access	SU	SU	LTS (m)	LTS (m)	LTS (m)
Air Quality					
Temporary Emissions of ROG, NO_X, and PM_{10} during Construction	-	SU	SU	SU	SU
General Conformity with the Applicable Air Quality Plan	-	-	LTS	-	-
Long-term Changes in Emissions of ROG, NO_X, and PM_{10} Associated with Project Implementation	-	-	LTS	LTS	LTS
Exposure of Sensitive Receptors to Toxic Air Emissions	-	LTS	LTS	LTS	LTS
Noise					
Generation of Short-Term Construction Noise	-	LTS (m)	SU	SU	SU
Exposure of Sensitive Receptors to or Generation of Excessive Ground-borne Vibration or Noise	-	LTS (m)	SU	SU	SU
Exposure of Residents to Increased Traffic Noise Levels from Hauling Activity	-	LTS (m)	SU	SU	SU
Long-Term Increases in Noise	-	-	LTS (m)	LTS (m)	LTS (m)
Recreation					

Table 2-11
Summary of the Environmental Effects of the Alternatives

Environmental Effect	No-Action Alternative		Alternative 1, Proposed Action	Alternative 2	Alternative 3
	Continued Risk of Levee Failure	Airport Compartment Levee and Continued Risk of Perimeter Levee Failure			
Temporary Changes in Recreational Opportunities during Project Construction Activities	-	-	LTS	LTS	LTS
Permanent Encroachment on Parkland along Garden Highway	-	-	LTS (m)	LTS (m)	LTS (m)
Visual Resources					
Changes in Scenic Vistas, Scenic Resources, and Existing Visual Character of the Project Area	-	SU	SU	SU	SU
Changes in Light and Glare	-	LTS	LTS	LTS	LTS
Utilities and Service Systems					
Potential Temporary Disruption of Irrigation Supply	SU	SU	LTS (m)	LTS (m)	LTS (m)
Potential Disruption of Utility Service	SU	SU	LTS (m)	LTS (m)	LTS (m)
Increases in Solid Waste Generation	SU	SU	LTS	LTS	LTS
Hazards and Hazardous Materials					
Spills of Hazardous Materials	SU	SU	LTS	LTS	LTS
Exposure to Hazardous Materials Encountered at Project Sites	SU	SU	LTS (m)	LTS (m)	LTS (m)
Temporary Aircraft Safety Hazards Resulting from Project Construction Activities within or near the Airport Critical Zone	-	-	LTS	LTS	LTS
Potential to Result in Higher Frequency of Collisions between Aircraft and Wildlife at Sacramento International Airport	SU	SU	LTS (m)	LTS (m)	LTS (m)
Interference with an Adopted Emergency Evacuation Plan	LTS	LTS	LTS (m)	LTS (m)	LTS (m)
Exposure to Wildland Fires	-	LTS (m)	LTS (m)	LTS (m)	LTS (m)

- = no impact
B = beneficial or potentially beneficial impact
LTS = less-than-significant impact
LTS (m) = significant or potentially significant impact that would be less than significant with mitigation
SU = significant impact, despite mitigation (i.e., significant and unavoidable)

3.0 AFFECTED ENVIRONMENT

3.1 GENERAL SITE CONDITIONS

3.1.1 Natomas Basin

The Natomas Basin (**Plate 2**) 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, the County of Sacramento, and the County of Sutter. In addition to the American and Sacramento Rivers, the Natomas Basin is bordered on the north by the Natomas Cross Canal (NCC) and on the east by the Pleasant Grove Creek Canal (PGCC) and the Natomas East Main Drainage Canal (NEMDC) (also known as Steelhead Creek). The NCC diverts the runoff from a large watershed in western Placer and southern Sutter Counties around the Natomas Basin and is a contributor to the flows in the upper reach of the Sacramento River channel in SAFCA's jurisdiction. The NEMDC/Steelhead Creek is an engineered channel along the southeastern flank of the Natomas Basin. Tributaries to the NEMDC/Steelhead Creek 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 water bodies and in the American and Sacramento Rivers by an interconnected perimeter levee system. This levee system was originally created to promote agricultural development. Today, however, the Natomas Basin contains two major public transportation facilities, Interstate 5 (I-5), Interstate 80 (I-80), and State Route (SR) 99/70, and is the site of the Sacramento International Airport (Airport). Airport lands account for a little over 10% of the total acreage in the basin. Half of these lands lie outside of the Airport Operations Area and consist of "bufferlands" devoted to agricultural or open space use (see **Plate 8**). About 30% of the basin consists of developed urban uses mostly located south of Elkhorn Boulevard in the City of Sacramento (see **Plate 2**). The remaining 60% of the basin is in some form of developed agriculture or open space use in unincorporated areas of Sacramento and Sutter Counties, including 4,000 acres under the management of the Natomas Basin Conservancy (TNBC) (see **Plate 9**).

3.1.2 Levee Improvement Areas

The general characteristics of the areas along the NCC south levee, Sacramento River east levee, and PGCC west levee are described in the following subsections. See also **Plates 20a–20c**.

3.1.2.1 Natomas Cross Canal. The vicinity of the NCC is generally rural. Farms and rural residences are located on both sides of the NCC, with rice the primary crop under cultivation. Three homes are located 700–1,000 feet north of the south levee in Reach 1. In Reach 6 of the NCC, a few residences are located between 50 and 200 feet south of the levee. In Reach 7, a residence and several ranch buildings are within 25 feet of the levee landside toe. Several roadways are located in the vicinity of the NCC, including SR 99/70, which crosses the NCC in Reach 6; several county roads (Sankey Road, Powerline Road, Howsley Road), and Garden Highway, which is located on the crown of the Sacramento River east levee. On the west side of Garden Highway, approximately 660 feet southwest of the western terminus of the NCC south levee, are the Verona Village Resort, a small trailer campground, marina, restaurant, and store.

3.1.2.2 Sacramento River. Table 3-1 contains a description of the areas along the Sacramento River east levee in the project area.

Table 3-1 Description of the Sacramento River East Levee Area by Reach		
Reach	**Land Side**	**Water Side**
1	Sankey Road intersects Garden Highway near the start of Reach 1. Oak woodland and a rural residence are located approximately 3,000 feet south of the start of Reach 1; the rural residence is located within 50 feet of the landside toe of the levee. Rice and field crops border the levee throughout the reach.	Verona Village Resort (a small trailer campground, marina, restaurant, and store) is located on the west side of Garden Highway bordering the start of the reach. Small clusters of woodland are scattered along the highway to the south.
2	A rural residence adjacent to the existing levee is located approximately 1/3 mile south of the start of Reach 2. Field crops border the levee throughout the reach. The northern part of the TNBC Huffman West Habitat Preserve borders the levee in the southern end of the reach.	Small clusters of woodland are scattered along the highway. Eight residences are located at the end of Reach 2 adjacent to Garden Highway.
3	A field used for row crops, part of the TNBC Huffman West Habitat Preserve, covers the entire reach.	Six residences are located adjacent to Garden Highway.
4A and 4B	Field crops border the levee throughout the reach. Most of the parcels bordering the levee are TNBC land (Huffman West and Atkinson Habitat Preserves) or Airport land. Riego Road intersects Garden Highway approximately 1,500 feet from the start of Reach 4A. Agricultural facilities at the end of a narrow paved road are located approximately 2,000 feet south of Riego Road. The RD 1000 Pumping Plant No. 2 is located on the North Drainage Canal. The Elkhorn Canal closely parallels the levee from the North Drainage Canal south. A highline canal perpendicular to the levee is located approximately 2,000 feet south of the North Drainage Canal. A cluster of woodlands is located just south of the canal. A line of trees perpendicular to the levee is located near the southern end of the reach.	Approximately nine residences, interspersed among woodland, are located adjacent to Garden Highway. Several docks and private marinas, including the Rio Ramaza Marina, are located along the bank. The NMWC Prichard Lake Pumping Plant and pump tender's residence are located at the North Drainage Canal.
5A and 5B	Field crops border the levee throughout the reach on Airport land. A cluster of woodlands is located at the start of the reach. A rural residence with outbuildings and surrounding woodland is located approximately 1,600 feet south of the start of the reach. Elverta Road intersects Garden Highway approximately 1,500 feet north of the end of the reach. The Elkhorn Canal closely parallels the levee throughout the reach.	Woodland covers the entire reach west of Garden Highway.
6A and 6B	Field crops border the levee throughout the reach. The West Drainage Canal, which borders Teal Bend Golf Club on the north, intersects the levee approximately 1,400 feet south of the orchard. Reservoir Road intersects Garden Highway approximately 1,000 feet south of the West Drainage Canal. The golf course covers the remaining 2,800 feet of the reach. The Elkhorn Canal closely parallels the levee throughout the reach.	Approximately eight residences, interspersed among woodland, are located adjacent to Garden Highway. Several docks are located along the bank. NMWC's Elkhorn Pumping Plant is located at the start of Reach 6A.
7	Teal Bend Golf Club extends approximately 600 feet beyond the start of the reach. Field crops border the levee for the remaining 2,400 feet of the reach. The Elkhorn Canal closely parallels the levee throughout the reach.	Approximately 14 residences, interspersed among woodland, are located adjacent to Garden Highway. Several private docks are located along the bank.

Table 3-1 Description of the Sacramento River East Levee Area by Reach		
Reach	**Land Side**	**Water Side**
8	Field crops border the levee throughout the reach. A rural residence with outbuildings and surrounding woodland is located at the start of the reach. Another rural residence with outbuildings and surrounding woodland is located approximately 1,200 feet south of the first residence. West Elkhorn Boulevard intersects Garden Highway approximately 800 feet north of the end of the reach. A woodland cluster is located at the end of the reach. The Elkhorn Canal closely parallels the levee throughout the reach, ending approximately 1,200 feet south of Elkhorn Boulevard.	Approximately eight residences, interspersed among woodland, are located adjacent to Garden Highway. Several private docks are located along the bank.
9A and 9B	A woodland cluster is located approximately 1,300 feet south of the start of the reach. Two rural residences are located within 1,000 feet of Bayou Road and the I-5 overpass. A woodland cluster is located on the south side of the I-5 overpass. Another woodland cluster is located approximately 700 feet further south. A woodland cluster is located at the end of Reach 9. Field crops border the levee throughout the reach.	Approximately 10 residences are located adjacent to Garden Highway interspersed among woodland. Several private docks are located along the bank. Two restaurant/ marina facilities (Alamar Marina Restaurant & Bar and Swabbies Restaurant & Bar) are located within 800 feet of the intersection of Bayou Road and Garden Highway.
10	A rural residence is located at the start of the reach. A woodland cluster is located approximately 1,100 feet farther south. A large ranch occupies Reach 10 from approximately 1,700 feet south of the start of the reach to the end of the reach. Field crops border the levee throughout the reach. RD 1000's Pumping Plant No. 5 is located in the middle of the reach.	Approximately five residences, interspersed among woodland, are located adjacent to Garden Highway. Several private docks are located along the bank.
11A and 11B	Reach 11 contains the remaining 400 linear feet of the large ranch in Reach 10. Field crops border the levee throughout the reach. A rural residence is located approximately 2/3 mile from the start of Reach 11. Another rural residence is located another 2,000 feet south. Approximately ½ mile farther south, the river bends to the east. A cluster of trees is located approximately 1,600 feet west of the end of the reach. Field crops border the levee throughout the reach. RD 1000's Pumping Plant No. 3 is located within the reach.	Approximately 12 residences, interspersed among woodland, are located adjacent to Garden Highway. Several private docks are located along the bank.
12	An orchard covers much of Reach 12, at which point the river trends south again. A rural residence is located approximately ½ mile south of the start of the reach. A rural residence and the Kimura Ditch are located 500–700 feet north of the end of the reach, followed by two more residences. A highline ditch starts at the Kimura Ditch and closely parallels the levee to the south. Field crops border the levee throughout the reach.	Approximately 14 residences, interspersed among woodland, are located adjacent to Garden Highway. Several private docks are located along the bank.

Table 3-1 Description of the Sacramento River East Levee Area by Reach		
Reach	**Land Side**	**Water Side**
13	A residence is located at the start of Reach 13. Pumping Plant No. 3 and a large drainage ditch perpendicular to the levee are located 800 feet south of the start of the levee. Another 1,400 feet farther south is a woodland cluster. A highline ditch closely parallels the levee for the length of the reach. Field crops border the levee throughout the reach. The TNBC Cummings preserve includes mitigation plantings for valley elderberry longhorn beetle.	Approximately 13 residences, interspersed among woodland, are located adjacent to Garden Highway. Several private docks are located along the bank.
14	Radio Road intersects Garden Highway approximately 1,600 feet south of the start of Reach 14 at the end of a large field used for row crops. A rural residence is located approximately 800 feet farther south. The southern part of the reach is bordered by the TNBC Alleghany preserve.	Approximately 14 residences, interspersed among woodland, are located adjacent to Garden Highway. Several private docks are located along the bank. NMWC's Riverside Pumping Plant is located in the middle of the reach.
15	Reach 15 starts at the intersection of San Juan Road and Garden Highway. Two residential estates are located 600 and 1,200 feet farther south. Scattered trees are located adjacent to the levee. The northern part of the reach is bordered by the TNBC Alleghany preserve.	Approximately 21 residences, interspersed among woodland, are located adjacent to Garden Highway. More than a dozen private docks are located along the bank.
16	Eight rural residences amid scattered trees are located in the first 1,600 feet of Reach 16. The next 2,000 feet are a mixture of open fields, rural residences, farm buildings, and scattered trees. Dense woodland makes up the remaining 1,200 feet of the reach. The reach contains approximately 20 residences.	Approximately 12 residences, interspersed among woodland, are located adjacent to Garden Highway. Several private docks are located along the bank.
17	A rural residence is located at the start of Reach 17, approximately 600 feet inland from the levee toe. A rural residence with outbuildings is located approximately 800 feet south of the start of the reach.	Approximately seven residences, interspersed among woodland, are located adjacent to Garden Highway. Several private docks are located along the bank.
18	Reach 18 contains four to five rural residences among small orchards north of the I-80 overcrossing. A woodland cluster is located on the east side of the I-80 overcrossing, where the river bends east.	Approximately six residences, interspersed among woodland, are located northwest of the I-80 overcrossing, adjacent to Garden Highway. Several private docks are located along the bank.
19A and 19B	Two rural residences are located within 800 feet of the start of Reach 19, with scattered trees along and adjacent to the levee. The rest of the reach contains a subdivision of several hundred homes, the Swallows Nest Golf Course and condominium complex, and a subdivision of approximately 90 homes. Scattered trees are located on or adjacent to the levee.	Sand Cove Park (37 acres) is located southeast of the I-80 overcrossing. Woodland occupies the first 1,700 feet of Reach 19. The remaining mile to the east is a mixture of homes, private docks, and businesses, including the River View Marina.
20A and 20B	Reach 20 contains an office park and the 13-acre Natomas Oaks Park. Scattered trees are located on or adjacent to the levee.	The first 2/3 mile east of Reach 19 contains a mixture of homes, private docks, and businesses, including the Riverbank Marina. The remaining 2,000 feet contains Discovery Park woodland.

Notes: I-5 = Interstate 5; I-80 = Interstate 80; NMWC = Natomas Mutual Water Company; RD = Reclamation District; TNBC = The Natomas Basin Conservancy
Source: Data compiled by EDAW in 2008

3.1.2.3 Pleasant Grove Creek Canal. The area along the PGCC contains primarily agricultural uses along with minimal industrial manufacturing and rural residential uses. Farther south, more residences exist, but they are located outside of the project area.

3.2 ENVIRONMENTAL RESOURCES NOT CONSIDERED IN DETAIL

3.2.1 Climate

The project would consist of short-duration construction to improve the levee system in the Natomas Basin and would have no effect on regional climate.

3.2.2 Mineral Resources

There are no known mineral commodities in the project area. No known mineral resources would be affected by the project.

3.3 ENVIRONMENTAL RESOURCES EVALUATED IN DETAIL

3.3.1 Agricultural Resources

The general extent of agricultural land uses in the project study area is described above in Section 3.1.

The California Department of Conservation, Office of Land Conservation, maintains a statewide inventory of farmlands. These lands are mapped by the Division of Land Resource Protection as part of the Farmland Mapping and Monitoring Program (FMMP). The maps are updated every 2 years with the use of aerial photographs, a computer mapping system, public review, and field reconnaissance. Farmlands are divided into the following five categories based on their suitability for agriculture:

- **Prime Farmland**—land that has the best combination of physical and chemical characteristics for crop production. It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops when treated and managed.

- **Farmland of Statewide Importance**—land other than Prime Farmland that has a good combination of physical and chemical characteristics for crop production.

- **Unique Farmland**—land that does not meet the criteria for Prime Farmland or Farmland of Statewide Importance, but that has been used for the production of specific crops with high economic value.

- **Farmland of Local Importance**—land that is either currently producing crops or has the capability of production, but that does not meet the criteria of the categories above.

- **Grazing Land**—land on which the vegetation is suited to the grazing of livestock.

These categories are sometimes referred to as Important Farmland. Other categories used in the FMMP mapping system are “urban and built-up lands,” “lands committed to nonagricultural use,” and “other lands” (land that does not meet the criteria of any of the other categories).

Plate 29 shows the designated farmland within the Natomas Basin and the area northeast of the basin, where the Reclamation District (RD) 1001 borrow site is located, according to the latest data available from FMMP (2004 data). As shown in **Plate 29**, much of the farmland in the Natomas Basin, including

the farmland in areas where project features would be located, is designated by the FMMP as Prime Farmland and Farmland of Statewide Importance (California Department of Conservation 2006a). The mapping indicates that Important Farmland in the Natomas Basin totaled approximately 42,000 acres in 2004. This represents approximately 8% of the total of approximately 515,000 acres of Important Farmland mapped by the FMMP in Sutter and Sacramento Counties in 2004 (California Department of Conservation 2006b, 2006c).

The Land Evaluation and Site Assessment (LESA) system is a tool used to rank lands for suitability and inclusion in the Federal Farmland Protection Program (FPP) administered by the Natural Resource Conservation Service (NRCS). LESA evaluates several factors, including soil potential for agriculture, location, market access, and adjacent land use. In general, because of the soil qualities, availability of irrigation water, and proximity of markets for agricultural products, agricultural lands in the project study that are State-designated Important Farmlands would also receive a high ranking in the LESA system.

3.3.2 Land Use and Socioeconomics

3.3.2.1 Land Uses and Housing. As described above, much of the project area includes rural portions of Sutter and Sacramento Counties. Cultivated lands and scattered rural residences are present in these areas. The Airport, operated by Sacramento County Airport System (SCAS), is a major feature of the project area. The rural land use pattern transitions from agriculture to urbanization where Sacramento County gives way to the City of Sacramento. The portion of the Natomas Basin that is within the City of Sacramento includes the North Natomas Community Plan area and the South Natomas planning area. The South Natomas planning area consists of more than 5,000 acres bounded by the American River on the South, the Sacramento River and I-80 on the west, I-80 on the north, and the NEMDC/ Steelhead Creek on the east. Of the total, 590 acres are vacant. Close to 2,200 acres is designated for residential uses; 200 acres of the residential-designated lands are vacant (City of Sacramento Planning Department 2006). The North Natomas Community Plan area extends generally between I-80 on the south and Elverta Road on the north, and between the West Drainage Canal, Fisherman's Lake, and SR 99/70 on the west and the NEMDC/Steelhead Creek on the east. The plan area includes more than 9,000 acres, most of which is in the City of the Sacramento and 1,600 acres of which are in Sacramento County. Approximately 3,500 acres are designated for residential use, the primary use in the plan area. The Employment Center designation has the most remaining vacant land with 890 acres of available land (City of Sacramento Planning Department 2007).

No concentrations of minority groups or low-income populations have been identified in the project area. The U.S. Department of Housing and Urban Development (HUD) defines "low income" and "very low income" for its many housing assistance programs. Generally, low income is considered to be 80% of the median income for the Metropolitan Statistical Area and adjusted for household size and the specific housing program (HUD 2003).

The California Association of Realtors reported that the Housing Affordability Housing Index for the Sacramento metropolitan area, based on Sacramento Association of Realtors Multiple Listing Service Data, was 43% for the second quarter of 2002 (City of Sacramento 2005). This means that 43% of households in the City of Sacramento could afford the area's median priced home. The median home price for that same period, including single-family detached and single-family attached housing products, was $225,000. Based on these data the City found that, "Despite ups and downs in the market in housing prices, the Sacramento Metropolitan region continues to be one of the most affordable housing markets in the state" (City of Sacramento 2005).

3.3.2.2 Relevant Land Use Plans and Policies. The following local land use plans and policies may be relevant to the project.

Local Plans and Policies. The Land Use Element of the Sutter County General Plan (Sutter County 1996) designates the proposed general distribution, location, and extent of all uses of land, including land for agriculture, and includes the following agricultural resource goal and policy that may be relevant to the project.

- **Goal 6.A.** To preserve high-quality agricultural land for agricultural purposes.
    - **Policy 6.B-3.** The County shall encourage the continued operation and expansion of existing agricultural industries.

Chapter 1500–1410 of the Sutter County Zoning code states that the General Agriculture District (AG District) is established to provide areas for general farming, low-density uses, open spaces, and by use permit, limited retail service uses that the Planning Commission believes will support the local agricultural industry. The AG District classification may be applied to rural communities where the predominant land use is of a general agricultural nature but the needs of the agricultural community may require the location of retail, commercial, and service establishments. This district is consistent with the Agriculture–20 Acre Minimum Parcel Size (AG-20) or Agriculture–80 Acre Minimum Parcel Size (AG-80) and Agriculture–Rural Community (AG-RC) general plan land use designations.

The *Sacramento County General Plan* is currently being updated. The Agricultural Element of the current *Sacramento County General Plan* (Sacramento County 1993) describes the goals of this element as the challenge of "maintenance of the County's agricultural lands, [and] their agricultural productivity...." The following objective and policies of the current general plan may be relevant to this project.

- **Objective:** Retain agricultural land holdings in units large enough to guarantee future and continued agricultural use.
    - **Policy AG-7.** Agricultural zoning district boundaries shall be rational and shall respect parcel boundaries.
    - **Policy AG-8.** Agricultural land divisions shall not adversely affect the integrity of agricultural pursuits. Agricultural land divisions may be denied if the reviewing authority finds that the division of land is likely to create circumstances inconsistent with this policy.

The *City of Sacramento General Plan 2030* is currently being drafted. The *City of Sacramento General Plan 2006* contains goals and policies related to flood control and the phased conversion of agricultural properties, as well as the provision of sufficient housing and commercial and economic opportunities (City of Sacramento 1998). The City of Sacramento (City) has a program with SAFCA and the USACE in which it works with SAFCA and other responsible agencies to resolve floodplain restrictions. The following policies may be relevant to this project.

- **Conservation and Open Space Policy 10** To conserve and protect natural resources and planned open space areas and to phase the conversion of agricultural lands to planned urban uses.

  The City will provide open space for recreation. The American and Sacramento River Parkways will be conserved and protected. The City has other open space areas that can

also be developed to their recreational use potential. These areas include utility easements, floodways and floodplains.

- **Resource Protection Policy B.10** The City shall seek to minimize or avoid adverse impacts to historic and cultural resources from natural disasters. To this end, the City shall promote seismic safety, flood protection, and other building programs that preserve, enhance, and protect these resources.

Airport Plans and Regulations. Federal requirements pertaining to wildlife hazard management at airports are described under Title 14 Code of Federal Regulations (CFR) Part 139.337. Commercial service airports that experience a significant number of collisions between aircraft and wildlife (wildlife strikes), such as Sacramento International Airport, are required to develop a program to limit the number of hazardous wildlife incursions, deploy sufficient resources to implement such programs, and correct conditions that attract hazardous wildlife. Commercial airports that experience multiple wildlife strikes must prepare a wildlife hazard management plan (WHMP) that outlines necessary habitat modifications and wildlife control procedures and identifies those responsible for implementing the plan (CFR Part 139.337[f][1]). The Federal Aviation Administration (FAA) also addresses control of hazardous wildlife in Advisory Circulars (ACs). In AC 150/5200-33A, the FAA provides direction on where public-use airports should restrict land uses that have the potential to attract hazardous wildlife. FAA recommends a distance of 10,000 feet separating wildlife attractants and aircraft movement areas. The area within a 10,000-foot radius of the Airport Operations Area is designated as the Critical Zone. The FAA definition of wildlife attractants in AC 150/5200-33A includes human-made or natural areas, such as poorly drained areas, retention ponds, agricultural activities, and wetlands. AC 150/5200-33A recommends against the use of airport property for agricultural production within a 5-mile radius of the Airport Operations Area unless the income from the agricultural crops is necessary for the economic viability of the airport.

The Airport Comprehensive Land Use Plan (CLUP) (Airport Land Use Commission 1994) establishes planning boundaries for the airport and defines compatible types and patterns of future land use. The purpose of the CLUP is to provide the Airport land area with compatibility guidelines for height, noise, and safety. The CLUP designates airport safety zones to the land surrounding the airport to minimize the number of people exposed to aircraft crash hazards. This is accomplished by enforcing land use restrictions in the safety zones. The CLUP designates three safety zones:

- the clear zone, which is near the runway and is the most restrictive;
- the approach/departure zone, which is located under the takeoff and landing slopes and is less restrictive; and
- the overflight zone, which is the area overflown by aircraft during the normal traffic pattern and is the least restrictive.

Federal Emergency Management Agency Flood Zone Designations. Flood zones are geographic areas that the Federal Emergency Management Agency (FEMA) has defined according to varying levels of flood risk. These zones are depicted on a community's Flood Insurance Rate Map (FIRM) or Flood Hazard Boundary Map. Each zone reflects the severity or type of flooding in the area. In January 2008, FEMA proposed remapping the Natomas Basin as an AE zone, with the designation to take effect in December 2008. FEMA defines AE zones as areas with a 1% annual chance of flooding. The designation would result in the requirement that the bottom floor of all new buildings be constructed at or above base flood elevation—as little as 3 feet in some of Natomas but up to 20 feet above the ground level in much of the basin. It is therefore anticipated that this designation would effectively stop any projects that are not issued building permits by the time the new map takes effect. An alternative to this

designation, the A99 zone, may be applied where it can be shown that an area with a 1% annual chance of flooding will be protected by a Federal flood control system where construction has reached specified legal requirements. The main requirements are that 100% of the cost of the flood protection system restoration project must be authorized, 60% must be appropriated, 50% must be expended, and "critical features" must be under construction and 50% completed (FEMA 2007). Construction is not constrained and there are no FEMA-specified building elevation requirements with an A99 designation. Mandatory flood insurance purchase requirements apply to both designations, however. When an area is protected from the base flood by a levee, dike, or other structural measure, it is shown in FEMA mapping as Shaded Zone X. There are no building constraints or mandatory flood insurance requirements in areas with this designation.

3.3.3 Topography, Geology, and Soils

The Natomas Basin is relatively flat and open. Ground surface elevations range from 10 feet mean sea level (msl) in the south–central area of the basin to more than 30 feet msl along the eastern edge of the basin. Flood control levees provide the only significant topographic relief in and near the project area.

3.3.3.1 Geology. The project area lies largely in the Sacramento Valley portion of the Great Valley Geomorphic Province. The Great Valley is a large valley trending northwest-southeast that is bounded by the Sierra Nevada to the east and south, the Coast Ranges to the west, and the Klamath Mountains to the north. The Great Valley is drained by the Sacramento and San Joaquin Rivers, which join and flow out of the Great Valley province through San Francisco Bay. This geomorphic province is an asymmetric trough approximately 400 miles long and 50 miles wide that is characterized by a relatively flat alluvial plain made up of a deep sequence of sediment deposits from Jurassic (180 million years ago) to recent age. The sediments in the Great Valley vary between 3 and 6 miles in thickness and were derived primarily from erosion of the Sierra Nevada to the east, with lesser material from the Coast Ranges to the west. The eastern edge of the Sacramento Valley is flanked by uplifted and tilted sedimentary strata that overlie rocks of the Foothills Metamorphic Belt and are in turn overlain on the west by younger alluvium.

The Sacramento Valley has been a depositional basin throughout most of the late Mesozoic and Cenozoic time. A vast accumulation of sediments was deposited during cyclic transgressions and regressions of a shallow sea that once inundated the valley. Overlying the thick sequence of sedimentary rock units that form the deeply buried bedrock units in the mid-basin areas of the valley are Late Pleistocene and Holocene (Recent) alluvial deposits, consisting of reworked fan and stream materials that were deposited by streams prior to the construction of the existing flood control systems. The youngest geomorphic features in the program study area are low floodplains, which are found primarily along the Sacramento and American Rivers. The natural floodplains of these rivers are very wide in this area because the land is relatively flat. These major drainage ways were originally confined within broad natural levees sloping away from the rivers or streams. The natural levees formed through the deposition of alluvium during periods of flooding. As flood waters lost energy, the coarser materials settled out nearest the rivers and streams, forming the natural levees and sand bars in the vicinity of the river channel. The finer material was carried in suspension farther from the rivers or streams, and settled out in quiet water areas such as swales, abandoned meander channels, and lakes. However, because the streams have meandered and reworked the previously deposited sediments, extreme variations in material types may be found over a limited distance or depth.

Flanking the Recent alluvial deposits in the project area are late Pleistocene alluvial fan and terrace deposits of the Modesto and Riverbank Formations (Helley and Harwood 1985). Stream terrace deposits, mapped as the Modesto Formation, are higher in elevation and older than floodplain sediments. Before the construction of the existing levees, these stream terraces were occasionally flooded, but only small

amounts of sediment were deposited during flood events. The lower fan terraces of the Riverbank Formation are higher in elevation and older than stream terraces, and were only rarely flooded.

3.3.3.2 Seismicity. The project area has experienced relatively low seismic activity in the past and does not contain any Alquist-Priolo Earthquake Fault Zones (California Geological Survey 1999, Hart and Bryant 1999). Numerous earthquakes of magnitude (M) 5.0 or greater have occurred on regional faults, primarily those within the San Andreas Fault System. The west side of the Central Valley is a seismically active region. The nearest known active (Holocene or Historic) fault trace to the project area is the Dunnigan Hills fault, approximately 30 miles northwest of downtown Sacramento and 15 miles from the Natomas Basin (Jennings 1994).

The closest active faults to the project area are listed in **Table 3-2**. In addition, **Table 3-2** identifies the approximate distance from the project site, maximum moment magnitude (M), and fault class.

Table 3-2
Active Faults in the Project Area

Fault Name	Age of Fault Activity[1]	Approximate Distance from Project Site (Nearest Point)	Fault Class[2]	Maximum Moment Magnitude[3]
Dunnigan Hills	Holocene	15 miles	NA	NA
Coast Range Fault Zone	Historic	50 miles	NA	6.5
Green Valley	Historic	40 miles	B	6.9
Prairie Creek	Historic	30 miles	NA	6.5
Swain Ravine	Historic	25 miles	NA	6.5
Cleveland Hills	Historic	40 miles	NA	6.5
Hayward–Rodgers Creek	Historic	55 miles	A	7.0
San Andreas	Historic	75 miles	A	7.9

Notes: NA = not applicable

1 Historic = activity within the last 200 years; Holocene = activity within the last 10,000 years

2 Faults with an "A" classification are capable of producing large magnitude (M) events (M greater than 7.0), have a high rate of seismic activity (e.g., slip rates greater than 5 millimeters per year), and have well-constrained paleoseismic data (e.g., evidence of displacement within the last 700,000 years). Class B faults are those that lack paleoseismic data necessary to constrain the recurrence intervals of large-scale events. Faults with a "B" classification are capable of producing an event of M 6.5 or greater.

3 The moment magnitude scale is used by seismologists to compare the energy released by earthquakes. Unlike other magnitude scales, it does not saturate at the upper end, meaning that there is no particular value beyond which all earthquakes have about the same magnitude, which makes it a particularly valuable tool for assessing large earthquakes.

Sources: Jennings 1994, Petersen et al. 1996, California Department of Water Resources 1979

Potential seismic hazards resulting from a nearby moderate to major earthquake can generally be classified as primary and secondary. The primary effect is fault ground rupture, also called surface faulting. Because there are no active faults mapped in the project area by the California Geological Survey or the U.S. Geological Survey, and the area is not located within an Alquist-Priolo Earthquake Fault Zone, fault ground rupture is unlikely. Common secondary seismic hazards include ground shaking, liquefaction, subsidence, and seiches. These hazards are discussed briefly below:

- **Ground shaking.** Seismic ground shaking refers to ground motion that results from the release of stored energy during an earthquake. The intensity of ground shaking depends on the distance from the earthquake epicenter to the site, the magnitude of the earthquake, site soil conditions, and the characteristic of the source. The project area has a relatively low risk of seismic ground shaking (California Geological Survey 2003, Petersen et al. 1996).

- **Ground failure/liquefaction.** Liquefaction is a process by which water-saturated materials (including soil, sediment, and certain types of volcanic deposits) lose strength and may fail during strong ground shaking, when granular materials are transformed from a solid state into a liquefied state as a result of increased pore-water pressure. Structures on ground that undergoes liquefaction may sink or suffer major structural damage. Liquefaction is most likely to occur in low-lying areas where the substrate consists of poorly consolidated to unconsolidated water-saturated sediments or similar deposits of artificial fill. Liquefaction during an earthquake requires strong shaking continuing for a long period and loose, clean granular materials (particularly sands) that may settle and compact because of the shaking. Evidence of liquefaction may be observed in "sand boils," which are expulsions of sand and water from below the surface due to increased pore-water pressure below the surface. Areas paralleling the Sacramento River that contain clean sand layers with low relative densities coinciding with a relatively high water table have generally high liquefaction potential.

- **Subsidence and settlement.** Subsidence is the gradual settling or sudden sinking of the ground surface resulting from subsurface movement of earth materials. Seismically induced settlement refers to the compaction of soils and alluvium caused by ground shaking. Fine-grained soils are subject to seismic settlement and differential settlement. Areas underlain by low-density silts and clays associated with fluvial depositional environments are susceptible to seismically induced settlement. These environments include old lakes, sloughs, swamps, and streambeds. The amount of settlement may range from a few inches to several feet. The potential for differential settlement is highest and occurs over the largest areas during great earthquakes. A potential for differential settlement exists where low-density and unconsolidated material is encountered, such as overbank river deposits (present day and historical) common along the Sacramento River.

- **Seismic seiches.** A seiche is an earthquake-induced wave within an enclosed or restricted body of water, such as a lake, reservoir, or channel. Seiches can cause a body of water to overtop and damage levees and dams and may lead to inundation of surrounding areas. While a seiche in the project area could be damaging, the risk of seiches is low, given the distance from active faults and the anticipated short duration of any seismic ground shaking in the area.

3.3.3.3 Soils. The Sutter and Sacramento County soil surveys (NRCS 1988, 1993) identify a variety of soil map units in the project area. Most of the soils in the project area are shallow to moderately deep, sloping, well-drained soils with very slowly permeable subsoils underlain with hardpan. These soils have good natural drainage, slow subsoil permeability, and slow runoff (NRCS 1988, 1993).

The Natomas Basin generally consists of deep soils derived from alluvial sources, which range from low to high permeability rates and low to high shrink-swell potential. Soils range from low to high hazard ratings for construction of roads, buildings, and other structures related to soil bearing strength, shrink-swell potential, and the potential for cave-ins during excavation. Soils immediately adjacent to the Sacramento River are dominated by deep, nearly level, well-drained loamy and sandy soils. The natural

drainage is good, and the soils have slow to moderate subsoil permeability. The river terraces consist of very deep, well-drained alluvial soils. (NRCS 1988, 1993.)

3.3.4 Hydrology and Hydraulics

3.3.4.1 Surface Water Hydrology. The project area lies just north of the confluence of the Sacramento and American Rivers. The Sacramento River drainage basin covers approximately 26,150 square miles and includes the Feather River drainage basin, which totals approximately 5,500 square miles. Despite its relatively small size, the Feather River has the potential to generate very high peak floods. **Table 3-3** compares the runoff characteristics of these drainage basins.

Table 3-3
Basin Runoff Characteristics

Basin	Watershed Area (square miles)	Flood of Record (year)	Unregulated Flow Record 1-Day Flow (cfs)	Flow per Square Mile (cfs)
Sacramento River at Latitude of Verona	21,251	1997	624,000	29
Feather River at Shanghai Bend	5,313	1997	534,000	101
Sacramento River at Latitude of Sacramento	26,150	1997	840,000	32

Note: cfs = cubic feet per second
Source: SAFCA 2007 (data provided by MBK Engineers)

The American and Feather Rivers produce about 90% of the flood flows approaching Sacramento from the north and the east. Both historically and as part of the design of the Sacramento River Flood Control Project (SRFCP), flood flows approaching from the north are split between the Sacramento River and the Yolo Basin (Bypass). Under the current design of the SRFCP, the Yolo Bypass absorbs about 70% of this flow at the latitude of Verona and 80% at the latitude of Sacramento. To the east, the entire flow of the American River must be passed through the urban core of Sacramento. Improved flood protection for the Sacramento area is thus dependent on the strength of the levee system along the lower Sacramento and American Rivers and on the capability of Folsom Dam to limit American River flows to the design capacity of the American River levee system.

The SRFCP was designed based on the flows and water surface elevations produced by the great floods of 1907 and 1909. The project design considered that areas inundated by these floods would be protected by levees, thus increasing flood flows downstream due to the elimination of floodplain storage. Because the 1907 and 1909 floods were the largest to occur since 1862, it was assumed that floods of this magnitude would recur very infrequently throughout the watershed. In fact, based on the continuous record of streamflow data since the SRFCP was approved, it appears that the 1907 and 1909 floods are approximately equal to a 10-year flood (10% annual exceedance probability) along the American and Feather Rivers. Consequently, the original plan of flood control has been modified numerous times to account for changes in the SRFCP design flood and the flood risk associated with the urban areas in the American and Feather River basins. The most recent modifications have involved the construction of Folsom Dam and the extension of the levee along the north side of the American River and the construction of Oroville Dam and New Bullards Bar Dam in the Feather River basin.

3.3.4.2 Levee Design. When the SRFCP was conceived, river navigation was an important element of the Sacramento Valley's transportation infrastructure. Hydraulic mining debris (sand, gravel and cobbles) had clogged river channels and added significant uncertainty and cost to navigation. The SRFCP was designed in part to address this problem. Thus, the mainstem river levees were placed close to the channel to confine river flows in flood stage and use the energy of the river to drive hydraulic mining sediments out of the system. This design also reduced the cost of levee construction by taking advantage of the high ground built up by the river over time along its banks and by making it possible for existing technology (the clam shell dredge and hydraulic suction dredge) to efficiently use the sediment in the channel as a borrow source for the levees.

This design, although well suited to address the technical and financial challenges of a previous era, has left a succeeding generation of flood managers with two systemic problems and levee risk factors: chronic erosion and seepage. Because of the use of relatively porous hydraulic mining sediments in many parts of the mainstem levee system, the levees have a propensity to seep when subjected to prolonged high water surface elevations such as occurred during the floods of 1986 and 1997. Through-seepage was deemed a levee system design deficiency in the aftermath of the 1986 flood, and a substantial capital improvement program has been under way since the early 1990s to address this deficiency. Additionally, because the mainstem levees are constructed on high berms relatively close to the river channel, the same energy that was harnessed to drive hydraulic mining sediment from the system also exerts itself against the sandy alluvial soil layers that lie beneath the levees. In high river stage conditions, this energy is strong enough to push water through these layers in volumes great enough to exert an uplift force capable of fracturing the soil mantel on the land side of the levee. This "underseepage" can occur where levees are constructed on low-permeability foundation soil (silt and clay) underlain by a higher-permeability layer (sand and gravel), and makes the levee susceptible to failure during periods of high river stage.

3.3.4.3 Frequency of Flooding. 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. The probability (or frequency) of an uncontrolled flood in the Natomas Basin is linked to the hydrology of the lower Sacramento Valley and the performance of the levees comprising the SRFCP, including the levees upstream of the Natomas Basin. The hydrology of the lower Sacramento Valley was extensively analyzed by USACE and the State of California Reclamation Board (now the Central Valley Flood Protection Board) as part of the Sacramento and San Joaquin River Basins California Comprehensive Study. These data have been used to create hydraulic models that route the estimated runoff for various flood events through the river and stream channels comprising the SRFCP and estimate the resulting water surface elevations. In very large floods that exceed the design capacity of the SRFCP, these calculated water surface elevations are highly sensitive to assumptions about the performance of upstream SRFCP levees. If the SRFCP levees upstream of the Natomas Basin are assumed to fail when overtopped, these very large floods produce much lower water surface elevation in the channels around the Natomas Basin (by 1 to 2 feet) than if it is assumed the upstream levees will not fail when overtopped.

3.3.4.4 Irrigation and Drainage Facilities. Reclamation of the Natomas Basin for agricultural development required construction of two major ditch and canal systems in the Natomas Basin: an irrigation system owned and operated by Natomas Central Mutual Water Company (NMWC) and a drainage system owned and operated by RD 1000. NMWC 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 Elkhorn Boulevard, and the Riverside Main Irrigation Canal (Riverside Canal), which runs parallel to the east levee from approximately 1 mile north of San Juan Road to approximately Orchard Lane. These NMWC canals are fed by three pumping plants on the Sacramento River (**Plate 10**). They have earthen 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 NMWC also operates two pumps along the NCC south levee that provide irrigation water to agricultural lands in the northern portion of the basin. These NMWC irrigation systems and several other landowner-operated systems along the Sacramento River east levee and the NCC south levee will need to be relocated to accommodate improvements to these levees. The new facilities could provide a sustainable long-term source of agricultural irrigation water in the western and northern portions of the basin that are expected to remain in some form of agriculture or open space use to accommodate the Airport and two of the three major blocks of habitat being assembled by TNBC.

RD 1000 operates several drainage pumping plants along the Sacramento River east levee and the NCC south levee that could be affected by levee improvement activity. Pumping Plant 2, located in Sacramento River Reach 4B, pumps drain water from the lower end of the North Drainage Canal; Pumping Plant 5, located in Sacramento River Reach 10, pumps water from the West Drainage Canal; Pumping Plant 3, located in Sacramento River Reach 13, pumps drain water from the West Drainage Canal; Pumping Plant 1, located in Reach 20A, pumps drain water from the Main Drainage Canal; and Pumping Plant 4, located in NCC Reach 2, pumps drain water from the upper end of the North Drainage Canal. These pumping facilities include discharge pipelines that will 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 and would be replaced as an element of the proposed project in 2009–2010.

The City of Sacramento operates the Willow Creek drainage pumping station that is located in Sacramento River Reach 19B.

The major irrigation and drainage facilities that would be affected by the proposed project are discussed in Section 2.2.2.4.

3.3.4.5 Groundwater Hydrology

Basin and Aquifer Description. The Natomas Basin lies in the North American subbasin within the Sacramento Groundwater Basin. The subbasin is bounded on the north by the Bear River, on the west by the Feather and Sacramento Rivers, and on the south by the Sacramento River in the west and the American River in the east. The eastern boundary is a north-south line extending from the Bear River south to Folsom Lake, which passes about 2 miles east of the town of Lincoln (see **Plate 3** for general locations). The eastern boundary represents the approximate edge of the alluvial basin, where little or no groundwater flows into or out of the groundwater basin from the rock of the Sierra Nevada (California Department of Water Resources [DWR] 1997). The eastern portion of the subbasin is characterized by low, rolling dissected uplands. The western portion is nearly a flat flood basin for the Bear, Feather, Sacramento and American Rivers, and several small east side tributaries. The general direction of drainage is west-southwest at an average grade of about 5 percent (DWR 2003).

DWR Bulletin 118 (DWR 2003) describes the aquifer system in the subbasin as heterogeneous and consisting of many discontinuous beds of clay, silt, sand and gravel. The water-bearing materials of the subbasin are dominated by unconsolidated continental deposits of Late Tertiary and Quaternary age

deposits that include Miocene/Pliocene volcanics, older alluvium, and younger alluvium. Younger alluvium consisting of alluvial flood basin and stream channel deposits is present in the upper 100 feet in areas along and adjacent to the Sacramento and American Rivers. Sand and gravel zones, along with dredger tailings that are found sporadically along the American River, are highly permeable and yield significant quantities of water to wells. Older alluvium, deposited during Pliocene and Pleistocene times and occurring over the area between the Sierra foothills and the valley axis, consists of loosely to moderately compacted sand, silt and gravel. Permeability varies considerably in these alluvial deposits (Valley Springs, Laguna, and Fair Oaks formations), which occupy the upper 200 to 300 feet of the aquifer system. Groundwater in the older alluvium is typically unconfined, although semi-confined conditions exist on localized levels. The Mehrten and older geologic units can be characterized as composing the lower aquifer system, which is generally deeper than 300 feet toward the west side of the subbasin. Typically, the level of confinement increases with depth. The cumulative thickness of these deposits increases from a few hundred feet near the Sierra Nevada foothills on the east to over 2,000 feet along the western margin of the subbasin. Most of the groundwater is produced in the northern portion of the subbasin. (DWR 2003.)

Groundwater Recharge and Local Levels. Major recharge to the local aquifer system generally occurs along active river and stream channels where extensive sand and gravel deposits exist, particularly in the American River and Sacramento River channels (Sacramento Groundwater Authority [SGA] 2002). Where surface water is hydrologically disconnected from groundwater, it percolates through the unsaturated zone beneath the streambed to the groundwater and is a function of the underlying aquifer materials and water levels in the stream. Some evidence suggests this occurs in parts of the Sacramento River in northern Sacramento County (SGA 2003). In Western Placer County (northeast section of the subbasin), the rivers adjacent to the subbasin, including the Sacramento and Bear Rivers, and the major streams, ravines, and creeks that cross the valley floor are the main sources of recharge (Placer County Water Agency 2003). Other sources of recharge within the system include inflow of groundwater generally from the northeast; subsurface recharge from fractured geologic formations to the east; and deep percolation from applied surface water, precipitation, and small streams. The extensive agricultural operations in the Natomas Basin have also contributed to recharge there, with the portion of applied irrigation water in excess of crop demands becoming recharge water through deep percolation (SGA 2003).

Groundwater levels average 10 to 25 feet below ground surface in the Natomas Basin (MWH 2001). According to the SGA, hydrographs for wells in the western part of the North American subbasin show groundwater levels varying between -5 and 20 feet mean spring groundwater level between wells.

Groundwater Storage. DWR's Bulletin 118 assumed a specific yield of 7% and an aquifer thickness of 200 feet for 200,000 acres within the North American subbasin. Storage capacity can be estimated for the North American subbasin by applying the same assumptions as previous DWR studies (DWR 1997a), which indicated a specific yield of 7% and an assumed thickness of 200 feet over the entire 351,000-acre subbasin. The result is an estimated storage capacity of approximately 4.9 million acre-feet (DWR 2003).

Groundwater Budget. Based on a 1990 level of development, DWR estimated the components of a groundwater budget for the subbasin. Estimated inflows include natural recharge at 83,800 acre-feet per year (afy) and applied water recharge at 29,800 afy. There was no artificial recharge. Estimated outflows included urban extraction at 109,900 afy and agricultural extraction at 289,100 afy (DWR 2003) for a total of approximately 399,000 afy.

3.3.5 Water Quality

The East Drainage Canal and the West Drainage Canal drain the Natomas Basin. Currently, seven pumping sites remove stormwater from the Natomas Basin. Five sites pump into the Sacramento River, one pumps into the NCC, and four (RD 1000 Plant No. 6 and Plant No. 8 and City of Sacramento Gardenland and Azuza Pump Stations) pump into the NEMDC/Steelhead Creek.

3.3.5.1 Surface Water Quality. Surface water quality in the hydrologic region is generally good. Possible sources of contamination that can affect water quality include turbidity; pesticides and fertilizers from agricultural runoff; water temperature exceedances; and toxic heavy metals, such as mercury, copper, zinc, and cadmium from acid mine drainage (U.S. Geological Survey 2000, DWR 2005). The portion of the Sacramento River forming the western boundary of the project area is part of a 16-mile segment from Knights Landing to the Sacramento–San Joaquin Delta that is on the Section 303(d) list for diazinon from agricultural sources, mercury from abandoned mines, and toxicity from unknown sources (Central Valley Regional Water Quality Control Board [RWQCB] 2002).

As defined by the Basin Plan (Central Valley RWQCB 2007b), the following are the designated beneficial uses for the Sacramento River and all tributaries from the Colusa Basin Drain, upstream of the project area, to the I Street Bridge in Sacramento:

- Municipal, industrial, and agricultural supply
- Irrigation
- Contact and noncontact recreation
- Coldwater fish habitat, migration, and spawning
- Warm water fish habitat, migration, and spawning
- Wildlife habitat
- Power generation
- Navigation

3.3.5.2 Groundwater Quality. The project area is in the North American Groundwater Subbasin, which lies in the eastern central portion of the Sacramento Valley Groundwater Basin (see description in Section 3.3.4.5, “Groundwater Hydrology”).

Although there are many areas of good quality groundwater in the North American subbasin, some areas within the subbasin have shown elevated levels of total dissolved solids (TDS), chloride, sodium, bicarbonate, boron, fluoride, nitrate, iron manganese, and arsenic, based on applicable water quality standards and guidelines for domestic and irrigation uses. An area between the Airport and the Bear River to the north has high levels of TDS, chloride, sodium, bicarbonate, manganese, and arsenic (DWR 2006).

3.3.6 Fish and Aquatic Habitat

The NCC is a tributary to the lower Sacramento River near Verona, the NEMDC/Steelhead Creek is a tributary to the lower Sacramento River just upstream of its confluence with the lower American River, and the PGCC is a tributary to the NCC. These waterways are indirectly connected to the irrigation and drainage canals and ditches in the project area by a number of pumping facilities. The aquatic resources in these waterways provide important habitat for native anadromous and resident Central Valley fishes, including species that are listed under the Federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA), which are described in this section, and perform other important ecological functions, as described in Section 3.3.7, “Sensitive Aquatic Habitats.” Water quality and hydrology are discussed in Section 3.3.5, “Hydrology and Water Quality.”

3.3.6.1 Fish Species Found in the Channels Bordering the Natomas Basin. The NCC, lower Sacramento River, and PGCC and NEMDC/Steelhead Creek provide fish spawning, rearing, and/or migratory habitat for a diverse assemblage of native and nonnative species (**Table 3-4**). The use of different areas of these waterways by fish species is influenced by variations in habitat conditions, each species' habitat requirements, life history timing, and daily and seasonal movements and behavior.

Table 3-4
Fishes Present in the Natomas Cross Canal, Lower Sacramento River, Pleasant Grove Creek Canal, and/or NEMDC/Steelhead Creek

Common Name	Scientific Name	Native (N) or Introduced (I)
Sacramento River winter-run chinook salmon	*Oncorhynchus tshawytscha*	N
Central Valley spring-run chinook salmon	*Oncorhynchus tshawytscha*	N
Central Valley fall-/late fall–run chinook salmon	*Oncorhynchus tshawytscha*	N
Central Valley steelhead/rainbow trout	*Oncorhynchus mykiss*	N
Green sturgeon	*Acipenser medirostris*	N
White sturgeon	*Acipenser transmontanus*	N
Pacific lamprey	*Lampetra tridentate*	N
Sacramento pikeminnow	*Ptychocheilus grandis*	N
Sacramento splittail	*Pogonichthys macrolepidotus*	N
Sacramento sucker	*Catostomus occidentalis*	N
Hardhead	*Mylopharodon conocephalus*	N
California roach	*Lavinia symmetricus*	N
Striped bass	*Morone saxatilus*	I
American shad	*Alosa sapidissima*	I
Largemouth bass	*Micropterus salmoides*	I
Smallmouth bass	*Micropterus dolomieui*	I
White crappie	*Pomoxis annularis*	I
Black crappie	*Pomoxis nigromaculatus*	I
Channel catfish	*Ictalurus punctatus*	I
White catfish	*Ameiurus catus*	I
Brown bullhead	*Ictalurus nebulosus*	I
Bluegill	*Lepomis macrochirus*	I
Green sunfish	*Lepomis cyanellus*	I
Golden shiner	*Notemigonus crysaleucas*	I

Source: Moyle 2002

Altered flow regimes, flood control, and bank protection efforts along these channels have reduced available shaded riverine aquatic (SRA)[1] habitat, sediment transport, channel migration and avulsion, and large woody debris recruitment, and have isolated the channels from their floodplains. Altered flow regimes have resulted in reduced physical processes (sediment transport and deposition) and artificial seasonal flows (i.e., generally decreased water in winter and increased water in summer) relative to natural conditions. Past modifications of channels for agricultural water conveyance and flood control purposes have resulted homogenous, trapezoidal channels lacking in-stream structure with narrow and sparse bands of riparian vegetation that provide only limited SRA habitat functions. Combined, these alterations have resulted in marginal conditions that provide only limited habitat functions for most native fish species.

Native species present in the NCC and/or lower Sacramento River can be separated into anadromous species (i.e., species that spawn in fresh water after migrating as adults from marine habitat) and resident species. Native anadromous species include four runs of chinook salmon (*Oncorhynchus tshawytscha*), steelhead trout (*O. mykiss*), green and white sturgeon (*Acipenser medirostris* and *A. transmontanus*), and Pacific lamprey (*Lampetra tridentata*). Of these species, relatively low numbers of chinook salmon and steelhead seasonally use channels bordering the Natomas Basin during adult upstream and juvenile downstream migrations. The channels also may provide limited rearing habitat functions for juvenile salmon and steelhead during these seasonal outmigration periods. Green and white sturgeon and Pacific lamprey are only expected to utilize habitats in the lower Sacramento River.

Native resident species include Sacramento pikeminnow (*Ptychocheilus grandis*), Sacramento splittail (*Pogonichthys macrolepidotus*), Sacramento sucker (*Catostomus occidentalis*), hardhead (*Mylopharodon conocephalus*), California roach (*Lavinia symmetricus*), and rainbow trout (*O. mykiss*). Pikeminnow, splittail, sucker, hardhead, and roach may be present in relatively low numbers in all channels year-round, while resident rainbow trout is generally expected to be found only in the lower Sacramento River.

Nonnative anadromous species include striped bass (*Morone saxatilis*) and American shad (*Alosa sapidissima*). Striped bass and American shad are not known to utilize any of the channels in the project area with the exception of the lower Sacramento River. Nonnative resident species include largemouth bass (*Micropterus salmoides*), smallmouth bass (*M. dolomieu*), white and black crappie (*Pomoxis annularis* and *P. nigromaculatus*), channel catfish (*Ictalurus punctatus*), white catfish (*Ameiurus catus*), brown bullhead (*Ictalurus nebulosus*), bluegill (*Lepomis macrochirus*), green sunfish (*L. cyanellus*), and golden shiner (*Notemigonus crysaleucas*). With the exception of the lower Sacramento River, habitat conditions in channels bordering the Natomas Basin are most favorable for nonnative warm water resident species; therefore, these species are anticipated to be the most abundant in these channels.

3.3.6.2 Special-Status Fish Species. Seven special-status fish species have the potential to occur in the NCC, lower Sacramento River, and/or PGCC and NEMDC/Steelhead Creek, as described below (**Table 3-5**). Of the seven species, green sturgeon, Central Valley steelhead Evolutionarily Significant Unit (ESU), Sacramento River winter-run chinook salmon ESU, and Central Valley spring-run chinook

[1] SRA habitat is defined as the nearshore aquatic habitat occurring at the interface between a river and adjacent woody riparian habitat. The principal attributes of this cover type are: (1) an adjacent bank composed of natural, eroding substrates supporting riparian vegetation that either overhangs or protrudes into the water and (2) water that contains variable amounts of woody debris, such as leaves, logs, branches, and roots and has variable depths, velocities, and currents. Riparian habitat provides structure (through SRA habitat) and food for fish species. Shade decreases water temperatures, while low overhanging branches can provide sources of food by attracting terrestrial insects. As riparian areas mature, the vegetation sloughs off into the rivers, creating structurally complex habitat consisting of large woody debris that furnishes refugia from predators, creates higher water velocities, and provides habitat for aquatic invertebrates.

Table 3-5
Special-Status Fish Species Potentially Occurring in the Natomas Cross Canal, Lower Sacramento River, Pleasant Grove Creek Canal, and/or NEMDC/Steelhead Creek

Species	Status[1]		Habitat	Potential to Occur
	USFWS/ NMFS	DFG		
Central Valley fall-/late fall–run chinook salmon *Oncorhynchus tshawytscha*	SC	SSC	Requires cold, freshwater streams with suitable gravel for spawning; rears in seasonally inundated floodplains, rivers, and tributaries, and in the Delta	Occurs in the NCC, lower Sacramento River, and PGCC and NEMDC/Steelhead Creek
Sacramento River winter-run chinook salmon ESU *Oncorhynchus tshawytscha*	E	E	Requires cold, freshwater streams with suitable gravel for spawning; rears in seasonally inundated floodplains, rivers, and tributaries, and in the Delta	Occurs in the Sacramento River; juveniles may stray into the NCC
Central Valley spring-run chinook salmon ESU *Oncorhynchus tshawytscha*	T	T	Requires cold, freshwater streams with suitable gravel for spawning; rears in seasonally inundated floodplains, rivers, and tributaries, and in the Delta	Occurs in the Sacramento River and certain tributaries; adults and juveniles may stray into the NCC
Central Valley steelhead ESU *Oncorhynchus mykiss*	T	–	Requires cold, freshwater streams with suitable gravel for spawning; rears in seasonally inundated floodplains, rivers, and tributaries, and in the Delta	Occurs in the NCC, lower Sacramento River, and PGCC and NEMDC/Steelhead Creek
Green sturgeon *Acipenser medirostris*	T	–	Requires cold, freshwater streams with suitable gravel for spawning; rears in seasonally inundated floodplains, rivers, tributaries, and Delta	Occurs in the lower Sacramento River; unlikely to stray into the NCC, PGCC, or NEMDC/Steelhead Creek
Sacramento splittail *Pogonichthys macrolepidotus*	–	SSC	Spawning and juvenile rearing from winter to early summer in shallow weedy areas inundated during seasonal flooding in the lower reaches and flood bypasses of the Sacramento River, including the Yolo Bypass	Occurs in the lower Sacramento River; may also occur in the NCC
Hardhead *Mylopharodon conocephalus*	–	SSC	Spawning occurs in pools and side pools of rivers and creeks; juveniles rear in pools of rivers and creeks, and in shallow to deeper water of lakes and reservoirs	Occurs in the lower Sacramento River; likely to occur in the NCC, PGCC, and NEMDC/Steelhead Creek

Notes: Delta = Sacramento–San Joaquin Delta; DFG = California Department of Fish and Game; ESU = Evolutionarily Significant Unit; NEMDC = Natomas East Main Drainage Canal; NMFS = National Marine Fisheries Service; PGCC = Pleasant Grove Creek Canal; USFWS = U.S. Fish and Wildlife Service

[1] Legal Status Definitions

Federal Listing Categories (USFWS and NMFS)
- E Endangered (legally protected)
- T Threatened (legally protected)
- SC Species of Concern

State Listing Categories (DFG)
- E Endangered (legally protected)
- T Threatened (legally protected)
- SSC Species of Special Concern (no formal protection)

Source: Data compiled by EDAW in 2008

salmon ESU are Federally listed as endangered or threatened species. Sacramento River winter-run chinook salmon ESU (endangered) and Central Valley spring-run chinook salmon ESU (threatened) are also listed under CESA. National Marine Fisheries Service (NMFS) determined that listing is not warranted for Central Valley fall-/late fall–run chinook salmon. However, this species is still designated a species of concern by NMFS and a species of special concern by California Department of Fish and Game (DFG) because of concerns about specific risk factors. The remaining two species, hardhead and Sacramento splittail, are considered species of special concern by DFG. Delta smelt, which is Federally and state listed as threatened, is found in the Sacramento River but downstream of the confluence with the American River, and therefore is not expected to be found in the Sacramento River near the project site. Delta smelt are not found in the NCC, PGCC, or NEMDC/Steelhead Creek. Summary descriptions for those species that have the potential to occur in the project area are provided below.

Fall-Run Chinook Salmon. Adult fall-run chinook salmon enter the Sacramento and San Joaquin River systems from July through April and spawn from October through February. During spawning, the female digs a redd (gravel nest) in which she deposits her eggs, which are then fertilized by the male. Optimal water temperatures for egg incubation are 6.7 degrees Celsius (ºC) to 12.2ºC (Rich 1997). Newly emerged fry remain in shallow, lower-velocity edgewaters, particularly where debris congregates and makes the fish less visible to predators (DFG 1998). The duration of egg incubation and time of fry emergence depends largely on water temperature. In general, eggs hatch after a 3- to 5-month incubation period, and alevins (yolk-sac fry) remain in the gravel until their yolk-sacs are absorbed (2–3 weeks).

Juveniles typically rear in freshwater (in their natal streams, the Sacramento River system, and the Sacramento–San Joaquin Delta [Delta]) for up to 5 months before entering the ocean. Juveniles migrate downstream from January through June. Juvenile chinook salmon prefer water depths of 0.5–3.3 feet and velocities of 0.26–1.64 feet per second (Raleigh, Miller, and Nelson 1986). Important winter habitat for juvenile chinook salmon includes flooded bars, side channels, and overbank areas with relatively low water velocities. Juvenile chinook salmon have been found to rear successfully in floodplain habitat, which routinely floods but is dry at other times. Growth rates appear to be enhanced by the conditions found in floodplain habitat.

Cover structures, space, and food are necessary components for chinook salmon rearing habitat. Suitable habitat includes areas with instream and overhead cover in the form of undercut banks; downed trees; and large, overhanging tree branches. The organic materials forming fish cover also help provide sources of food, in the form of both aquatic and terrestrial insects. Growth of juvenile chinook salmon in floodplain habitat is fast relative to growth in river habitat. Juvenile salmon have been found to have growth rates in excess of 1 millimeter (mm) per day when they rear in flooded habitat and as much as 20 mm in 2–3 weeks (Jones & Stokes 2001). The water temperature in floodplain habitat is typically higher than that in main channel habitats. Although increased temperature increases metabolic requirements, the productivity in flooded habitat is also increased, resulting in higher growth rates (Sommer et al. 2001). The production of drift invertebrates in the Yolo Bypass has been found to be one to two times greater than production in the river (Sommer et al. 2001). Also, grasses that are flooded support invertebrates that are also a substantial source of food for rearing juveniles. Increased areas resulting from flooded habitat can also reduce the competition for food and space and potentially decrease the possible encounters with predators (Sommer et al. 2001). Juvenile chinook salmon that grow faster are likely to migrate downstream sooner, which helps to reduce the risks of predation and competition in freshwater systems.

Juvenile chinook salmon in the Sacramento River system move out of upstream spawning areas into downstream habitats in response to many factors, including inherited behavior, habitat availability, flow, competition for space and food, and water temperature. The number of juveniles that move and the timing of movement are highly variable. Storm events and the resulting high flows appear to trigger movement

of substantial numbers of juvenile chinook salmon to downstream habitats. In general, juvenile abundance in the Delta increases as flow increases (U.S. Fish and Wildlife Service [USFWS] 1993).

Fall-run chinook salmon emigrate as fry and subyearlings and remain off the California coast during their ocean migration (63 Federal Register [FR] 11481, March 9, 1998). Fall-run chinook salmon occur in the lower Sacramento River and are likely to occur in the NCC, PGCC, and NEMDC/Steelhead Creek adjacent to the project area.

Winter-Run Chinook Salmon. Adult winter-run chinook salmon leave the ocean and migrate through the Delta into the Sacramento River system from November through July. Salmon migrate upstream past the Red Bluff Diversion Dam (RBDD) on the Sacramento River from mid-December through July, and most of the spawning population has passed RBDD by late June.

Winter-run chinook salmon spawn from mid-April through August, and incubation continues through October. The primary spawning grounds in the Sacramento River are above RBDD. Adult winter-run chinook salmon generally do not enter the American River.

Juvenile winter-run chinook salmon rear and emigrate in the Sacramento River from July through March (Hallock and Fisher 1985). Juveniles descending the Sacramento River above RBDD from August through October and possibly November are mostly pre-smolts (smolts are juveniles that are physiologically ready to enter seawater) and probably rear in the Sacramento River below RBDD. Juveniles have been observed in the Delta between October and December, especially during high Sacramento River discharge caused by fall and early-winter storms.

Triggers for downstream movement are similar to those described above for fall-run chinook salmon. Winter-run salmon smolts may migrate through the Delta and bay to the ocean from December through as late as May (Stevens 1989). The Sacramento River channel is the main migration route through the Delta. Adult winter-run chinook salmon spend 1–4 years in the ocean. About 67% of the adult escapement that leaves the ocean to spawn in the Sacramento River consists of 3-year-olds, 25% consists of 2-year-olds, and 8% consists of 4-year-olds (Hallock and Fisher 1985). Winter-run chinook salmon occur in the lower Sacramento River adjacent to the project area.

Spring-Run Chinook Salmon. Spring-run chinook salmon historically were the second most abundant run of Central Valley chinook salmon (Fisher 1994). They occupied the headwaters of all major river systems in the Central Valley where there were no natural barriers. Adults returning to spawn ascended the tributaries to the upper Sacramento River, including the Pit, McCloud, and Little Sacramento Rivers. They also occupied Cottonwood, Battle, Antelope, Mill, Deer, Stony, Big Chico, and Butte Creeks and the Feather, Yuba, American, Mokelumne, Stanislaus, Tuolumne, Merced, San Joaquin, and Kings Rivers. Spring-run chinook salmon migrated farther into headwater streams where cool, well-oxygenated water is available year-round.

Current surveys indicate that remnant, nonsustaining spring-run chinook salmon populations may be found in Cottonwood, Battle, Antelope, and Big Chico Creeks (DWR 1997b). More sizable, consistent runs of naturally produced fish are found only in Mill and Deer Creeks. The Feather River Fish Hatchery sustains the spring-run population on the Feather River, but the genetic integrity of that run is questionable (DWR 1997b). Estimates since 1953 on the Feather River indicate that numbers returning to the hatchery average around 2,115, although the estimates have increased dramatically since 1990 (DFG 2006).

Historical records indicate that adult spring-run chinook salmon enter the mainstem Sacramento River in February and March and continue to their spawning streams, where they then hold in deep, cold pools

until they spawn. Spring-run chinook salmon are sexually immature during their spawning migration. Some adult spring-run chinook salmon start arriving in the Feather River below the Fish Barrier Dam in June. They remain there until the fish ladder is opened in early September. Spawning and rearing requirements for the species are similar to those identified above for fall-run chinook salmon.

Spawning occurs in gravel beds from late August through October, and emergence takes place in March and April. Spring-run chinook salmon appear to emigrate at two different life stages: fry and yearlings. Fry move between February and June, while the yearling spring-run emigrate October to March, peaking in November (Cramer and Demko 1997).

Juveniles display considerable variation in stream residence and migratory behavior. Juvenile spring-run chinook salmon may leave their natal streams as fry soon after emergence or rear for several months to a year before migrating as smolts or yearlings (Yoshiyama, Fisher, and Moyle 1998). Triggers for downstream movement are similar to those described above for fall-run chinook salmon.

On March 9, 1998 (63 FR 11481), NMFS issued a proposed rule to list Central Valley spring-run chinook salmon ESU as endangered. NMFS designated the species as threatened on September 16, 1999 (64 FR 50393). On February 5, 1999, the California Fish and Game Commission listed it as threatened under CESA. Critical habitat originally had been designated for Central Valley spring-run chinook salmon by NMFS (65 FR 7764, February 16, 2000). However, following a lawsuit (*National Association of Home Builders et al. v. Donald L. Evans, Secretary of Commerce, et al.*), NMFS rescinded the listing. After further review, critical habitat for the Central Valley spring-run chinook salmon ESU was designated on August 12, 2005. Critical habitat is designated to include select waters in the Sacramento and San Joaquin River basins. Spring-run chinook salmon occur in the lower Sacramento River adjacent to the project area.

Central Valley Steelhead. Historically, steelhead spawned and reared in most of the accessible upstream reaches of Central Valley rivers, including the Sacramento and American Rivers and many of their tributaries. Compared with chinook salmon, steelhead generally migrated farther into tributaries and headwater streams where cool, well-oxygenated water is available year-round.

In the Central Valley, steelhead are now restricted to the upper Sacramento River downstream of Keswick Reservoir; the lower reaches of large tributaries downstream of impassable dams; small, perennial tributaries of the Sacramento River mainstem; and the San Francisco Bay/Sacramento–San Joaquin Delta (Bay-Delta) system.

The upstream migration of adult steelhead in the mainstem Sacramento River historically started in July, peaked in September, and continued through February or March. Central Valley steelhead spawn mainly from January through March, but spawning has been reported from late December through April (McEwan and Jackson 1996). During spawning, the female digs a redd (gravel nest) in which she deposits her eggs, which are then fertilized by the male. Egg incubation time in the gravel is determined by water temperature, varying from approximately 19 days at an average water temperature of 15.5ºC to approximately 80 days at an average temperature of 14.5ºC (McEwan and Jackson 1996).

Steelhead fry usually emerge from the gravel 2–8 weeks after hatching, between February and May, sometimes extending into June (Barnhart 1986, Reynolds et al. 1993). Newly emerged steelhead fry move to shallow, protected areas along streambanks but move to faster, deeper areas of the river as they grow. Juvenile steelhead feed on a variety of aquatic and terrestrial insects and other small invertebrates.

Juvenile steelhead rear throughout the year and may spend 1–3 years in freshwater before emigrating to the ocean. Smoltification, the physiological adaptation that juvenile salmonids undergo to tolerate saline

waters, occurs in juveniles as they begin their downstream migration. Smolting steelhead generally emigrate from March to June (Barnhart 1986, Reynolds et al. 1993).

NMFS completed a status review of steelhead populations in Washington, Oregon, Idaho, and California and identified 15 Distinct Population Segments (DPSs) in this range. On August 9, 1996, NMFS issued a proposed rule to list five of these DPSs (including the Central Valley steelhead) as endangered and five as threatened under the ESA (61 FR 155). The Central Valley steelhead DPS was later listed as threatened (downgraded from its proposed status of endangered) (63 FR 13347, March 19, 1998), and critical habitat (which included the lower Feather and Yuba Rivers) was designated for this DPS (65 FR 7764, February 16, 2000). However, after the lawsuit referenced above (*National Association of Home Builders et al. v. Donald L. Evans, Secretary of Commerce, et al.*), NMFS rescinded the listing. After further review, critical habitat for the Central Valley steelhead DPS was designated on August 12, 2005. This habitat includes select waters in the Sacramento and San Joaquin River basins.

Green Sturgeon. Green sturgeon has recently has been listed as threatened by NMFS (71 FR 17757, April 7, 2006). Green sturgeon are found in the lower reaches of large rivers, including the Sacramento–San Joaquin River basin, and in the Eel, Mad, Klamath, and Smith Rivers. Green sturgeon adults and juveniles are found throughout the upper Sacramento River, as indicated by observations incidental to winter-run chinook monitoring at RBDD in Tehama County (NMFS 2005). Green sturgeon spawn predominantly in the upper Sacramento River. They are thought to spawn every 3–5 years (Tracy 1990). Their spawning period is March to July, with a peak in mid-April to mid-June (Moyle, Foley, and Yoshiyama 1992). Juveniles inhabit the estuary until they are approximately 4–6 years old, when they migrate to the ocean (Kohlhorst et al. 1991). Green sturgeon is found primarily in the Sacramento River and occasionally in the Feather River.

Sacramento Splittail. Recent data indicate that Sacramento splittail occur in the Sacramento River as far upstream as RBDD (Sommer et al. 1997) and that some adults spend the summer in the mainstem Sacramento River rather than returning to the estuary (Baxter 1999). The distribution and extent of spawning and rearing along the mainstem Sacramento River is unknown.

Sacramento splittail spawn over flooded terrestrial or aquatic vegetation (Moyle 2002, Wang 1986). Sacramento splittail spawn in early March and May in lower reaches of the Sacramento River (Moyle et al. 1995). Spawning has been observed to occur as early as January and to continue through July (Wang 1986). Larval splittail are commonly found in the shallow, vegetated areas where spawning occurs. Larvae eventually move into deeper, open water habitats as they grow and become juvenile. During late winter and spring, young-of-year juvenile splittail (i.e., those less than 1 year old) are found in floodplain habitat, sloughs, rivers, and Delta channels near spawning habitat. Juvenile splittail gradually move from shallow, nearshore habitats to the deeper, open water habitats of Suisun and San Pablo Bays (Wang 1986). In areas upstream of the Delta, juvenile splittail can be expected to be present in the flood basins (i.e., Sutter and Yolo Bypasses and the Sacramento River) when these areas are flooded during winter and spring.

In 1999, after 4 years of candidate status, the splittail was listed as threatened under the ESA (64 FR 25, March 10, 1999). Fall midwater trawl surveys indicate that juvenile splittail abundance has been highly variable from year to year, with peaks and declines coinciding with wet and dry periods, respectively, and correlated with the availability of flooded shallow-water habitat. After the listing, the State Water Contractors, the San Luis & Delta-Mendota Water Authority, and others challenged the listing, contending that it violated the ESA and the Administrative Procedures Act. On June 23, 2000, the U.S. District Court in Fresno ruled in favor of the plaintiffs and found the listing unlawful. On September 22, 2003, USFWS withdrew splittail from the list of threatened species, indicating that habitat restoration actions implemented through the CALFED Bay-Delta Program and the Central Valley Project

Improvement Act are likely to keep the splittail from becoming endangered in the foreseeable future (68 FR 55139, September 22, 2003).

Hardhead. Hardhead are widely distributed throughout the low- to mid-elevation streams in the main Sacramento–San Joaquin drainage, including the Sacramento River system. Undisturbed portions of larger streams at low to middle elevations are preferred by hardhead. Hardhead are able to withstand summer water temperatures above 20ºC; however, they will select lower temperatures when they are available. Hardhead are fairly intolerant of low-oxygenated waters, particularly at higher water temperatures. Pools with sand-gravel substrates and slow water velocities are the preferred habitat; adult fish inhabit the lower half of the water column, while the juvenile fish remain in the shallow water closer to the stream edges. Hardhead typically feed on small invertebrates and aquatic plants at the bottom of quiet water (Moyle 2002). Hardhead is a Federal species of concern and a state species of special concern.

3.3.6.3 Other Important Native Fish Species Supported by the Natomas Cross Canal, Lower Sacramento River, Pleasant Grove Creek Canal, and NEMDC/Steelhead Creek. Sacramento sucker and Sacramento pikeminnow are two additional native species of importance in the project area.

Sacramento Sucker. The Sacramento sucker is widely distributed throughout the Sacramento River system. Sacramento sucker occupy waters from cold, high-velocity streams to warm, nearly stagnant sloughs. They are common at moderate elevations (600–2,000 feet). Sacramento sucker feed on algae, detritus, and benthic invertebrates. They usually spawn for the first time in their fourth or fifth years. When they cannot move upstream and end up spawning in lake habitat, they typically orient themselves near areas where spring freshets flow into the lake. They typically spawn in stream habitat on gravel riffles from late February to early June. The eggs hatch in 3–4 weeks, and the young typically live in the natal stream for a couple of years before moving downstream to a reservoir or large river (Moyle 2002).

Sacramento Pikeminnow. Sacramento pikeminnow occupy rivers and streams throughout the Sacramento–San Joaquin River system, mainly at elevations between 300 and 2,000 feet. Sacramento pikeminnow spawn in April and May, with eggs hatching in less than a week. Within a week of hatching, the fry are free-swimming and schooling. Adult pikeminnow may feed on other fish, including juvenile pikeminnow, chinook salmon, and steelhead, but, according to Moyle (2002), are overrated as predators on salmonid species in natural environments. They can, however, be major predators on juvenile salmon and steelhead in riverine environments modified by dams and fish ladders. Pikeminnow tend to remain in well-shaded, deep pools with sand or rock substrate and are less likely to be found in areas where there are higher numbers of introduced predator species, such as largemouth bass and other centrarchid species.

3.3.6.4 Important Nonnative Fish Species Supported by the Natomas Cross Canal, Lower Sacramento River, Pleasant Grove Creek Canal, and NEMDC/Steelhead Creek. Striped bass and American shad are important nonnative species that are supported by channels in the project area.

Striped Bass. Striped bass are anadromous fish that have been an important part of the sport-fishing industry in the Delta. They were introduced into the Sacramento–San Joaquin estuary between 1879 and 1882 (Moyle 2002). Striped bass may move into the lower reaches of the rivers year-round but probably most often between April and June, when they spawn. The species tends to remain in deep, slow-moving water, where it has access to prey without having to expend a great deal of energy.

American Shad. American shad are an anadromous fish that have been introduced into the Central Valley and have become established as a popular sport fish. American shad enter the American River to spawn during the spring (primarily May and June) and support a seasonal fishery downstream of the dams during these months.

3.3.6.5 Designated Essential Fish Habitat. The NCC and Sacramento River have also been designated as Essential Fish Habitat by the Pacific Fishery Management Council to protect and enhance habitat for coastal marine fish and macroinvertebrate species that support commercial fisheries. Essential Fish Habitat is defined as waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity. Under the Pacific Coast Salmon Fisheries Management Plan (Pacific Fishery Management Council 2003), the NCC and lower portion of the NEMDC/Steelhead Creek (i.e., portion below confluence with Dry Creek) have been designated as Essential Fish Habitat for fall-run chinook salmon, and the Sacramento River has been designated as Essential Fish Habitat for spring-, fall-, late fall-, and winter-run chinook salmon.

3.3.7 Sensitive Aquatic Habitats

Sensitive aquatic habitats include those that are of special concern to resource agencies or that are afforded specific consideration through ESA, the California Environmental Quality Act (CEQA), Section 1602 of the California Fish and Game Code, Section 404 of the Clean Water Act (CWA), or the Sustainable Fisheries Act (as amended). These habitats are of special concern because they are of high value to plants, wildlife, and fish species and have high potential to support special-status species. They also provide other important ecological functions, such as enhancing flood and erosion control and maintaining water quality. Essential Fish Habitat is described in Section 3.3.6.5 above; other sensitive aquatic habitats are described below.

Irrigation/drainage canals and ditches in the project area are anticipated to be considered waters of the United States and subject to regulation under CWA Section 404. Other permanently and/or seasonally wet habitats, such as freshwater marsh and seasonal wetland, could qualify as jurisdictional waters of the United States subject to Section 404 regulation if they are adjacent or abutting other waters of the United States. A wetland delineation was completed in 2006 for the NCC portion of the project area. It concluded that the NCC and irrigation/ drainage ditches and small areas of seasonal wetlands at the toe of some portions of the levee are under CWA jurisdiction; this delineation was verified by USACE on November 7, 2006. A delineation of jurisdictional waters of the United States elsewhere in the project area is under review by USACE. The draft delineation report covering the anticipated footprint for the 2008 construction phase elements (levee improvements and canal relocations, including borrow operations at the Airport north bufferlands and Brookfield sites), identifies the following features as potentially jurisdictional: irrigation and drainage ditches and canals along the toe of the levee, lateral ditches that connect with these, seasonal wetlands within the Airport north bufferlands and Brookfield borrow areas, and patches of freshwater marsh and slough north of the Teal Bend Golf Club. In addition, the bank protection element of Alternative 2 at erosion sites along the Sacramento River east levee would be within USACE jurisdictional areas, and some of the discharge pipes conveying filtered stormwater drainage from the east levee to the east bank of the Sacramento River under Alternatives 1 and 3 might extend to areas within CWA and/or Rivers and Harbors Act jurisdiction.

The functional value of an aquatic resource is considered by USACE as part of the CWA Section 404 regulatory process. Aquatic functions may be generally categorized as low, moderate, or high, defined for the purposes of this EIS as follows:

- **High:** Natural structure and function of biotic community exists, with minimal changes in structure or function evident—i.e., zero to low-levels of human disturbance (e.g., natural plant communities intact, no artificial structures present, sensitive plant and/or wildlife species utilization)

- **Moderate:** Moderate levels of disturbance (e.g., natural plant communities intact with some evidence of non-native vegetation, low-intensity developments such as trails, selective vegetation management for flood control purposes)

- **Low:** High levels of disturbance (e.g., vegetation disking for fire clearance purposes, dominance of monotypic stands of non-native vegetation, presence of man-made structures)

The relative functional value of the features identified above that would fall within the footprint of one or more of the action alternatives is generally as follows: irrigation canals and irrigation/drainage ditches—low; seasonal wetlands near the toe of the NCC south levee and in the Airport north bufferlands area—moderate; and slough, freshwater marsh, NCC, and Sacramento River bank—moderate to high.

All of the aquatic habitats described above are also anticipated to qualify as waters of the state and regulation under the Porter-Cologne Water Quality Control Act. In addition, waterways and associated riparian habitats are likely subject to regulation under Section 1600 et seq. of the California Fish and Game Code. Within the potential footprint of elements of the 2008 construction phase, riparian habitat is present along the water side of the NCC, in strips along larger drainage canals (e.g., the North Drainage Canal), and in scattered patches east of the Sacramento River east levee.

Other habitats considered sensitive by DFG include those identified as "rare and worthy of consideration" in natural communities recognized by the CNDDB. These sensitive communities provide essential habitat to special-status species that are often restricted in distribution or decreasing throughout their range. Some woodland patches within the project area could be categorized as Great Valley cottonwood riparian forest, which is a natural community documented in the California Natural Diversity Data Base (CNDDB).

3.3.8 Vegetation and Wildlife

3.3.8.1 Land Use and Vegetation. Before 1850, vegetation in the Natomas Basin and the remainder of the Sacramento Valley bore little resemblance to its current state. The Sacramento River dominated the area, its banks lined by a riverine growth of oak, western sycamore, Fremont cottonwood, willow, and Oregon ash, up to a mile in width. Drainage from the western slopes of the Sierra Nevada resulted in regular flooding of the Sacramento Valley, rendering the Natomas Basin an area of highly fertile, alluvial soils. The southern portion of the basin was part of the overlapping American and Sacramento River floodplains. This large floodplain supported large tracts of riparian woodland and scrub, permanent freshwater marsh, and seasonal wetland. It is likely that vernal pools also existed historically in the Natomas Basin, particularly in upland areas in the eastern portion (USFWS, City of Sacramento, and Sutter County 2003).

Currently, the Natomas Basin supports a wide array of land uses and habitat types, including urban, suburban, and rural development; agricultural fields; and remnant and restored native habitat. **Table 3-6** summarizes information compiled for the most recent categorization of land cover types conducted for TNBC.

The southern portion of the Natomas Basin is largely developed, particularly south of West Elkhorn Boulevard and east of El Centro Road. The western and northern portions, in contrast, are dominated by agricultural lands. The primary crops produced in the Natomas Basin are rice, corn, grain, and tomatoes. Rice, the most common crop, is generally grown over large areas of contiguous land north of Elkhorn Boulevard, although the amount of land in active rice production has greatly diminished in recent years and many former rice fields are now fallow or support grain crops, such as wheat. Agricultural lands in the southern and western portions support other crops and urban land uses (City of Sacramento, Sutter County, and TNBC 2003).

Table 3-6 Land Cover Types in the Natomas Basin	
Habitat Type	**Acres**
Alfalfa	1,401
Fallow rice	8,046
Fallow row and grain crops	2,103
Fresh emergent marsh	46
Fresh emergent marsh (created)	590
Grass hay	153
Grassland (created)	71
Irrigated grassland	354
Non-habitat land uses (developed, disturbed/bare, ruderal)	13,734
Non-native annual grassland	6,516
Non-riparian woodland	50
Open water	310
Orchard	179
Rice	14,539
Riparian scrub	110
Riparian woodland	100
Row and grain crops (milo, safflower, tomatoes, sunflower, wheat)	4,534
Seasonal wetland	88
Valley oak woodland	191
Vetch	120
Total	53,233
Source: Habitat mapping by Jones & Stokes 2006; data compiled by EDAW	

Only small fragments of native habitat persist in the Natomas Basin. Riparian habitat is primarily restricted to a narrow strip along the levees of the Sacramento River and the NCC. Small patches of woodland, scrub, and wetland habitats dominated by native species are scattered throughout the Natomas Basin, most relatively close to the Sacramento River or adjacent to other features that support surface water. An extensive network of irrigation and drainage ditches also traverse the Natomas Basin and a growing number of restored marsh habitat patches are being created, primarily in the north. Most of these are owned and managed by TNBC; others are separately managed as Airport mitigation sites.

The project area is largely undeveloped, except for residences widely scattered along the northern and middle reaches of the Sacramento River, the westernmost reaches of the NCC, and the PGCC. Residences are more densely spaced in the southern reaches of the Sacramento River. Levee slope maintenance zones along the landside toe are dominated by weedy ruderal vegetation that is regularly maintained via mowing and/or burning. Irrigation/drainage ditches and canals are present along many of the levee reaches, landward of the maintenance zones. These ditches generally support little native vegetation and are regularly maintained. Lateral ditches and canals also extend into the project area. The relatively limited amount of native vegetation within the project area is associated with these lateral ditches, which are concentrated in the upper reaches of the Sacramento River east levee, and remnant woodland and scrub patches scattered along the land side of the Sacramento River east levee. The dominant habitat landward

of levee maintenance zones and irrigation/drainage features is agricultural. Areas along the Sacramento River are predominantly row and field crops, while those along the NCC are exclusively rice; those adjacent to the PGCC and at the potential borrow sites are a mix of rice and row/field crops.

3.3.8.2 Wildlife. Before European settlement, the Sacramento area floodplains supported a wide variety and large numbers of wildlife species associated with its riparian habitats, permanent and seasonal wetlands, and oak woodlands and savannas. Much of this habitat has been lost, locally and regionally. Initially, land within the Natomas Basin was converted to agriculture, though more recent land use conversions have been to urban development. As a result, there have been shifts in wildlife use as land uses and habitats have changed. With the conversion to agriculture, the abundance of species restricted to natural habitats likely decreased, and in some cases particular species ceased to occur (City of Sacramento, Sutter County, and TNBC 2003). However, remnant native habitat patches and created habitat associated with drainage and agricultural supply ditches and habitat reserves have allowed remnant wildlife populations to persist within the Natomas Basin, most notable of which are giant garter snake and the Swainson's hawk populations. The presence of ditches among the mosaic of agricultural fields and remnant riparian and wetland patches provides important nesting, feeding, and migration corridor habitat for a variety of wildlife species that inhabit the Natomas Basin. Many of these are special-status species, which are described in Section 3.3.9, "Special-Status Terrestrial Species."

Wildlife use is also linked to the Natomas Basin's position in the Pacific Flyway, the westernmost of North America's four flyways, or migration routes. These flyways are defined as geographic regions with breeding grounds in the north, wintering grounds in the south, and a system of migration routes in between. The Central Valley lies at the southerly end of the Pacific Flyway migratory route. Historically, the Central Valley contained approximately 4 million acres of wetlands, including permanent marshes and seasonal wetlands created by winter rains and spring snowmelt from the Sierra Nevada. Today, approximately 300,000 acres remain, providing wintering habitat for 60% of the Pacific Flyway's current waterfowl population and migration habitat for an additional 20% of the population. All together, approximately 10–12 million ducks and geese, along with millions of other water birds, winter in or pass through the Central Valley each year (City of Sacramento, Sutter County, and TNBC 2003). Although most marshes and seasonal wetlands in the Natomas Basin have been converted to agricultural and urban uses, flooded rice fields continue to attract and support migrant waterfowl. Some species also utilize pasture, harvested rice, and other croplands for foraging (USFWS, City of Sacramento, and Sutter County 2003).

The project area provides habitat for a variety of wildlife species, ranging from those that utilize the widely distributed agricultural fields and levee maintenance zones to species that are restricted to remnant patches of native vegetation and the system of irrigation/drainage ditches and canals. Many common wildlife species utilize the project area, and a number of sensitive species also have potential to occur within and adjacent to the levee improvement areas. These sensitive species are discussed further in Section 3.3.9, "Special-Status Terrestrial Species."

3.3.9 Special-Status Terrestrial Species

Special-status fish species are discussed in Section 3.3.6, "Fish and Aquatic Habitat."

3.3.9.1 Special-Status Plant Species. Nine special-status plant species were evaluated for their potential to occur in the project area. These are species that are covered under the Natomas Basin Habitat Conservation Plan (NBHCP) and/or are considered rare, endangered, or threatened by California Native Plant Society (CNPS) and are considered to have suitable habitat in the project region. **Table 3-7** summarizes for each species the regulatory or CNPS listing status, including coverage in the NBHCP; habitat association; and potential for occurrence in the project area.

Table 3-7 Special-Status Plant Species Evaluated for Potential to Occur in the Project Area				
Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
Dwarf downingia	*Downingia pusilla*	CNPS: 2	Vernal pools and lakes	No suitable habitat is present within the project area
Bogg's Lake hedge-hyssop	*Gratiola heterosepala*	CA: endangered CNPS: 1B NBHCP: covered	Vernal pools and lake margins	No suitable habitat is present within the project area
Rose mallow	*Hibiscus lasiocarpus*	CNPS: 2	Freshwater marshes and swamps	Low potential to occur in ditches and ponds in the project area
Delta tule pea	*Lathyrus jepsonii jepsonii*	CNPS: 1B NBHCP: covered	Freshwater and brackish marshes and sloughs	Low potential to occur in ditches and ponds in the project area
Legenere	*Legenere limosa*	CNPS: 1B NBHCP: covered	Vernal pools	No suitable habitat is present within the project area
Colusa grass	*Neostapfia colusana*	Federal: threatened CA: endangered CNPS: 1B NBHCP: covered	Vernal pools	No suitable habitat is present within the project area
Slender orcutt grass	*Orcuttia tenuis*	Federal: threatened CA: endangered CNPS: 1B NBHCP: covered	Vernal pools	No suitable habitat is present within the project area
Sacramento orcutt grass	*Orcuttia viscida*	Federal: endangered CA: endangered CNPS: 1B NBHCP: covered	Vernal pools	No suitable habitat is present within the project area
Sanford's arrowhead	*Sagittaria sanfordii*	CNPS: 1B NBHCP: covered	Freshwater ponds, marshes and ditches	Low potential to occur in ditches and ponds in the project area

Notes:
CA = California; CNPS = California Native Plant Society; NBHCP = Natomas Basin Habitat Conservation Plan
California Native Plant Society Listing Categories:
1B Plants considered rare, threatened, or endangered in California and elsewhere
2 Plants considered rare, threatened, or endangered in California but more common elsewhere
Sources: CNPS 2007; CNDDB 2007; City of Sacramento, Sutter County, and TNBC 2003; USFWS 2005

Three of the nine species were determined to have potential to occur in the project area: rose mallow, Delta tule pea, and Sanford's arrowhead. All of these species occur in freshwater habitats, including marshes, swamps, sloughs, and ditches. Potentially suitable habitat for them within the project area is provided by the NCC and irrigation and drainage canals throughout the project area. Elkhorn Reservoir and associated irrigation features immediately north of the Teal Bend Golf Club also provide potential habitat. In general, these areas provide low-quality habitat and are unlikely to support these three special-status plants. In August 2007, focused surveys for rose mallow, Delta tule pea, and Sanford's arrowhead were conducted in areas of suitable habitat that could be disturbed during the 2008 construction phase. None of the species were observed during the surveys, which were conducted during the blooming season for all three species in accordance with DFG guidelines. Because focused surveys have not been conducted in areas of suitable habitat that would be disturbed in 2009–2010, the potential presence of these special-status elsewhere in the project area cannot be conclusively ruled out.

The remaining six species included in **Table 3-7** are not addressed further in this section, because the project area does not support the vernal pool and seasonal wetland habitats in which they occur. Potential habitat for these species is generally concentrated in the eastern portion of the Natomas Basin, between Del Paso Road and Riego Road (south of the PGCC portion of the project area). The seasonal wetlands along the NCC were evaluated by a botanist and determined to be unsuitable habitat for these additional special-status plant species.

3.3.9.2 Special-Status Wildlife Species. Twenty special-status wildlife species, including all species covered by the NBHCP, were evaluated for their potential to occur in the project area. **Table 3-8** summarizes for each species the regulatory status, including coverage in the NBHCP; habitat association; and potential for occurrence in the project area. Six of these species (four invertebrate species and two amphibian species) are not addressed further in this section because the project area does not support the habitats in which they occur. Three of the bird species listed in **Table 3-8** have been documented in the area in the past but are not known to nest in the project area and are not discussed further. The remaining eleven species were determined to have potential to occur in the project area during at least part of the year and are discussed below.

Table 3-8
Special-Status Wildlife Species Evaluated for Potential to Occur in the Project Area

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
Invertebrates				
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	Federal: threatened NBHCP: covered	Elderberry shrubs, typically in riparian habitats	Elderberry shrubs are present within and adjacent to the Sacramento River east levee improvement area
California linderiella	*Linderiella occidentalis*	Federal: endangered NBHCP: covered	Vernal pools and other seasonal wetlands	No suitable habitat is present within the project area
Vernal pool tadpole shrimp	*Lepidurus packardi*	Federal: endangered NBHCP: covered	Vernal pools and swales	No suitable habitat is present within the project area
Midvalley fairy shrimp	*Branchinecta mesovallensis*	NBHCP: covered	Vernal pools	No suitable habitat is present within the project area
Vernal pool fairy shrimp	*Branchinecta lynchi*	Federal: threatened NBHCP: covered	Vernal pools and other seasonal wetlands	No suitable habitat is present within the project area
Amphibians				
California tiger salamander	*Ambystoma californiense*	Federal: threatened CA: species of special concern NBHCP: covered	Vernal pools and seasonal wetlands in upland with burrows and other belowground refuge	No suitable habitat is present within the project area
Western spadefoot	*Spea hammondii*	CA: species of special concern NBHCP: covered	Vernal pools and seasonal wetlands in upland with burrows and other belowground refuge	No suitable habitat is present within the project area
Reptiles				
Giant garter snake	*Thamnophis gigas*	Federal: threatened CA: threatened NBHCP: covered	Streams, sloughs, ponds, and irrigation/ drainage ditches; also require upland refugia not subject to flooding during the snake's inactive season	The Natomas Basin supports key population; rice fields, ditches, and ponds in the project area provide potentially suitable habitat

Table 3-8 Special-Status Wildlife Species Evaluated for Potential to Occur in the Project Area				
Common Name	**Scientific Name**	**Status**	**Habitat**	**Potential for Occurrence**
Northwestern pond turtle	*Actinemys marmorata marmorata*	CA: species of special concern NBHCP: covered	Ponds, marshes, rivers, streams, sloughs; nest in nearby uplands with suitable soils	Ditches and ponds in the project area provide potentially suitable habitat
Birds				
White-faced ibis	*Plegadis chihi*	CA: species of special concern NBHCP: covered	Forage and roost in shallow water and flooded fields; nest in freshwater marshes	Rice fields in project area provide foraging habitat; the only nesting colony in the Natomas Basin is approximately 3 miles from the nearest levee improvement area
Aleutian Canada goose	*Branta canadensis leucopareia*	NBHCP: covered	Forage in agricultural fields and roost in aquatic habitats	Could be a winter visitor to the project area, but no recent documented occurrences
White-tailed kite	*Elanus leucurus*	CA: fully protected	Forage in grasslands and agricultural fields; nest in isolated trees or small woodland patches	Known to nest and forage in the project area
Northern harrier	*Circus cyaneus*	CA: species of special concern	Forage and nest in grassland, agricultural fields, and marshes	Known to nest and forage in the project area
Cooper's hawk	*Accipiter cooperii*	CA: species of special concern	Forage and nest in open woodlands and woodland margins	Known to nest and forage in the project area
Swainson's hawk	*Buteo swainsoni*	CA: threatened NBHCP: covered	Forage in grasslands and agricultural fields; nest in open woodland or scattered trees	Known to nest and forage in the project area
American peregrine falcon	*Falco peregrinus anatum*	CA: endangered and fully protected NBHCP: covered	Forage in a variety of open habitats, particularly marshes and other wetlands	Likely to occasionally forage in the project area, but no suitable nesting habitat is present
Burrowing owl	*Athene cunicularia*	CA: species of special concern NBHCP: covered	Grasslands and agricultural fields	Known to occur along the PGCC
Bank swallow	*Riparia riparia*	CA: threatened NBHCP: covered	Forage in various habitats; nest in banks or bluffs, typically adjacent to water	Could forage in the project area, but no colonies have been documented nearby within the past 10 years
Loggerhead shrike	*Lanius ludovidianus*	CA: species of special concern NBHCP: covered	Forage in grasslands and agricultural fields; nest in scattered shrubs and trees	Known to nest and forage in the project area
Tricolored blackbird	*Agelaius tricolor*	CA: species of special concern NBHCP: covered	Forage in grasslands and agricultural fields; nest in freshwater marsh, riparian scrub, and other dense shrubs and herbs	Known to nest and forage in the project area

Notes:
CA = California; NBHCP = Natomas Basin Habitat Conservation Plan ; PGCC = Pleasant Grove Creek Canal
Sources: CNDDB 2007; City of Sacramento, Sutter County, and TNBC 2003; USFWS 2005; USFWS 2006a

Valley Elderberry Longhorn Beetle. The valley elderberry longhorn beetle is Federally listed as threatened and is covered under the NBHCP. These beetles are patchily distributed throughout the remaining riparian forests of the Central Valley, from Redding to Bakersfield, and appear to be only locally common (i.e., found in population clusters that are not evenly distributed across the Central Valley). Valley elderberry longhorn beetles require elderberry shrubs (*Sambucus* species) for reproduction and survival, and are rarely seen because they spend most of their life cycle as larvae within the stems of the shrubs. It appears that in order to function as habitat for the valley elderberry longhorn beetle, host elderberry shrubs must have stems that are 1.0 inch or greater in diameter at ground level. Use of the shrubs by the beetle is rarely apparent; often the only exterior evidence is an exit hole created by the larva just before the pupal stage.

USFWS released a 5-year status review for the valley elderberry longhorn beetle on October 2, 2006 (USFWS 2006b). This review reported an increase in known beetle locations from 10 at the time of listing in 1980 to 190 in 2006. Because of the presumed increase in the estimated population and the concurrent protection and restoration of several thousand acres of riparian habitat suitable for valley elderberry longhorn beetles, the USFWS status review determined that this species is no longer in danger of extinction, and recommended that the species no longer be listed under ESA. This recommendation is not a guarantee that the species will be delisted, however, because formal changes in the classification of listed species require a separate USFWS rulemaking process distinct from the 5-year review. If valley elderberry longhorn beetles are removed from the ESA list, it will likely be more than a year before this decision is finalized.

There are no known documented occurrences of the beetle in the project area, but the species is known to occur in the nearby American River Parkway. Elderberry shrubs that could support beetles are relatively sparsely scattered throughout the project area, primarily in riparian vegetation on the water side of the Sacramento River east levee. Elderberry shrubs are also scattered in some remnant riparian and oak woodland clumps on the land side of the levee, but they are relatively uncommon in these locations.

Giant Garter Snake. The giant garter snake is Federally and state listed as threatened and is a primary covered species under the NBHCP. This species formerly ranged throughout the wetlands of California's Central Valley but appears to have been extirpated from the southern San Joaquin Valley (Hansen and Brode 1980, USFWS 1999) and has suffered serious declines in other parts of its former range. The primary cause of decline, loss or degradation of aquatic habitat caused by agricultural development, has been compounded by the loss of upland refugia and bankside vegetation cover (Thelander 1994).

Giant garter snakes inhabit agricultural wetlands and other waterways, such as irrigation and drainage canals, rice fields, marshes, sloughs, ponds, small lakes, low-gradient streams, and adjacent uplands in the Central Valley (USFWS 1999). Rice fields and their adjacent irrigation and drainage canals serve an important role as aquatic habitat for giant garter snake. During the summer, giant garter snakes use the flooded rice fields as long as their prey is present in sufficient densities. In late summer, rice fields provide important nursery areas for newborns. In late summer/fall, water is drained from the rice fields and giant garter snake prey items become concentrated in the remaining pockets of standing water, which allows the snakes to gorge before their period of winter inactivity (USFWS 1999). It appears that the majority of giant garter snakes move back into the canals and ditches as the rice fields are drained, although a few may overwinter in the fallow fields, where they hibernate within burrows in the small berms separating the rice checks (Hansen 1998).

Managed marsh in TNBC reserves also provides important habitat for giant garter snake. In contrast to rice, managed marsh provides year-round habitat, and habitat elements to meet all of the giant garter snake's daily and seasonal needs, such as dense cover, basking sites, and refugia. TNBC reserves have

been designed to provide habitat elements throughout the marsh; by contrast, the limited availability of the same elements in rice fields contributes to giant garter snake use occurring primarily around the perimeter of the rice fields. Approximately 600 acres of created marsh habitat are present in the Natomas Basin, as shown in **Table 3-6**.

The width of uplands used by giant garter snake varies considerably. Many summer basking and refuge areas used by this snake are immediately adjacent to canals and other aquatic habitats, and may even be located in the upper canal banks. Giant garter snakes have also been found hibernating as far as 820 feet (250 meters) from water, however, and any land within this distance may be important for snake survival in some cases (Hansen 1988). USFWS considers 200 feet to be the width of upland vegetation needed to provide adequate habitat for giant garter snake along the borders of aquatic habitat (USFWS 1997).

The Natomas Basin supports one of the most significant of the remaining giant garter snake populations. In general, recent occurrences of the species have been concentrated in the central and northern portions of the basin, with giant garter snakes becoming increasingly uncommon at Fisherman's Lake in the south (TNBC 2007). Irrigation and drainage ditches and canals throughout the project area provide habitat of varying quality for giant garter snake, depending on the location. In general, irrigation ditches on the far western side of the basin are of poor habitat quality, while rice fields and canals in the north and TNBC lands within and adjacent to the project area provide high-quality habitat and support a known population. **Table 3-6** lists the overall acreages of habitat types in the Natomas Basin; ditches and canals are included in the "Open water" designation.

Large waterways, such as the Sacramento and American Rivers, do not provide suitable habitat for giant garter snake. The NCC, PGCC, and NEMDC/Steelhead Creek provide habitat of limited value for giant garter snake, and there is little evidence to suggest the species regularly occurs in these channels.

Northwestern Pond Turtle. Northwestern pond turtle is a DFG species of special concern and is covered under the NBHCP. This species is generally associated with permanent or near-permanent aquatic habitats, such as lakes, ponds, streams, freshwater marshes, and agricultural ditches. They require still or slow-moving water with instream emergent woody debris, rocks, or similar features for basking sites. Pond turtles are highly aquatic but can venture far from water for egg laying. Nests are typically located on unshaded upland slopes in dry substrates with clay or silt soils (Jennings and Hayes 1994).

Ditches, ponds, and marshes throughout the Natomas Basin provide potential habitat for northwestern pond turtle. Basinwide acreages of these habitats are shown in **Table 3-6** in the categories "Open water" and "Fresh emergent marsh." Potential breeding habitat is very limited because of the predominance of agriculture and development, but turtles could occur along ditches and margins of other aquatic habitat. Limited information is available on the status and distribution of the northwestern pond turtle in the basin. Surveys conducted in 2004–2006 for TNBC documented only 15 occurrences of northwestern pond turtle in the Natomas Basin (TNBC 2007). Although there have been few documented occurrences, several of them have been within or near the project area.

Swainson's Hawk. Swainson's hawk is state listed as threatened and is a primary covered species under the NBHCP. As many as 17,000 Swainson's hawk pairs may have nested in California at one time (DFG 1994). Currently, there are 700–1,000 breeding pairs in California, of which 600–900 are in the Central Valley (Estep 2003). Swainson's hawks typically occur in California only during the breeding season (March–September) and winter in Mexico and South America. The Central Valley population migrates only as far south as central Mexico. Swainson's hawks begin to arrive in the Central Valley in March; nesting territories are usually established by April, with incubation and rearing of young occurring through June (Estep 2003).

Swainson's hawks are found most commonly in grasslands, low shrublands, and agricultural habitats that include larges trees for nesting. Nests are found in riparian woodlands, roadside trees, trees along field borders, and isolated trees. Corridors of remnant riparian forest along drainages contain the majority of known nests in the Central Valley (England, Bechard, and Houston 1997; Estep 1984; Schlorff and Bloom 1984). Nesting pairs frequently return to the same nest site for multiple years and decades.

Prey abundance and accessibility are the most important features determining the suitability of Swainson's hawk foraging habitat. In addition, agricultural operations (e.g., mowing, flood irrigation) have a substantial influence on the accessibility of prey and thus create important foraging opportunities for Swainson's hawk. Crops that are tall and dense enough to preclude the capture of prey do not provide suitable habitat except around field margins, but prey animals in these habitats are accessible during and soon after harvest. Swainson's hawks feed primarily on small rodents but also consume insects and birds. Although the most important foraging habitat for Swainson's hawks lies within a 1-mile radius of each nest (City of Sacramento, Sutter County, and TNBC 2003), Swainson's hawks have been recorded foraging up to 18.6 miles from nest sites (Estep 1989). Any habitat within the foraging distance may provide food at some time in the breeding season that is necessary for reproductive success. In a dynamic agricultural environment such as the Natomas Basin, the area required for Swainson's hawk foraging habitat depends on time of season, crop cycle, crop type, and disking/harvesting schedule, as these factors affect the abundance and availability of prey (City of Sacramento, Sutter County, and TNBC 2003).

The most recent survey published by TNBC (2007) documented that 45 of the 94 known nesting territories in the Natomas Basin and along adjacent waterways were active in 2006. Most nest sites are located in the western portion of the basin along the Sacramento River. In 2006, four nests were present along the NCC and one nest was present approximately 0.25 mile west of the PGCC. Along the Sacramento River, the majority of nest sites are located on the water side of the levees, and the relatively few nest sites on the land side of the Sacramento River east levee are typically located at least several hundred feet or more from the levee. In addition to the scattered nest sites adjacent to the project area, agricultural fields and levee maintenance zones throughout the project area provide suitable foraging habitat for Swainson's hawk. Basinwide acreages of grasslands and alfalfa, row, and grain crops that may provide foraging habitat for Swainson's hawks are shown in **Table 3-6**.

Burrowing Owl. Burrowing owl is a DFG species of special concern and is covered under the NBHCP. Burrowing owls and their nests are also protected under Section 3503.5 of the California Fish and Game Code, which states that it is unlawful to take, possess, or destroy any raptors, including their nests or eggs. Burrowing owls typically inhabit grasslands and other open habitats with low-lying vegetation. They are also known to nest and forage in idle agricultural fields, ruderal fields, and the edges of cultivated fields, although these areas provide lower-quality habitat than native grasslands. Burrow availability is an essential component of suitable habitat. Burrowing owls are capable of digging their own burrows in areas with soft soil, but they generally prefer to adopt those excavated by other animals, typically ground squirrels. In areas where burrows are scarce, they can use pipes, culverts, debris piles, and other artificial features.

Burrowing owl sightings are generally in the eastern half of the Natomas Basin, with the highest concentration along the far eastern edge (TNBC 2007). No burrowing owls have been observed during the many general and focused biological surveys conducted in project surveys in 2005–2007 along the Sacramento River east levee and the NCC. However, there have been observations along the PGCC, just north of Sankey Road, including an observation of a pair of burrowing owls by a project biologist in August 2007.

Other Nesting Birds. Several bird species identified in **Table 3-8** have the potential to nest in or adjacent to the project area. Species associated with riparian and other woodland habitats, such as

Cooper's hawk and white-tailed kite, are most likely to nest along the Sacramento River (Cooper's hawk) and in remnant woodland and suitable trees on the land side of the levees (white-tailed kite). In general, these two raptor species are relatively uncommon in the project area, but several active nests are known to have been documented adjacent to the project area in recent years, including a white-tailed kite nest found near Prichard Lake during project studies in 2007. Northern harriers are likely to nest in grain crops and fallow agricultural fields in and adjacent to the project area. Three harrier nests were documented by a project biologist in 2007 in fallow fields and upland adjacent to Prichard Lake. Loggerhead shrikes are known to nest at several TNBC reserves and elsewhere in the Natomas Basin (TNBC 2007) and are likely to nest in small trees and shrubs within the project area, particularly on the land side of the Sacramento River east levee.

In recent years, tricolored blackbirds have been known to nest only outside of the project area, on a preserve in TNBC's Central Basin Reserve Area (TNBC 2007). In 2007, however, a new nesting colony was discovered by a project biologist in the northeastern portion of the Natomas Basin. There is also potential for this species to nest in areas of suitable habitat elsewhere adjacent to the project area, including several TNBC reserves and other lands north of the airport. Similarly, white-faced ibis were not known to nest anywhere in the Natomas Basin until 2007, when a new nesting colony became established at a preserve in TNBC's Central Basin Reserve Area. This colony is approximately 3 miles from the nearest portion of the project area.

3.3.10 Cultural Resources

3.3.10.1 Prehistoric and Ethnographic Setting. The project area is situated within the lands traditionally occupied by the Nisenan, or Southern Maidu. The language of the Nisenan, which includes several dialects, is classified within the Maiduan family of the Penutian linguistic stock (Kroeber 1925). The western boundary of Nisenan territory was the western bank of the Sacramento River and the area between present-day Sacramento and Marysville. In the Sacramento Valley, the tribelet, consisting of a primary village and a few satellite villages, served as the basic political unit (Moratto 1984). Valley Nisenan territory was divided into three tribelet areas, each populated with several large villages (Wilson and Towne 1978), generally located on low, natural rises along streams and rivers or on slopes with a southern exposure. One important village, *Pusune*, near Discovery Park, appears to have been recorded as CA-SAC-26. Other villages—*Wollok*, *Leuchi*, *Wishuna*, *Totola*, and *Nawrean*—were located east of the confluence of the Feather and Sacramento Rivers, near the northwestern portion of the Natomas Basin.

Euro-American contact with the Nisenan began with infrequent excursions by Spanish explorers and Hudson Bay Company trappers traveling through the Sacramento and San Joaquin Valleys in the early 1800s. In general, Nisenan lifeways remained stable for centuries until the early to middle decades of the 19th century. With the coming of Russian trappers and Spanish missionaries, cultural patterns began to be disrupted as social structures were stressed. An estimated 75% of the Valley Nisenan population died in the malaria epidemic of 1833. With the influx of Europeans during the Gold Rush era, the population was further reduced as a result of disease and violent relations with the miners. However, today the Maidu are reinvesting in their traditional culture and, through newfound political, economic, and social influence, now constitute a growing and thriving native community in California.

3.3.10.2 Historic Setting. Agriculture and ranching were the primary industries in the present-day Sacramento and Sutter County region during the historic period. Regional ranching originated on the New Helvetia rancho in the early 1840s. The Gold Rush precipitated growth in agriculture and ranching, as ranchers and farmers realized handsome returns from supplying food and other goods to miners.

The infrastructure of RD 1000 was completed in the 1920s. It includes levees, drainage canals, pumps, irrigation systems, agricultural fields, and roads, as well as remnant natural features. The originally

constructed features included levees and exterior drainage canals, an interior drainage canal system, nine pumping plants, and a series of levee and interior roads, and unpaved rights-of-way between the farm fields.

RD 1000 has been previously evaluated as a Rural Historic Landscape District on behalf of the USACE, and was found eligible for NRHP and CRHR listing (Dames & Moore 1994a). Dames & Moore determined that RD 1000 appears to be eligible for listing as a Rural Historic Landscape District at the state level of significance for the period from 1911 to 1939 under Criterion A, with the area of significance listed as reclamation and the historical context listed as the flood control and reclamation of the Sacramento River basin within the SRFCP as an important part of the history of reclamation and flood control. The district retains much of its historic integrity, including location design, setting, materials, workmanship, feeling, and association. The contributing and non-contributing elements of the district were defined as part of this effort (**Plate 30**). Contributing elements were described as follows:

- **Drainage System:** East Levee, River Levee, Cross Canal Levee; Natomas East Main Drainage Canal; Cross Canal; Pleasant Grove Canal; Pumping Plants No. 1-A, 2, and 3; and the drainage ditches within the areas of contributing large scale land patterns.

- **Road System:** Garden Highway from Orchard Lane north to the Cross Canal; East Levee/Natomas Road; Sankey Road; Riego Road; Elverta Road; Elkhorn Boulevard from Garden Highway to the western boundary of the Sacramento Airport; Del Paso Road from Powerline Road to its intersection with I-5; San Juan Road from Garden Highway to its intersection with I-5; Powerline Road; El Centro Road from north of I-80 to its intersection with Bayou Way; and the right-of-way roads within fields in the areas of contributing large scale land patterns.

- **Large-Scale Land Patterns:** Land area that is comprised of open fields formed by the intersection of the canals and roads in the area bounded as follows: west of the East Levee; west of Sorrento Road; north of Del Paso Road between the East Levee and I-5, west of I-5 from its intersection with Del Paso Road to its intersection with I-80; north of I-80 from its intersection with I-5 to the River Levee; east of the River Levee; and south of the Cross Canal Levee.

3.3.10.3 Records Search Results. Records searches of pertinent cultural resource information were conducted in 2006 and 2007. Most of the searches were conducted at the North Central Information Center (NCIC) of the California Historical Resources Information System, located at California State University, Sacramento. The NCIC records search covered portions of the project area in Sacramento County. Records searches were also conducted at the Northeast Information Center (NEIC), which maintains cultural resource records for Sutter County.

The NEIC and NCIC reported that several cultural resource inventories have been conducted within the project area. These are listed in **Tables 3-9 and 3-10**, respectively.

Numerous archaeological investigations have covered portions of the Natomas Basin. These have generally focused on areas closest to the rivers and levees. There has been very little archaeological inventory of lands more than 100 feet from the levee toes, and ground surface visibility has frequently been poor even in surveyed areas.

The most comprehensive of these investigations were completed by Dames & Moore and Far Western. In 1994, Dames & Moore (1994b) conducted a broad survey in the Natomas Basin as part of the American

Table 3-9
Previous Cultural Resources Surveys Conducted in the Project Area in Sutter County

NEIC Report No.	Author(s)	Title	Date
1135	Bass, H. O.	*Department of Transportation Negative Archaeological Survey Report: State Route 99*	1983
7173	Cultural Resources Unlimited	*A Cultural Resources Study for Sutter Bay Project, Sutter County, California*	1992
7175	Cultural Resources Unlimited	*A Cultural Resources Study for Sutter Bay Project Highway 99/70 Interchange/Crossroad Improvements Sutter County, California*	1992
3469B	Dames & Moore	*Rural Historic Landscape Report for Reclamation District 1000 for the Cultural Resources Inventory and Evaluations for the American River Watershed Investigation, Sacramento and Sutter Counties, California*	1996
5777	Dames & Moore	*Historic Property Treatment Plan for Reclamation District 1000 Rural Historic Landscape District for the Cultural Resources Inventory and Evaluations for the American River Watershed Investigation, Sacramento and Sutter Counties, California*	1994
4197	Dames & Moore	*Archaeological Inventory Report, Natomas Locality, Cultural Resources Inventory and Evaluation, American River Watershed Investigation, El Dorado, Placer, Sacramento, and Sutter Counties, California*	1994
6892	Derr, E. H.	*American Basin Fish Screen and Habitat Improvement Project, Feasibility Study: Alternative 1C, 2C, 3, Sacramento and Sutter Counties, California*	2002
6944	Ebasco Environmental	*Cultural Resources Survey of the Sacramento Energy Project Sacramento County, California*	1992
5655	Egherman, R., and B. Hatoff	*Roseville Energy Facility Cultural Resources Appendix J-1 of Application for Certification*	2002
6945	Foster, J. W., and D. G. Foster	*An Archaeological Survey of the South Sutter Industrial Center Property, Sutter County, California*	1992
2987	Jensen, P.	*Historic Properties Survey Report for the Proposed Fifield Road at Pleasant Grove Creek Canal, Caltrans District 3, Sutter County, California*	1999
6893	Kaptain, N.	*Historic Property Survey Report for the State Route 99/Riego Road Interchange Project Sutter and Sacramento Counties*	2005
4658	Nelson, W. J., M. Carpenter, and K. L. Holanda	*Cultural Resources Survey for the Level (3) Communications Long Haul Fiber Optics Project. Segment WPO4: Sacramento to Redding*	2000
3469A	Peak & Associates	*Historic American Engineering Record Reclamation District 1000 HAER No. CA-187*	1997
1141	Wilson, K. L.	*Sacramento River Bank Protection Unit 34 Cultural Resources Survey Final Report*	1978

Note: NEIC = Northeast Information Center
Source: Data provided by the Northeast Information Center in 2007

Table 3-10
Previous Cultural Resources Surveys Conducted in the Project Area in Sacramento County

NCIC Report No.	Author(s)	Title	Date
–	Banek, B.	*An Archaeological Reconnaissance of the South Natomas Area for the River Bank Holding Company, Sacramento County, California*	1982
4188	Billat, L. B.	*Nextel Communications Wireless Telecommunications Service Facility—Sacramento County*	2001
–	Bouey, P. D.	*Cultural Resources Inventory and Evaluation: Sacramento River Bank Protection (Unit 44) Project*	1989
4206, part 1	Bouey, P. D., and R. Herbert	*Intensive Cultural Resources Survey and National Register Evaluation: Sacramento Urban Area Flood Control Project*	1990
6519	Bouey, P., J. Berg, J., and C. A. Hunter	*Cultural Resources Test Excavations, Sacramento Urban Area Flood Control Project, Sacramento County, California*	1991
4457	California Department of Transportation	*Negative Historic Property Survey Report for the Proposed Installation of Automatic Vehicle Census Systems on Interstate 80 East of the West El Camino Over-Crossing and on Highway 51 East of the "E" Street Ramps, Sacramento County, California*	2003
4194	Chavez, D., L. H. Shoup, C. Desgrandchamp, and W. G. Slater	*Cultural Resources Evaluations for the North Natomas Community Plan Study Area, Sacramento, California*	1984
4193	County of Sacramento Department of Environmental Review and Assessment	*Draft Environmental Impact Report for Teal Bend Golf Course Use Permit*	1995
4190	CRS Archaeological Consulting and Research Services	*Sacramento Metro Airport Airmail Facility*—letter report	1988
3409	Cultural Resources Unlimited	*A Cultural Resources Study for Sacramento Area Flood Control Agency Borrow Sites Project Sacramento County*	1993
4463	Cultural Resources Unlimited	*A Cultural Resources Survey and Archival Review for the Arden-Garden Connector Project Sacramento County, California*	1992
3469B	Dames & Moore	*Rural Historic Landscape Report for Reclamation District 1000 for the Cultural Resources Inventory and Evaluations for the American River Watershed Investigation, Sacramento and Sutter Counties, California*	1996
4197	Dames & Moore	*Archaeological Inventory Report, Natomas Locality, Cultural Resources Inventory and Evaluation, American River Watershed Investigation, El Dorado, Placer, Sacramento, and Sutter Counties, California*	1994
5777	Dames & Moore	*Historic Property Treatment Plan for Reclamation District 1000 Rural Historic Landscape District for the Cultural Resources Inventory and Evaluations for the American River Watershed Investigation, Sacramento and Sutter Counties, California*	1996
4195	Derr, E.	*Cultural Resources Report: North Natomas Comprehensive Drainage Plan; Levee Improvements, Canal Widening and Additional Pumping Capacity*	1997

Table 3-10 Previous Cultural Resources Surveys Conducted in the Project Area in Sacramento County			
NCIC Report No.	**Author(s)**	**Title**	**Date**
4466	Derr, E.	*Historic Resource Evaluation Report for the Arden-Garden Connector Project CT-03-30274.B1 Sacramento County, California*	1983
6892	Derr, E. H.	*American Basin Fish Screen and Habitat Improvement Project, Feasibility Study: Alternative 1C, 2C, 3, Sacramento and Sutter Counties, California*	2002
6944	Ebasco Environmental	*Cultural Resources Survey of the Sacramento Energy Project Sacramento County, California*	1992
5655	Egherman, R., and B. Hatoff	*Roseville Energy Facility Cultural Resources Appendix J-1 of Application for Certification*	2002
3489A	Far Western Anthropological Research Group	*Report on the First Phase of Archaeological Survey for the Proposed SMUD Gas Pipeline Between Winters and Sacramento Yolo and Sacramento Counties, California*	1993
3489B	Far Western Anthropological Research Group	*Addendum to the Report on the First Phase of Archaeological Survey for the Proposed SMUD Gas Pipeline Between Winters and Sacramento Yolo and Sacramento Counties, California*	1993
4206, part 2	Far Western Anthropological Research Group	*Intensive Cultural Resources Survey and National Register Evaluation: Sacramento Urban Area Flood Control Project*—letter report to SHPO	2005
–	Foster, J. W.	*A Cultural Resource Investigation of the Blue Oaks Skilled Nursing Facility Site Auburn, California*	1995
–	Glover, L. C., and P. D. Bouey	*Sacramento River Flood Control System Evaluation, Mid-Valley Area Cultural Resources Survey, Colusa, Sacramento, Sutter, Yolo, and Yuba Counties, California*	1990
4449	Herbert, R. F.	*Report on the National Register Eligibility of the Sacramento River Docks Building 37 McClellan Air Force Base, Sacramento, California*	1995
5803	Herbert, R. F.	*Report on the National Register Eligibility of the Sacramento River Dock Complex including Building 4635 (Dock) and Building 4637 (Warehouse) McClellan Air Force Base, Sacramento, California*	1995
4202	Humphreys, S., and L. McBride	*A Review of the Work Carried Out at Sacramento 16, the Bennett Mound*	1966
4178	Jones & Stokes	*Archaeological Survey Report for the North Natomas Drainage System's San Juan Pump Station*	1992
2956	Nadolski, J. A.	*Archaeological Survey Report for the Jibboom Street Bridge Project Sacramento, California*	2001
4435	Nadolski, J. A.	*Archaeological Investigations for the Sacramento-KOVR Diverse Lateral Overbuild in Sacramento and Yolo Counties*	2001
5810	PAR Environmental Services, Inc.	*Northgate Boulevard/Arden-Garden Intersection Cultural Resources Investigation, City of Sacramento, Sacramento County, California*	n.d.

Table 3-10
Previous Cultural Resources Surveys Conducted in the Project Area in Sacramento County

NCIC Report No.	Author(s)	Title	Date
4187	Pastron, A. G., and R. K. Brown	*Historical and Cultural Resource Assessment Proposed Telecommunications Facility Natomas Park, Site No. SA-750-01 2450 Del Paso Road, Sacramento County, California*	2001
173	Peak, A. S.	*American River Parkway An Archaeological Perspective*	1973
2764	Peak & Associates	*Historic Property Survey Report and Finding of No Adverse Effect for the Proposed American River Parkway Bike Trail Improvement Project, City and County of Sacramento, California*	2001
2765	Peak & Associates	*Archaeological Survey Report for the Proposed American River Parkway Bike Trail Improvement Project, City and County of Sacramento, California*	
3469A	Peak & Associates	*Historic American Engineering Record Reclamation District 1000 HAER No. CA-187*	1997
4173	Peak & Associates	*Report on the Archaeological Testing Within the Riverbend Classics Project Area, City of Sacramento, California*	1999
4181	Peak & Associates	*Cultural Resources Overview for the North Natomas Long-Term Planning Area, Sacramento County, California*	2000
6830	Peak & Associates	*Determination of Eligibility and Effect for the Natomas Panhandle Annexation Project Area Sacramento County, California*	2005
4201	Peak, A. S., H. L. Crew, and R. Gerry	*The 1971 Archaeological Salvage of the Bennett Mound, CA-SAC-16, Sacramento, CA*	1984
4456	Ritchie, M.	*Finding of Effect for the Proposed Safety Improvements and Rehabilitation of the Jibboom Street Bridge on Jibboom Street, Bridge No. 24C-022, Sacramento, Sacramento County, California*	2001
–	Snyder, J. W.	*Historic Property Survey Report (Positive) for the Jibboom Street Bridge Safety Improvements and Rehabilitation Project Jibboom Street, Sacramento County, California*	2003
4441	Sonoma State Anthropological Studies Center	*Archaeological Surface Reconnaissance and Backhoe Testing for the South Natomas Projects (P92-122, P92-160) Sacramento County, California*	
3408	Theodoratus Cultural Research	*Discovery Park Construction Site Examination for Archaeological Resources in the Area of CA-Sac-26*—letter report	1981
4458	True, D. L.	*8-Acre Survey at 1801 Garden Highway, Sacramento, California*	1983
1141	Wilson, K. L.	*Sacramento River Bank Protection Unit 34 Cultural Resources Survey Final Report*	1978

Note: SHPO = State Historic Preservation Officer
Source: North Central Information Center Record Search 2007

River Watershed Investigation. Surveying of selected parcels along the Sacramento River resulted in the identification of 17 primarily historic sites. During the same effort, Dames & Moore visited an additional 10 previously identified cultural resources to update site records for those locations. At the same time, Dames & Moore (1994a) prepared a draft Historic Property Treatment Plan that explored the history and elements of RD 1000. In 1996, Dames & Moore completed its evaluation of RD 1000, concluding that it appeared to be eligible for listing on the NRHP under Criterion A at a state level of significance as an

example of reclamation and flood control in the Sacramento River basin during the period 1911–1939 (see Section 3.3.10.2). This report extensively documents both the contributing and noncontributing resources of RD 1000. Previously, in 1990, Far Western had conducted surveys of areas along the same route surveyed by Dames & Moore in 1994 (Dames & Moore 1994b), as well as of additional areas (Bouey and Herbert 1990). Far Western (Bouey, Berg, and Hunter 1991) followed up with limited test excavations of two sites south of the Airport.

Numerous cultural resources were identified in the course of previous survey efforts, including ranches and farms; agricultural, transportation, and reclamation features; and debris scatters, as well as prehistoric occupation and burial sites, frequently seen as mounds or the disturbed remnants of mounds.

3.3.10.4 Field Survey Results. Fieldwork undertaken in 2007 and early 2008 has focused on the areas that would be affected by the 2008 project construction phase: the NCC south levee, Sacramento River east levee Reaches 1–4B to Station 214+00, the proposed right-of-way of the relocated Elkhorn Canal and the new GGS/Drainage Canal, and potential borrow sites. Project archaeologists have conducted pedestrian surveys of those portions of these areas; no cultural resources have been identified in the canal footprints from the northern end of the canal alignments to Elverta Road.

In April/May 2007, an archaeologist examined the NCC south levee and adjacent lands within the existing maintenance right-of-way. In July/August 2007 and January/February 2008, a crew of archaeologists conducted field surveys in accessible parcels within the Sacramento County–owned Airport bufferlands north of the Airport. On the Airport bufferlands, the surveys have covered a 400-foot-wide strip east of the Sacramento River east levee and the proposed borrow areas. Survey areas within 1,000 feet of the Sacramento River and the locations of prehistoric lakebeds were walked using transects 15 meters apart. Farther from the Sacramento River and prehistoric lakebeds, the transect interval was widened to 30 meters. Portions of the proposed project footprint on privately owned parcels along the Sacramento River east levee continue to be surveyed as access becomes available.

In addition, a representative of the Ione Band of the Miwok showed an archaeologist the potential locations of subsurface cultural resources that have not been recorded in any of the previously prepared documentation filed with the NCIC and NEIC, which are known to him from anecdotal information (SAFCA 2007).

Two new historic sites in Sacramento County, NLIP-1 and NLIP-2, were identified during the surveys adjacent to the Sacramento River east levee, and four groups of farm buildings in Sutter County, NLIP-3 through NLIP-6, were also identified and evaluated.

The archaeologists also conducted a small-scale shovel testing program along the eastern side of CA-Sac-485/H, a former residence and prehistoric occupation site, to support preliminary engineering design efforts related to canal alignment.

3.3.10.5 Known Cultural Resource Sites in the Sutter County Portion of the Project Area. The known cultural resource sites in or near the Sutter County portion of the project area are listed in **Table 3-11**. Most of the listed sites are in or near areas proposed for the 2009 and 2010 construction phases. The sites that may be affected during the 2008 construction phase are shown with an asterisk. The sites listed in **Table 3-11** are described below.

Table 3-11 Cultural Resources in the Sutter County Portion of the Project Area						
Trinomial	**P-No.**	**Historic/ Prehistoric**	**Description**	**Date Recorded**	**Quadrangle**	**NRHP/CRHR Evaluation, If Known**
CA-SUT-84H*	51-000084	Historic	NCC/PGCC levees	1994	Pleasant Grove, Verona	Eligible
	51-000096H*	Historic	1950s-era ranch	2002	Taylor Monument	
NLIP-3*		Historic	Farm Complex	2007	Verona	Not eligible
NLIP-4*		Historic	Farm Complex	2007	Verona	Not eligible
NLIP-5*		Historic	Farm Complex	2007	Verona	Not eligible
NLIP-6*		Historic	Farm Complex	2007	Verona	Not eligible
Barney Mound*		Prehistoric	Intact occupation mound site	Not	Verona	Potentially eligible

Notes: CRHR = California Register of Historic Resources; NRHP = National Register of Historic Places.
Sites that would be or may be affected by elements of the 2008 construction phase are marked with an asterisk.
Source: Data compiled by EDAW in 2008

CA-SUT-84H (P-51-000084). This trinomial includes both the NCC south levee and the PGCC west levee, the northernmost contributing resources to RD 1000. The NCC levee measures approximately 25 feet wide at the top and 75 feet wide at the base, and is 15 feet high. The top has been graded and graveled for vehicle traffic. The PGCC levee is smaller, measuring approximately 20 feet wide at the top, 60 feet wide at the base, and 10 feet high. There is also an associated retention basin, constructed of concrete and measuring 50 feet by 35 feet across and 15 feet deep. A concrete and steel pump foundation is located within the basin. Concrete footings running from a hole in the side of the basin to the top of the NCC levee indicate that a large pipe once connected the two features.

Archaeologists reported that the levee (unclear which one) was raised and strengthened twice, after flooding during 1938–1939 and after flooding in RD 1001 during 1955. RD 1000 modified the NCC south levee and its adjacent canals in 1987 and SAFCA modified them in 1996. SAFCA completed cutoff wall construction in the western portion of the NCC south levee in fall 2007.

P-51-000096H. Located on the Sacramento/Sutter county line and at the edge of a proposed borrow area, this resource consists of a historic ranch complex that includes two residences, four sheds or barns, and a trailer. The archaeological survey crew was not allowed on the property to record the structures in more detail.

NLIP-3, 7240 Garden Highway. The Sutter County Assessor's records currently list this property along the Sacramento River east levee south of Sankey Road as vacant. No construction date is on file for the buildings. The construction methods and materials appear to date to the early 20th century. This property appears to have always functioned as a residential and agricultural complex. The buildings are in good condition but lack the historic associations or architectural distinctions that would make them eligible for listing on the CRHR or NRHP.

NLIP-4, 11000 Garden Highway. This property is near the Sacramento River east levee north of Riego Road. The Sutter County Assessor's records list one of the two residences on the property as being constructed in 1957. The property has been in the Lauppe family since that time. The land, originally listed as Assessor's Parcel Number 35-020-15, was split into separate parcels several years ago as part of a lot-line adjustment. Because of the split, the 35-020-15 parcel number was retired, and additional parcel numbers (35-020-18, 35-020-19) were assigned.

Research did not reveal this property to be significantly associated with an important historic event, and the historic-era building located here is not known to be associated with an individual considered important in local history. The property itself has undergone regular periods of construction over the years, with new buildings added and older structures modified. The buildings lack the historic associations or architectural distinctions that would make them eligible for listing on the CRHR or NRHP.

NLIP-5, Howsley Road at the Natomas Cross Canal. This small complex includes a mid-20th century residence and several turn-of-the-century horse stalls. The buildings are in good condition but lack the historic associations or architectural distinctions that would make them eligible for listing on the CRHR or NRHP.

NLIP-6, Howsley Road at the PGCC. This is a small residential complex dating to the mid-20th century. The buildings are in good condition but lack the historic associations or architectural distinctions that would make them eligible for listing on the CRHR or NRHP.

Barney Mound. This is an unrecorded prehistoric occupation mound with a residence on top, located along Powerline Road north of Sankey Road, about 4,000 feet south of the NCC south levee. Although the site has not been recorded officially, it is well known in the region and, as an intact prehistoric mound site in an area where almost all such sites have been destroyed, is likely to be eligible for CRHR and NRHP listing. The mound is well outside of the project footprint, but its presence is a notable indicator of the presence of prehistoric peoples in the vicinity.

3.3.10.6 Known Cultural Resource Sites in the Sacramento County Portion of the Project Area.

The known cultural resource sites in the Sacramento County portion of the project area are listed in **Table 3-12**. The listing does not include several known sites in the southeastern portion of the Natomas Basin (located mainly along the NEMDC/Steelhead Creek) because there are no proposed project elements in that part of the basin. Most of the listed sites are in or near areas proposed for the 2009 and 2010 construction phases. The sites that may be affected during the 2008 construction phase are shown with an asterisk. The sites listed in **Table 3-12** are described below.

CA-Sac-15/H. This site, near the Sacramento River east levee south of I-5, consists of a prehistoric occupation midden mound with a concentration of debitage, flaked stone tools, shell artifacts, faunal remains, fire-cracked rock, and baked clay objects. The mound has been heavily affected by farming and ranching activities. There is a ranch complex including a bunkhouse, garden, shed, chicken coop, water tower, garage, and driveway on the mound; historic debris on the site includes glass and broken ceramic fragments.

A limited auger testing program was carried out west of the mound along the Sacramento River east levee and found no cultural materials along that transect (Bouey and Herbert 1990).

Table 3-12
Cultural Resources in the Sacramento County Portion of the Project Area

Trinomial	P-No.	Historic/ Prehistoric	Description	Date Recorded	Quadrangle	NRHP/CRHR Evaluation, If Known
CA-Sac-15/H	34-000042	Both	Occupation mound with historic debris	1934, 1990, 1993	Taylor Monument	
CA-Sac-16/H	34-000043	Both	Occupation/burial mound with historic debris and foundations	1934, 1966, 1984, 1987, 1990, 1993	Taylor Monument	Potentially eligible
CA-Sac-17	34-000044	Prehistoric	May have been destroyed	1934, 1990	Taylor Monument	
CA-Sac-18	34-000045	Prehistoric	Lithic scatter	1934, 1994	Taylor Monument	
CA-Sac-160/H	34-000187	Both	Occupation/burial mound with historic farm	1947, 1949, 1994	Taylor Monument	
CA-Sac-164	34-000191	Prehistoric	Occupation/burial site nominated to NRHP	1972, 1982, 1988, 1989, 1990, 1991, 2001–2007	Sacramento West	Eligible
CA-Sac-430H	34-000457	Historic	West drainage canal	1991, 1993, 1997	Taylor Monument	
CA-Sac-485/H*	34-000512	Both	Occupation mound and historic home site	1994	Taylor Monument	Potentially eligible
CA-Sac-486H*	34-000513	Historic	Historic home site	1994	Taylor Monument	
CA-Sac-487H*	34-000514	Historic	Historic debris and vegetation	1994	Taylor Monument	
CA-Sac-488H*	34-000515	Historic	Historic debris and vegetation	1994	Taylor Monument	
CA-Sac-489H*	34-000516	Historic	Historic debris and vegetation	1994	Taylor Monument	
CA-Sac-490H	34-000517	Historic	Historic debris and vegetation	1994	Taylor Monument	
CA-Sac-491H	34-000518	Historic	Historic debris and vegetation	1994	Taylor Monument	
CA-Sac-492H	34-000519	Historic	Historic well, pipes and vegetation	1994	Taylor Monument	
CA-Sac-493H	34-000520	Historic	Historic debris	1994	Taylor Monument	
CA-Sac-494H	34-000521	Historic	Historic debris	1994	Taylor Monument	
CA-Sac-569H	34-000741	Historic	Paved road	1994, 1998	Taylor Monument, Rio Linda	
CA-Sac-836H*	34-001354	Historic	Farm complex	2005	Taylor Monument	Not eligible
	34-000883	Historic	Paved road	1998	Taylor Monument	
	34-000884	Historic	Paved road	1998	Taylor Monument	
	34-000886	Historic	Paved road	1998	Rio Linda, Taylor Monument	
	34-001552	Historic	House	2002	Taylor Monument	
	34-001557*	Historic	Pumping plant	2006	Taylor Monument	
	34-001558*	Historic	Pumping plant	2006	Taylor Monument	
	34-001559*	Historic	Pumping plant	2006	Taylor Monument	
NLIP-1*		Historic	Lean-to and shed	2007	Taylor Monument	Not eligible
NLIP-2*		Historic	Historic debris scatter	2007	Taylor Monument	Not eligible

Note: Sites that would be or may be affected by elements of the 2008 construction phase are marked with an asterisk.
Source: Data provided by EDAW in 2007

CA-Sac-16/H (P-34-000043). CA-Sac-16/H is in the Airport bufferlands south of the Airport Operations Area. This site has been variously called the Bennett Mound, Mound Ranch, Willey Mound, and S-16. It includes the remains of a prehistoric occupation mound, possibly the largest in the Sacramento Valley, but has been leveled in stages by agricultural activities. The site location corresponds to the ethnographic village of *Nawrean*. What remains today consists of dark midden soils in plowed fields with fragments of human remains, shell, fire-cracked rock, baked clay objects, groundstone, faunal bone, flaked stone artifacts, and debitage. A few historic artifacts, such as brick and ceramic fragments, are also present. Today, two separate loci have been identified and recorded as CA-Sac-16/H; the larger, Locus I, represents the approximate original location of the mound. Locus II is an area of redeposited soil taken from the mound in the past. There is also a historic-era component of the site from the remnants of a slaughterhouse and brick factory present before the 1930s. Historic artifacts noted include bricks, sawed mammal bone, a filled-in privy, bottles, ceramic and metal fragments, and glass.

The site was originally described as very large, up to 7 acres in area, and 20 feet high. The earliest investigations were conducted in 1923 by Zallio, who excavated at the site a number of times and recovered projectile points, bone tools, Haliotis ornaments, and other artifacts (Bouey, Berg, and Hunter 1991). It was first formally recorded in 1934 by Heizer, who identified it as a large mound with stone artifacts and freshwater shell on the surface. Sacramento Junior College excavated pits and trenches up to 18 feet deep in 1936–1937. The main focus of this effort was on recovery of mortuary remains; however, considerable quantities of nonburial associated artifacts were also documented. More excavations were conducted by Sacramento State College in 1953 and by American River College between 1966 and 1971, and more artifacts and burials were salvaged by Peak, Crew, and Gerry (1984) when what was left of the mound was leveled. At that time, Peak, Crew, and Gerry estimated that as much as 13 feet of the mound might still be present below the plowed surface. As an interesting side note—and as an indication of the original CA-Sac-16/H mound's prominence—Peak, Crew, and Gerry mention that Heinrich Schliemann (an amateur archaeologist and later the discoverer of Troy) visited the site in 1851–1852.

More recently, Bouey and Herbert (1990) completed a surface survey and excavated two auger holes at the toe of the levee that forms the western boundary of the site; they reported evidence of subsurface cultural deposits, including shell midden. Larger-scale excavations (Bouey, Berg, and Hunter 1991), dug within 100 feet of the levee toe and the ramp leading up to Garden Highway, confirmed that midden deposits still exist; however, agricultural activity seems to have destroyed any stratigraphic integrity the deposits might have had that close to the levee. It may be that Bouey and Herbert were looking strictly at redistributed mound soils.

The summary of the research done by 1991 (Bouey, Berg, and Hunter 1991) agreed with the conclusions of Derr (1983) that the site was a large, permanent habitation locus occupied from the Upper Archaic (ca. 1000 B.C.) to just after the beginning of European contact. Derr found that the upper 20–60 centimeters of soil (in the areas he examined near the levee) consisted of redistributed midden with artifacts and isolated human remains. What appears to be missing from any of these analyses is an attempt to define the original mound or to find intact elements of the site that may have been located beyond the original mound. If there are intact subsurface deposits associated with CA-Sac-16/H, then the site may be eligible for listing on the CRHR or NRHP because of the potential information contained in those deposits.

The earliest documentation, Heizer's site record form from 1934, does not give dimensions for the mound and does not contain specific enough information to provide for relocation of the original boundaries of the mound. It is presumed that the dispersed midden from the mound now covers a larger surface area than the mound used to occupy. However, it is unclear exactly how large an area that is because various investigations have reported Locus I (the larger site deposit) as measuring 110 meters by 185 meters (Bouey and Herbert 1990), 250 meters by 250 meters (Kauffman and Kauffman 1983), and 450 meters by 850 meters (Dames & Moore 1993). The Dames & Moore site record form appears to be the only one that

maps out the secondary Locus II area, northeast of the main deposit and east of a drainage ditch (as of 1993).

CA-Sac-17 (P-34-000044). This is the location of a mound site reported by Heizer in 1934 west of Fisherman's Lake; however, none of the mound remains. In 1990, Bouey and Herbert attempted to locate any cultural remains but could not find any evidence of cultural deposits on the surface or in auger holes.

CA-Sac-18 (P-34-000045). This site, landward of the Sacramento River east levee north of San Juan Road, consists of a sparse scatter of basalt debitage, one cryptocrystalline biface fragment, a polished stone, and possible fire-cracked rock. It was originally described by Heizer as a mound 30 yards in diameter and 5 feet high; however, Heizer may have misinterpreted a natural rise in the landscape as a mound. CA-Sac-18 appears to be lacking the intensive cultural deposits that are the hallmark other nearby known mound sites (Dames & Moore 1994b).

CA-Sac-160/H (P-34-000187). This is a multicomponent site near the Sacramento River east levee north of San Juan Road. It includes a prehistoric occupation mound with a farm complex situated on top. Excavations in the 1940s removed numerous burials and artifacts, including groundstone, flaked stone tools, shell beads and ornaments, fire-cracked rock, baked clay objects, stone beads, faunal remains, bone awls, bird bone tubes and whistles, obsidian drills, quartz crystals, charmstones, and historic glass trade beads, as well as historic debris related to farming and occupation of the top of the mound.

CA-Sac-164 (P-34-000191). CA-Sac-164 is a very large, deeply stratified prehistoric occupation and burial mound near Sand Cove Park on the Sacramento River that has been explored a number of times using archaeological techniques; however, in spite of these efforts, the true boundaries of the site remain unknown. The site includes shell midden with abundant cultural materials including fire-cracked rock, flaked and ground stone tools, charmstones, polished bone implements, debitage, quartz crystals, bone and shell beads, baked clay objects, and plentiful faunal remains. Large fire-cracked rock features and hearths have also been noted. Because of its significant scientific value and the integrity, CA-Sac-164 was nominated for NRHP listing in 2001.

The site was first recorded in 1951, after a newspaper article reported that human remains and stone tools were eroding out of the cutbank and into the Sacramento River. Observers who walked along the edge of the cutbank in summer and fall when the river was at its lowest noted that site deposits, interspersed with flood-deposited silt, extended at least 4 meters below the current-day surface. Excavations in the 1970s, 1980s, and 1990s confirmed the depth of intact and resource-bearing cultural strata at the site. Work on the land side of the Sacramento River levee indicated that downward-trending cultural strata might be found there as well, beginning well over a meter below the ground surface.

Annual river height fluctuation, wave action resulting from boat wakes, and looting combined to cause continual erosion and collapse of the cutbank. This resulted in artifacts and remains falling onto the beach area below, where they either washed into the river or collected by the public. To address this issue, a site stabilization program was implemented in 2005 that included placing dirt and plantings over the cutbank and creating a wave break near the river's edge of the site.

CA-Sac-430H (P-34-000457). This feature is the West Drainage Canal, a relatively unmodified canal that originates at Fisherman's Lake and flows southeast to the East and Main Drainage Canals.

CA-Sac-485/H (P-34-000512). This site, between the Sacramento River east levee and the proposed location of the relocated Elkhorn Canal, was once a prehistoric occupation and burial mound that has been leveled by agricultural activities and was documented by Dames & Moore in 1994.

The remains of a historic-era homestead, consisting mainly of ornamental vegetation, driveway, and historic debris, were noted on top of the prehistoric site. Dames & Moore archaeologists noted that the prehistoric component was large, measuring 220 meters by 160 meters with two depositional loci—a larger area near Garden Highway and a smaller deposit to the east. Prehistoric artifacts noted at the time included obsidian and basalt flakes and tools, shell beads and ornaments, faunal remains, groundstone fragments, charmstones, baked clay, imported exotic tool stone, and shell.

In August 2007, archaeologists undertook a limited shovel testing program at CA-Sac-485/H to determine whether there was an undisturbed subsurface deposit that could be affected by the proposed canal construction in the vicinity of this site. The August investigation began with a survey of the site area where a sparse assortment of artifacts was visible; because no concentrations of artifacts were identified on the surface, the Dames & Moore archaeological site map was used to guide the placement of shovel test pits (STPs). Brian Padilla, of the El Dorado Miwok, was present while the STPs were excavated.

During the course of excavations, archaeologists uncovered artifacts including obsidian and basalt flakes; clamshell disk beads; burned earth; faunal remains, including freshwater mussel shell; and fire-cracked rock. Human remains were uncovered in three of the STPs; the Sacramento County coroner and NAHC were contacted, excavation of each of those three STPs was halted immediately, and the remains were reburied where they were found. None appeared to be part of a larger, intact burial and all were found in the upper 50 centimeters of soil. (SAFCA 2007.)

In general, site soils consisted of dry compact silts with a small sand and clay content; excavation and screening were difficult because the soils were very dry and hard. If artifacts were recovered, excavation generally proceeded to 100 centimeters below surface (cmbs); where no artifacts were found, excavations terminated around 80 cmbs. A deeply buried midden layer was identified in each of the four STPs (Nos. 4, 6, 21, and 24) closest to the levee, beginning anywhere from 55 cmbs to 80 cmbs. Excavation halted at approximately 100 cmbs in these STPs without reaching the bottom of the midden deposit; a split-spoon probe was used in STP No. 21 to find the bottom of the deposit, which was reached at approximately 160 cmbs. Although the northern and southern edges of the midden deposit were not located, the STP program was halted on the assumption that a more formal testing program, using a combination of test units and additional STPs, would be implemented as part of more detailed design of the proposed project. Based on the data collected during the brief testing at CA-Sac-485/H, it appears that significant intact prehistoric deposits may be found below capping soils at the site. If this is true, CA-Sac-485/H may be eligible for listing on the CRHR or NRHP for the site's data potential.

CA-Sac-486H (P-34-000513). This site near the Sacramento River east levee south of the North Drainage Canal consists of the remains of a historic-era homestead. The structure that once stood on the site has been demolished. Remnant landscape plantings and debris consisting of ceramic fragments, bottle glass, ceramic, bricks, mortar, and metal fragments were noted. The structures were visible in a 1937 aerial photograph and were depicted on the 1967 U.S. Geological Survey topographic quadrangle map. The archaeologists who identified the site in 1994 noted that some of the trees appeared to be less than 30 years old, although a fragment of amethyst glass (generally associated with the turn of the century) was noted.

CA-Sac-487H (P-34-000514). Like CA-Sac-486H, this location near the Sacramento River east levee south of the North Drainage Canal includes historic debris, such as concrete fragments, milled lumber, metal fence posts, wire, farm machinery parts, clear and green glass, window glass, and ornamental plantings, all of which indicate that a structure existed at the site at one point but has since been demolished. Also like the previous site, a structure was visible in this location in a 1937 aerial photograph; several structures were indicated on the 1950 and 1975 topographic quadrangle maps for the area.

CA-Sac-488H (P-34-000515). This is another site near the Sacramento River east levee south of the North Drainage Canal where a structure appeared on a 1937 aerial photograph and 1950 topographic quadrangle map, although no building is on the site today. Historic debris, ornamental vegetation, and a fence line remain. The debris included various concrete fragments, corrugated metal, wire, culvert pipe, and a large section of iron pipe.

CA-Sac-489H (P-34-000516). This is another site near the Sacramento River east levee south of the North Drainage Canal where a structure appeared on a 1937 aerial photograph and 1950 topographic quadrangle map, although no building is on the site today. The associated debris includes a fenced-off well head, concrete fragments, lumber, window glass, wooden posts, galvanized pipes, old fencing overgrown by an oak tree, an enamelware bucket, tires, ceramic fragments, bottle glass, and a metal bucket. Ornamental landscaping plants were also noted.

CA-Sac-490H (P-34-000517). This site, near the south end of Powerline Road, had three structures that appeared on a 1937 aerial photograph and 1950 topographic quadrangle map, although no building is on the site today. The historic debris is similar to the debris found at sites CA-Sac-486H through CA-Sac-489H, including concrete, brick, iron piping, a fence post, bottle glass, ceramic fragments, and galvanized metal pipe, as well as remnant ornamental vegetation.

CA-Sac-491H (P-34-000518). This site, also near the south end of Powerline Road, was likely used in association with four structures that appeared on the 1950 topographic quadrangle map. The 1937 aerial photograph associated with other sites listed here includes coverage of this property; however, only trees are clearly visible in the photograph. The artifacts consist of a sparse scatter, including a wood fence, concrete fragments, bricks, and metal fence posts. Ornamental vegetation was noted nearby.

CA-Sac-492H (P-34-000519). This site, near the south end of Powerline Road, consists of a concrete-capped well, associated water pipes, and remnant ornamental vegetation and fruit trees that were likely associated with a structure visible on the 1950 topographic quadrangle map of the area. A cluster of trees is visible in the 1937 aerial photograph, but no structures are clearly visible. The site is now used to keep honeybees.

CA-Sac-493H (P-34-000520). The 1950 topographic quadrangle map and 1937 aerial photograph of the region indicate that there was once a large barn and associated structure at this location near the Sacramento River east levee south of I-5. Today, scattered historic debris—clear and colored glass, porcelain and earthenware, iron pipe, bone fragments, brick, and a white ceramic insulator—is all that remains.

CA-Sac-494H (P-34-000521). This is another site, west of Fisherman's Lake, where a structure appeared on a 1937 aerial photograph and 1950 topographic quadrangle map, although no building is present today. Associated debris documented by an archaeological team in 1994 included concrete and brick fragments, an iron water pipe, white ceramic insulators, and clear bottle glass. In addition, the archaeologists noted abundant modern debris on the site, making it difficult to distinguish between modern and historic artifacts.

CA-Sac-569H (P-34-000741). This is a segment of Del Paso Road, a two-lane paved road that extends from Powerline Road to East Levee Road. Del Paso Road likely originated as a dirt farm road and has subsequently been modernized, paved, and widened.

CA-Sac-836H (P-34-001354). This resource, located near the Sacramento River east levee south of Elverta Road, consists of the Yuki Pear Farm complex with a relocated ranch house, a 1930s barn, a 1940s bunkhouse/workshop/garage, a 1960s bunkhouse, a 1974 residence, and a mid-1970s barn. A 1903

map shows the Farmers and Merchants Bank as the property owners; no improvements were listed on any maps in the next several years. By 1939, the property belonged to the California Trust and Savings Band; it later was owned by Thomas and Nancy McDermott. The McDermotts sold the land to A. R. Galloway, who never lived on the property but rented it to Masami Yuki as a tenant farmer. The Yuki family originally grew asparagus at the farm but switched to tomatoes in 1968 and planted the pear orchard in 1969.

P-34-000883H. This is El Centro Road, a north-south, paved two-lane road that dates to the period before 1921. It runs between I-80 to the south and Bayou Road to the north. It is likely that this was originally a dirt farm road that has been paved a number of times.

P-34-000884H. This is San Juan Road, an east-west, paved two-lane road that dates to the period before 1921. It runs between I-80 and the Sacramento River east levee. It is likely that this was originally a dirt farm road that has been paved a number of times in the past.

P-34-000886H. This is Elkhorn Boulevard, an east-west, paved two-lane road that dates to the period before 1921. It runs between the Sacramento River east levee and the NEMDC/Steelhead Creek. It is likely that this was originally a dirt farm road that has been paved a number of times in the past.

P-34-001552H. This site includes a 1950s-era house and shed, surrounded by a chain link fence. The house is located along Garden Highway, near the northern Sacramento County line.

P-34-001557H. This structure is a concrete valve tank associated with the Prichard Lake Pumping Plant at the end of the North Drainage Canal.

P-34-001558H. This resource consists of a concrete-lined sump 50 feet long and 25 feet wide associated with the Prichard Lake Pumping Plant.

P-34-001559H. This is a concrete pad near the P-34-001558H sump. It is also associated with the Prichard Lake Pumping Plant.

NLIP-1. This site was found near the Sacramento River east levee south of Riego Road during the project surveys. It lies in a dense cluster of trees, poison oak, and blackberry brambles and consists of the dilapidated remains of a lean-to and shed. Modern debris noted in the area between the two structures included white earthenware, tires, glass, window blinds, clear and brown bottle glass, corrugated metal sheets, and rusted metal objects. None of the site components appeared to be more than 40–50 years old. This site did not appear to contain values that would make it eligible for listing on the CRHR or NRHP.

NLIP-2. This site, found during the project surveys along the Sacramento River east levee north of Elverta Road, consists of a small historic debris scatter noted in a dirt farm road east of the Sacramento River east levee and a drainage ditch. It appears to contain a mix of modern debris and a fragment of amethyst glass. It is presumed that this deposit was relocated from one of the nearby farm sites. The mixture of historic and modern debris and the location in an area disturbed by levee, ditch, and road construction all indicate that this site does not retain sufficient integrity to make it eligible for listing on the CRHR or NRHP.

3.3.11 Paleontological Resources

Paleontological resources (fossils) are the remains or traces of prehistoric animals and plants that are 10,000 years old or older.

3.3.11.1 Regional Geology. The project area is located in the Sacramento Valley portion of the Great Valley Geomorphic Province and the transition between the valley and the Sierra Nevada foothills. The Great Valley is composed of thousands of feet of sedimentary deposits that have undergone periods of subsidence and uplift over millions of years. During the Jurassic and Cretaceous periods of the Mesozoic era, the Great Valley existed in the form of an ancient ocean. By the end of the Mesozoic, the northern portion of the Great Valley began to fill with sediment as tectonic forces caused uplift of the basin. By the time of the Miocene epoch, approximately 24 million years ago, sediments deposited in the Sacramento Valley were mostly of terrestrial origin.

Most of the surface of the Great Valley is covered with Recent (i.e., Holocene, 10,000 years Before Present [B.P.] to present day) and Pleistocene (i.e., 10,000–1,800,000 years B.P.) alluvium. This alluvium is composed of sediments from the Sierra Nevada to the east and the Coast Range to the west that were carried by water and deposited on the valley floor. Siltstone, claystone, and sandstone are the primary types of sedimentary deposits.

3.3.11.2 Rock Units in the Project Area and Their Potential to Contain Paleontological Resources. The rock formations of the project area are shown in **Plate 31**.

Holocene Alluvium. Sediments adjacent to the Sacramento and American Rivers are composed of Recent (Holocene) alluvial floodplain deposits (Wagner et al. 1987). In general, these deposits consist primarily of unconsolidated sand and silt. Holocene alluvial deposits overlay an older alluvial fan system composed of Pleistocene-age sediments. Construction activities that would occur within alluvial floodplain or basin deposits would be located within Holocene sediments. By definition, sediments associated with Holocene-age alluvium are too young to contain paleontologically sensitive resources.

Riverbank and Modesto Formations. Piper et al. (1939) were the first to publish detailed geologic maps in the southern Sacramento/northern San Joaquin Valley areas, and they designated the older alluvial Pleistocene deposits as the Victor Formation. However, Davis and Hall (1959) proposed a subdivision of the Victor Formation into the Turlock Lake (oldest), Riverbank (middle), and Modesto (youngest) formations. Marchand and Allwardt (1981) proposed that the name Victor Formation be abandoned and that the Turlock Lake, Riverbank, and Modesto Formations be adopted as formal nomenclature for Quaternary deposits in the Sacramento and San Joaquin Valleys. Most later researchers have followed this recommendation.

In the Sacramento Valley, the Modesto Formation is composed of alluvial terraces, some alluvial fans, and some abandoned channel ridges of the Sacramento River. The Modesto Formation can be divided into upper and lower members. The upper member is composed primarily of unconsolidated, unweathered, coarse sand and sandy silt. The age of this member has been placed at approximately 12,000–26,000 years B.P. (Atwater cited in Helley and Harwood 1985). The lower member of the Modesto Formation is composed of consolidated, slightly weathered, well-sorted silt and fine sand, silty sand, and sandy silt. Age estimates for the lower member range from 29,000 to 42,000 years BP (Marchand and Allwardt 1981, cited in Helley and Harwood 1985).

Sediments in the Riverbank Formation consist of weathered reddish gravel, sand, and silt that form alluvial terraces and fans. In the Sacramento Valley, this formation tends toward soil-profile developments that are more easily distinguishable from the Modesto Formation (Helley and Harwood 1985). The Riverbank Formation is Pleistocene in age (Wagner et al. 1987), but it is considerably older than the Modesto Formation; estimates place the age of the Riverbank between 130,000 and 450,000 years B.P. (Helley and Harwood 1985). The Riverbank Formation forms alluvial fans and terraces of the Sacramento River. The Riverbank's fans and terraces are higher in elevation and generally have a more striking topography than those formed by the Modesto Formation.

Remains of land mammals have been found at a number of localities in alluvial deposits referable to the Riverbank and Modesto Formations. Jefferson (1991a, 1991b) compiled a database of California Late Pleistocene vertebrate fossils from published records, technical reports, unpublished manuscripts, information from colleagues, and inspection of museum paleontological collections at more than 40 public and private institutions. Jefferson lists three nearby sites in Sutter County that have yielded Rancholabrean vertebrate fossils recovered from Pleistocene-age sediments. In addition, the University of California, Berkeley Museum of Paleontology (UCMP) Database lists several localities in the project area where fossils were recovered from sediments referable to the Riverbank Formation or the Modesto Formation.

There are at least eight recorded Rancholabrean-age vertebrate fossil sites from the Riverbank Formation within the Sacramento city limits (Hilton et al. 2000, UCMP 2006, Kolber 2004). These sites have yielded remains of mammoth, bison, coyote, horse, camel, antelope, several types of reptiles, and Harlan's ground sloth.

Fossil specimens from the Riverbank and Modesto Formations have been reported by Marchand and Allwardt (1981) near their type localities in the cities of Riverbank and Modesto, respectively. Other locations are also known throughout the northern and central valley (UCMP 2006). For example, there are several sites approximately 20–30 miles away in Yolo County, near the cities of Davis and Woodland, that have yielded Rancholabrean-age rodents, snakes, horses, antelope, Harlan's ground sloth, mammoth, and saber-toothed tiger from sediments referable to the Riverbank or Modesto Formations (Hay 1927, UCMP 2006).

As shown in **Plate 31**, the project area and portions of the RD 1001 borrow site contain areas of both the Modesto Formation and the Riverbank Formation.

3.3.12 Transportation and Circulation

The roadways in the project area are described in **Table 3-13** and shown in **Plate 2**.

All the roadways north of I-5 in the vicinity of the project sites and borrow areas are rural two-lane roads with low traffic volumes. Below I-5, nearer to and within the city of Sacramento, the roads are also two-lane roadways but have higher use. Data on traffic volumes are available for only a few of the roadways listed above. The use of some of these roadways can also be characterized in terms of Level of Service (LOS). LOS is a qualitative description of operation of a roadway segment based on delay and maneuverability that is often calculated by counties' congestion management agencies. It can range from "A," representing free-flow conditions, to "F," representing gridlock (**Table 3-14**).

The *Sutter County General Plan Background Report* (Sutter County 1996) contains the most recent traffic count and LOS data for roadways in the northern part of the Natomas Basin. In the general plan background report, Garden Highway between Sankey Road and Riego Road was rated LOS A, with an average daily traffic (ADT) volume of 340. SR 99/70 was rated LOS C with an ADT volume of 22,000. Riego Road was rated at LOS A with an ADT volume of 540, and Sankey Road was rated LOS A with an ADT volume of 440. LOS data were not available for the Natomas Basin portion of unincorporated Sacramento County. However, given that similar land uses exist south of the Sutter County line and west of SR 99/70, traffic volumes and conditions are expected to be similar.

Table 3-13 Project Area Roadway Network	
Roadways	**Description**
SR 99/70	SR 99/70 is a primary regional transportation corridor within Sutter County and supports north-south regional travel. SR 99 extends from I-5 in the project area north through Sacramento and Sutter Counties to the Butte County line. The roadway has two to four lanes over its length and provides regional access to the Sacramento metropolitan area in the south and the cities of Gridley and Chico in the north. SR 70 serves as the north-south regional travel corridor providing connection to Butte County to the north and Sacramento County to the south. SR 70 is a two-lane roadway that extends from the Yuba County line in the north, south to a junction with SR 99. At the junction with SR 99, SR 70 continues south as SR 99/70 to the Sacramento County line. The roadway provides regional access to the cities of Sacramento and Marysville.
I-5	I-5 is a primary regional transportation corridor within Sacramento County, providing connection between the city and county of Sacramento and Yolo County. It provides primary access to the Airport just west of Powerline Road.
I-80	I-80 is a primary regional transportation corridor within the city and county of Sacramento, intersecting I-5 just south of San Juan Road.
Garden Highway	Garden Highway is a north/south two-lane roadway that extends north from the Sacramento city limits along the Sacramento River to Yuba City. Garden Highway serves as an alternative north/south route to SR 99.
Howsley Road	Howsley Road is an east/west two-lane roadway that intersects SR 99/70 at the NCC and crosses the PGCC and connects with Pleasant Grove Road just west of the Sutter/Placer County line.
Natomas Road	Natomas Road is a north/south two-lane roadway on top of the west levee of the PGCC in Sutter County. It extends south from Howsley Road and becomes East Levee Road between Riego Road and West Elverta Road.
Pacific Avenue	Pacific Avenue is a north/south two-lane roadway that extends from Striplin Road to Howsley Road in Sutter County.
Powerline Road	Powerline Road is a north/south two-lane roadway that parallels SR 99/70, providing an alternate north/south route to Garden Highway and SR 99/70 from Sankey Road in Sutter County to Garden Highway in Sacramento County.
Riego Road	Riego Road is an east/west two-lane roadway extending from Garden Highway in Sutter County to Base Line Road in Placer County.
Sankey Road	Sankey Road is an east/west two-lane roadway in Sutter County that extends from Garden Highway east across SR 99/70.
Striplin Road	Striplin Road is an east/west two-lane roadway that extends from Garwood Road to Pacific Avenue in Sutter County.
West Elverta Road	West Elverta Road is an east/west two-lane roadway in Sacramento County at the north/south midpoint of the Natomas Basin that extends from Garden Highway east across SR 99/70.
Elkhorn Boulevard	Elkhorn Boulevard is an east/west two-lane roadway in Sacramento County between Powerline Road and SR 99/70 and extending into the city of Sacramento to the east.
West Elkhorn Boulevard	West Elkhorn Boulevard is an east/west two-lane roadway in Sacramento County that extends from Garden Highway to west of Sacramento International Airport.
Del Paso Road	Del Paso Road is an east/west two- to four-lane roadway that extends eastward across the basin from Powerline Road in Sacramento County across I-5 to the NEMDC/Steelhead Creek in the city of Sacramento.
San Juan Road	San Juan Road is an east/west two-lane roadway that connects the Garden Highway in Sacramento County to I-5 and the city of Sacramento.
El Centro Road	El Centro Road is a north/south two- to four-lane roadway in Sacramento County and the city of Sacramento that extends south from Del Paso Road to West El Camino Avenue.
West El Camino Avenue	West El Camino Avenue is an east/west four-lane roadway in the city of Sacramento that connects I-5 with El Centro Road.
Notes: I-5 = Interstate 5; I-80 = Interstate 80; NCC = Natomas Cross Canal; NEMDC = Natomas East Main Drainage Canal; PGCC = Pleasant Grove Creek Canal; SR = State Route	

Table 3-14 Level of Service Descriptions	
LOS	**Description**
A	Free-flow travel with an excellent level of comfort and convenience and the freedom to maneuver.
B	Stable operating conditions, but the presence of other road users causes a noticeable, though slight, reduction in comfort, convenience, and maneuvering freedom.
C	Stable operating conditions, but the operation of individual users is substantially affected by the interaction with others in the traffic stream.
D	High-density, but stable flow.
E	Operating conditions at or near capacity. Speeds are reduced to a low but relatively uniform value. Freedom to maneuver is difficult with users experiencing frustration and poor comfort and convenience. Unstable operation is frequent, and minor disturbances in traffic flow can cause breakdown conditions. Severe restriction in speed and freedom to maneuver, with poor levels of comfort and convenience.
F	Breakdown conditions. These conditions exist wherever the volume of traffic exceeds the capacity of the roadway. Long queues can form behind these bottleneck points with queued traffic traveling in a stop-and-go fashion.
Source: City of Sacramento 2005	

The most recent annual traffic counts performed for select roadways by Sacramento County Department of Transportation (August 17 and 18, 2006) show the daily traffic volume on Powerline Road north of Elverta Road to be between 250 and 270 in each direction (Sacramento County 2007a). Data on other Sacramento County roads in the project area are not available.

City of Sacramento traffic count data (City of Sacramento 2005) indicate an average one-way ADT of 381 on San Juan Road between El Centro Road and Garden Highway (April 2003 data). The *City of Sacramento General Plan Background Report* (City of Sacramento 2005) and the July 2006 Draft Environmental Impact Report for the Greenbriar Development Project (City of Sacramento and Sacramento LAFCo 2006) contain LOS data for roadways for the portions of the southern Natomas Basin that are within Sacramento's city limits and sphere of influence. The City of Sacramento regards LOS C as unacceptable. Elkhorn Boulevard west of the SR 99/70 interchange operates at LOS A. San Juan Road, West El Camino Avenue, and Garden Highway are shown as operating at LOS A through LOS C, depending on time of day. Segments of I-80, I-5, and SR 99/70 operate at LOS D or below during commute hours, with heavy traffic occurring during the morning hours in the direction of job centers (e.g., downtown Sacramento) and in the afternoon/evening hours in the opposite direction. According to the Sacramento International Airport Master Plan EIR (Sacramento County 2007b), I-5 between Airport Boulevard in Sacramento County and County Road 22 on the Yolo County side of the Sacramento River operates at LOS B or C in both directions during peak hours.

3.3.13 Air Quality

The project area is located within the southern portion of the Sacramento Valley Air Basin (SVAB), which comprises all of Butte, Colusa, Glenn, Sacramento, Shasta, Sutter, Tehama, Yolo, and Yuba Counties, the western portion of Placer County, and the eastern portion of Solano County. Air quality within the project area is regulated by the U.S. Environmental Protection Agency (EPA), California Air Resources Board (ARB), the Feather River Air Quality Management District (FRAQMD) (Sutter County portion of the project area), and the Sacramento Metropolitan Air Quality Management District

(SMAQMD) (Sacramento County portion of the project area). Each of these agencies develops rules, regulations, policies, and/or goals to comply with applicable legislation. Although EPA regulations may not be superseded, both state and local regulations may be more stringent than EPA regulations. Ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM), and lead are the most prevalent air pollutants known to be deleterious to human health. These pollutants are commonly referred to as "criteria air pollutants." Ozone, typically associated with poor air quality, is not emitted directly into the air, but is formed through a series of chemical reactions between reactive organic gases (ROG) and oxides of nitrogen (NO_X) in the presence of sunlight. Motor vehicles and stationary industrial sources are major sources of emissions of both ROG and NO_X, which are also referred to as ozone precursors.

Air pollutant concentrations are measured at several monitoring stations in the SVAB. The Sacramento–3801 Airport Road station is the closest monitoring station to the levee improvement sites with data to meet EPA and ARB criteria for quality assurance for all criteria pollutants, except for fine particulate matter ($PM_{2.5}$). The Yuba City air quality monitoring station on Almond Street is the closest monitoring station with $PM_{2.5}$ data. In general, the ambient air quality measurements from these monitoring stations are representative of the air quality in the project area.

Table 3-15 summarizes the air quality data from this monitoring station for the latest three years for which data are available, 2004–2006. Both ARB and EPA use the type of monitoring data provided in **Table 3-15** to designate areas according to attainment status for criteria air pollutants established by the agencies. The purpose of these designations is to identify those areas with air quality problems and thereby initiate planning efforts for improvement. The three basic designation categories are "nonattainment," "attainment," and "unclassified." The "unclassified" designation is used in an area that cannot be classified on the basis of available information as meeting or not meeting the standards. In addition, the California designations include a subcategory of the nonattainment designation, called "nonattainment-transitional." The nonattainment-transitional designation is given to nonattainment areas that are progressing and nearing attainment. **Table 3-16** summarizes the attainment status for criteria air pollutants for Sutter and Sacramento Counties.

3.3.14 Noise

3.3.14.1Sound and the Human Ear. Noise is generally defined as sound that is loud, disagreeable, or unexpected. Sound, as described in more detail below, is mechanical energy transmitted in the form of a wave due to a disturbance or vibration. Because of the ability of the human ear to detect a wide range of sound pressure fluctuations, sound pressure levels are expressed in logarithmic units called decibels (dB). The sound pressure level in decibels is calculated by taking the log of the ratio between the actual sound pressure and the reference sound pressure squared. The reference sound pressure is considered the absolute hearing threshold (Caltrans 1998).

Because the human ear is not equally sensitive to all sound frequencies, a specific frequency-dependent rating scale was devised to relate noise to human sensitivity. An "A-weighted" decibel (dBA) scale performs this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear. The basis for compensation is the faintest sound audible to the average ear at the frequency of maximum sensitivity. This dBA scale has been adopted by most authorities for the purpose of regulating environmental noise. Typical indoor and outdoor noise levels are presented in **Plate 32**.

Table 3-15 Summary of Annual Air Quality Data			
	2004	**2005**	**2006**
Sacramento–3801 Airport Road			
Ozone			
State standard (1-hour/8-hour avg., 0.09/0.07 ppm)			
National standard (8-hour avg., 0.08 ppm)			
Maximum concentration (1-hour/8-hour avg., ppm)	0.090/0.072	0.100/0.087	0.105/0.086
Number of days state standard exceeded	0	4	5
Number of days national 8-hour standard exceeded	0	1	1
Respirable Particulate Matter (PM_{10})			
State standard (24-hour avg., 50 $\mu g/m^3$)			
National standard (24-hour avg., 150 $\mu g/m^3$)			
Maximum concentration ($\mu g/m^3$)	87.1	99.8	84.0
Number of days state standard exceeded	12	25	4
Number of days national standard exceeded	0	0	0
Nitrogen Dioxide (NO_2)			
State standard (1-hour avg., 0.18 ppm)			
National standard (annual, 0.053 ppm)			
Maximum concentration ($\mu g/m^3$) (1-hour avg., ppm)	0.082	0.074	0.072
Number of days state standard exceeded	0	0	0
Carbon monoxide (CO)			
State standard (1-hour/8-hour avg., 20/9.1 ppm)			
National standard (1-hour/8-hour avg., 35/9.5 ppm)			
Maximum concentration (1-hour/8-hour avg., ppm)	4.00/3.53	3.90/2.97	4.70/3.15
Number of days state standard exceeded	0	0	0
Number of days national 1-hour/8-hour standard exceeded	0/0	0/0	0/0
Yuba City–Almond Street Monitoring Station			
Fine particulate matter ($PM_{2.5}$)			
No separate state standard			
National standard (24-hour avg., 35 $\mu g/m^3$)			
Maximum concentration ($\mu g/m^3$)	41.0	47.2	51.6
Number of days national standard exceeded	0	0	0

Notes: $\mu g/m^3$ = micrograms per cubic meter; NA = not available; ppm = parts per million by volume
Sources: ARB 2007, EPA 2007

Table 3-16
Ambient Air Quality Standards and Attainment Status Designations for Sutter and Sacramento Counties

Pollutant	Averaging Time	California		National Standards [1]		
		Standards [2,3]	Attainment Status [4]	Primary [3,5]	Secondary [3,6]	Attainment Status [7]
Ozone	1-hour	0.09 ppm (180 μg/m^3)	N (Serious)	–	–	NA
	8-hour	0.07 ppm[8] (137 μg/m^3)	Sutter: N Sacramento: N (Serious)	0.08 ppm (157 μg/m^3)	Same as Primary Standard	Sutter: N (Severe) Sacramento: N (Serious)
Carbon Monoxide (CO)	1-hour	20 ppm (23 mg/m^3)	A	35 ppm (40 mg/m^3)	–	Sutter: – Sacramento: A
	8-hour	9 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)		
Nitrogen Dioxide (NO_2)[9]	Annual Arithmetic Mean	0.030 ppm (56 μg/m^3)	A	0.053 ppm (100 μg/m^3)	Same as Primary Standard	Sutter: U/A Sacramento: A
	1-hour	0.18 ppm (338 μg/m^3)		–		
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	–	–	0.030 ppm (80 μg/m^3)	–	Sutter: U/A Sacramento: A
	24-hour	0.04 ppm (105 μg/m^3)	A	0.14 ppm (365 μg/m^3)	–	
	3-hour	–	–	–	0.5 ppm (1300 μg/m^3)	
	1-hour	0.25 ppm (655 μg/m^3)	A	–	–	–
Respirable Particulate Matter (PM_{10})	Annual Arithmetic Mean	20 μg/m^3	N	– [10]	Same as Primary Standard	Sutter: U Sacramento: N (Moderate)
	24-hour	50 μg/m^3		150 μg/m^3		
Fine Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	12 μg/m^3	Sutter: U Sacramento: N	15 μg/m^3	Same as Primary Standard	Sutter: N (Proposed) Sacramento: A/U
	24-hour	–		35 μg/m^3		
Lead	30-day Average	1.5 μg/m^3	A	–	–	Sutter: – Sacramento: A
	Calendar Quarter	–	–	1.5 μg/m^3	Same as Primary Standard	
Sulfates	24-hour	25 μg/m^3	A	**No National Standards**		
Hydrogen Sulfide	1-hour	0.03 ppm (42 μg/m^3)	U			
Visibility-Reducing	8-hour	Extinction coefficient of 0.23 per kilometer —	U			

Table 3-16
Ambient Air Quality Standards and Attainment Status Designations for Sutter and Sacramento Counties

Pollutant	Averaging Time	California		National Standards [1]		
		Standards [2,3]	Attainment Status [4]	Primary [3,5]	Secondary [3,6]	Attainment Status [7]
Particle Matter		visibility of 10 miles or more (0.07—30 miles or more for Lake Tahoe) because of particles when the relative humidity is less than 70%.				

[1] National standards (other than ozone, PM, and those based on annual averages or annual arithmetic means) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration in a year, averaged over 3 years, is equal to or less than the standard. The PM_{10} 24-hour standard is attained when 99% of the daily concentrations, averaged over 3 years, are equal to or less than the standard. The $PM_{2.5}$ 24-hour standard is attained when 98% of the daily concentrations, averaged over 3 years, are equal to or less than the standard. Contact the EPA for further clarification and current federal policies.

[2] California standards for ozone, CO (except Lake Tahoe), SO_2 (1- and 24-hour), NO_2, PM, and visibility-reducing particles are values that are not to be exceeded. All others are not to be equaled or exceeded. California Ambient Air Quality Standards (CAAQS) are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

[3] Concentration expressed first in units in which it was promulgated (i.e., parts per million [ppm] or micrograms per cubic meter [$\mu g/m^3$]). Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

[4] Unclassified (U): a pollutant is designated unclassified if the data are incomplete and do not support a designation of attainment or nonattainment.
Attainment (A): a pollutant is designated attainment if the state standard for that pollutant was not violated at any site in the area during a 3-year period.
Nonattainment (N): a pollutant is designated nonattainment if there was a least one violation of a state standard for that pollutant in the area.
Nonattainment/Transitional (NT): is a subcategory of the nonattainment designation. An area is designated nonattainment/transitional to signify that the area is close to attaining the standard for that pollutant.

[5] National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health.

[6] National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

[7] Nonattainment (N): any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant.
Attainment (A): any area that meets the national primary or secondary ambient air quality standard for the pollutant.
Unclassifiable (U): any area that cannot be classified on the basis of available information as meeting or not meeting the national primary or secondary ambient air quality standard for the pollutant.

[8] This concentration effective May 17, 2006.

[9] The CAAQS were amended on February 22, 2007, to lower the 1-hour standard to 0.18 ppm and establish a new annual standard of 0.03 ppm. These changes become effective after regulatory changes are submitted and approved by the Office of Administrative Law, expected later this year.

[10] Because of a lack of evidence linking health problems to long-term exposure to coarse particle pollution, EPA revoked the annual PM_{10} standard on September 21, 2006.

Sources: Feather River Air Quality Management District 2008; Sacramento Metropolitan Air Quality Management District 2008; California Air Resources Board 2008a, 2008b; U.S. Environmental Protection Agency 2008.

Because the decibel scale is logarithmic, sound levels measured in decibels are not additive. For example, a 65-dBA source of sound, such as a truck, when joined by another 65-dBA source results in sound amplitude of 68 dBA, not 130 dBA (i.e., doubling the source strength increases the sound pressure by 3 dBA). Amplitude is interpreted by the ear as corresponding to different degrees of loudness. Laboratory measurements correlate a 10-dBA increase in amplitude with a perceived doubling of loudness and establish a 3-dBA change in amplitude as the minimum difference perceptible to the average person (Caltrans 1998).

3.3.14.2 Sound Propagation. As sound (or noise) propagates from the source to the receptor, the attenuation, or manner of noise reduction in relation to distance, depends on surface characteristics, atmospheric conditions, and the presence of physical barriers. The inverse square law describes the attenuation caused by the pattern of sound traveling from the source to the receptor. Sound travels uniformly outward from a point source in a spherical pattern with an attenuation rate of 6 dBA per doubling of distance. However, from a line source (e.g., a road), sound travels uniformly outward in a cylindrical pattern with an attenuation rate of 3 dBA per doubling of distance. The surface characteristics between the source and the receptor may result in additional sound absorption and/or reflection. Atmospheric conditions such as wind speed, temperature, and humidity may affect noise levels.

Furthermore, the presence of a barrier between the source and the receptor may also attenuate noise levels. The actual amount of attenuation depends on the barrier size and frequency of the noise. A noise barrier may be any natural or human-made feature such as a hill, tree, building, wall, or berm (Caltrans 1998).

3.3.14.3 Noise Descriptors. The selection of a proper noise descriptor for a specific source depends on the spatial and temporal distribution, duration, and fluctuation of the noise. The noise descriptors most often encountered when dealing with traffic, community, and environmental noise are defined below (Caltrans 1998, Lipscomb and Taylor 1978).

- **L_{max} (Maximum Noise Level):** The maximum instantaneous noise level during a specific period of time. The L_{max} may also be referred to as the "peak (noise) level."

- **L_{min} (Minimum Noise Level):** The minimum instantaneous noise level during a specific period of time.

- **L_X (Statistical Descriptor):** The noise level exceeded X% of a specific period of time. The L_{50} is the noise level exceeded 50% of the time, for example.

- **L_{eq} (Equivalent Noise Level):** The energy mean (average) noise level. The instantaneous noise levels during a specific period of time in dBA are converted to relative energy values. From the sum of the relative energy values, an average energy value is calculated, which is then converted back to dBA to determine the L_{eq}.

- **L_{dn} (Day-Night Noise Level):** The 24-hour L_{eq} with a 10-dBA "penalty" for the noise-sensitive hours between 10:00 p.m. and 7:00 a.m. In calculating the L_{dn}, 10 dBA is added to each noise event occurring in the nighttime hours, resulting in a higher reported sound level than would occur without the penalty. The L_{dn} is intended to account for the fact that noise during this specific period of time is a potential source of disturbance with respect to normal sleeping hours.

- **CNEL (Community Noise Equivalent Level):** The CNEL is similar to the L_{dn} described above, but with an additional 5-dBA "penalty" for the noise-sensitive hours between 7:00 p.m. to 10:00 p.m., which are typically reserved for relaxation, conversation, reading, and television. If the same 24-hour noise data are used, the CNEL is typically approximately 0.5 dBA higher than the L_{dn}.

3.3.14.4 Existing Noise Conditions and Noise-Sensitive Land Uses in the 2008 Construction Phase Area. The major elements of the 2008 construction phase include the NCC south levee improvements; construction of the adjacent setback levee along Sacramento River east levee Reaches 1–4B, cutoff walls in Reaches 2–3, and seepage berms in Reaches 4A–4B; and construction of the relocated Elkhorn Canal and the new GGS/Drainage Canal between the North Drainage Canal and Elkhorn Reservoir. The area consists primarily of rural/agricultural land uses and residential uses located adjacent to the existing levee system.

A few noise-sensitive residential uses and an Arabian horse training ranch are located along Howsley Road east of SR 99/70 adjacent to, and south of, the NCC construction area (**Plate 20a**). Noise-sensitive land uses adjacent to the Sacramento River east levee area are Verona Village Resort on the water side of the levee at the west end of the NCC; residential uses located along the water side of the levee to the west of the construction area; and a few homes near the east levee in Reach 2 and farther east along Reach 4A (**Plate 20b**). Some waterside residences along the Sacramento River east levee are located within 150 feet of the construction area and some residences east of the Reach 4A construction area are located within approximately 700 feet. The residences in Sacramento River east levee Reach 2 and all but one residence at the east end of the NCC would be removed or relocated farther from the levee system before construction would take place in these areas.

Vehicle traffic, Airport operations, and agricultural activities are the primary noise sources in these areas. The major roadways in the area are SR 99/70, Garden Highway, Powerline Road, Riego Road, and West Elverta Road.

3.3.14.5 Existing Noise Conditions and Noise-Sensitive Land Uses in the 2009 and 2010 Construction Phase Areas. The major elements of the 2009 and 2010 construction phases include construction of the adjacent setback levee and of cutoff walls and seepage berms where needed along the Sacramento River east levee in Reaches 5A–20A, completion of the Elkhorn Canal relocation and the new GGS/Drainage Canal below Elkhorn Reservoir, construction of the replacement Riverside Canal, Airport West Ditch improvements, reconstruction of Pumping Plant No. 2, and PGCC west levee improvements. Existing noise sources in the construction areas include traffic on area roadways, aircraft flyovers and other Airport noise sources, railroad operations, machinery and activities associated with commercial and industrial uses, and miscellaneous sources within residential communities. The most substantial roadway traffic source within the area is vehicle traffic along I-5, I-80, and SR 99/70. Arterial roadways and stationary sources have a localized influence on the noise environment.

3.3.15 Recreation

The NCC and the PGCC are not considered recreational resources. The width and depth of these channels do not accommodate water-based recreation. The north and south levees of the NCC are owned and maintained by RD 1001 and RD 1000, respectively. RD 1000 also owns the PGCC west levee. These levees are used by the public for passive recreational activities such as walking and jogging. There are no recreational facilities adjacent to these levees.

The Sacramento River is a popular location for both water-related and land-based recreation. Recreational boating is one of the primary uses of the Sacramento River in the project area. Marinas and boat launches

in the project area are accessible from the land side of the levee only from Garden Highway. Land-based activities such as camping, picnicking, and shoreline fishing also occur in limited areas along the Sacramento River in and near the project area. Several parks and two golf courses are located in the project area. **Table 3-17** lists private and public marinas/boat launches, city and county parks, and golf courses; **Plate 33** shows their locations.

Table 3-17
Recreational Facilities In or Near the Project Area

Facility	Location	Features
Verona Marina	6955 Garden Highway, north of the NCC	Boat ramp, marina
Verona Village Resort	6995 Garden Highway	Boat ramp, picnic area, RV campground
Rio Ramaza	10000 Garden Highway	Boat ramp, marina, picnic area
Teal Bend Golf Club	7200 Garden Highway	18-hole golf course, bar and grill
The Alamar Marina	5999 Garden Highway	Boat ramp, marina, picnic area, restaurant, pub
Swabbie's at Metro Marina	5871 Garden Highway	Marina, picnic area, bar and grill
Elkhorn Boat Launch (County of Sacramento)	Garden Highway at North Bayou Road	Boat ramp and dock, picnic area
Costa Park Site (City of Sacramento)	Garden Highway and I-5	Undeveloped; planned neighborhood-serving park
Sand Cove Park (City of Sacramento)	2005 Garden Highway	Boat dock/landing, paved walkways, trails, picnic facilities
Swallows Nest Country Club	2245 Orchard Lane	Nine-hole golf course, community facility
Shorebird Park (City of Sacramento)	Kittiwake Drive and Swainson's Way	Play equipment, picnic area with shelter, lawn volleyball court
River View Marina	1801 Garden Highway	Boat ramp, marina, restaurant
Riverbank Marina	1371 Garden Highway #200	Marina, boat dock/landing, restaurant, pub
Natomas Oaks Park (City of Sacramento)	2101 Gateway Oaks Drive	Picnic area, oak preserve and interpretative center
Discovery Park (County of Sacramento)	Confluence of American and Sacramento Rivers	Boat ramp, picnic area, hiking and biking trails

Note: NCC = I-5 = Interstate 5; Natomas Cross Canal; RV = recreational vehicle
Sources: City of Sacramento Department of Parks and Recreation 2007; Sacramento County Regional Parks 2007; Sacramento River Guide 2007; Haenggi, pers. comm., 2007

3.3.16 Visual Resources

The areas along the NCC south levee and the PGCC west levee are rural and agricultural. The surrounding lands are almost entirely flat, and there are few trees in the landscape except those along the channels (i.e., on the water side of the levees), in widely spaced woodland areas along the land side of the levee, and near residences. Views of these areas lack vividness, but the visual components of the agricultural landscape are largely uninterrupted by built features. Views of the NCC south levee and PGCC west levee areas are therefore intact and unified. There are no major roadways along these

facilities, there are only a few residences from which viewers have near-distance views of the project sites, and these are not areas of recreational use or tourism. Views of these project areas are therefore of low sensitivity, and the quality of the views is low to moderate.

The potential borrow sites consist of lands under agricultural cultivation or fallowed fields, and all are adjacent to cultivated or fallowed agricultural fields or areas with similar land cover types that are managed for their habitat values. Residences are sparse in the vicinity of these sites, viewers are few, and there are no sensitive viewer groups near them.

Land uses along the Sacramento River east levee vary from rural in the north to urban in the south, as described in detail in **Table 3-1** above. The landscape of the western basin is almost entirely flat, the only topographic variation consisting of the levees and a few low rises where residences and agricultural buildings are located.

In Reaches 1–15, the area from the landside toe of the Sacramento River east levee to the Airport is largely rural and agricultural. Houses and agricultural structures are present in scattered locations along the levee system. Rows of mature trees, mainly oaks, cross the landscape in lines along parcel boundaries, and numerous individual mature trees and groves of various sizes are present along the landside levee toe and are scattered throughout the basin landscape. Where very large, mature oaks are present near Garden Highway, they often tower above all surrounding elements of the viewscape and are striking natural features both individually and as parts of overall views.

Airport facilities and arriving and departing aircraft are prominent features in the middle of the basin and in broader views of the overall landscape, and these Airport-related features contrast with the otherwise rural character of the northern and middle portion of the basin (approximately Reaches 1–13). I-5, which rises from about 2,000 feet east of the levee to cross the Sacramento River to the west, is also a dominant feature in views of the levee area in Reaches 8–10. In Reaches 13–15, urban and industrial uses form background elements to views of the rural agricultural setting from the vicinity of the levee.

The main viewer groups of the project area in Reaches 1–15 are local residents and travelers on Garden Highway, which is on the crown of the Sacramento River east levee and, therefore, elevated above the basin. Much of the viewscape is typical of local rural areas, consisting mainly of scattered agricultural outbuildings, rural roads, disturbed areas of ruderal vegetation bordering roadways, utility poles and overhead utility lines, and the existing levees. Approximately 25 feet high on average, the existing levee blocks views of the Sacramento River from the east. The existing levee and adjacent berms are an integral part of the visual setting to regular viewers, including area farmers, recreationists, and other travelers on local county roads. The levee is generally not visible from SR 70/99, which runs in a north-south direction approximately 3 miles to the east north of I-5. Trees in the riparian area along the Sacramento River west of the levee are visible above the top of the levee in views from the east. Garden Highway is used by local residents and by recreationists traveling to marinas, Verona Village Resort, and Teal Bend Golf Club, as well as by agricultural traffic. Recreationists are considered a sensitive viewer group; however, overall numbers of recreationists in this area are low. In addition, sweeping views of the basin are afforded to travelers on I-5 and I-80 where they are elevated, but these views are of short duration, and freeway travelers are not considered a sensitive viewer group. Overall views of the basin in these reaches lack vividness and are neither striking nor distinctive. Where Airport facilities are part of the viewshed, the viewscape lacks unity and intactness. However, outside the Airport Operations Area north of I-5, the rural reclamation features of the western basin (levees and berms, irrigation and drainage canals, and well-established agricultural elements) form a cohesive whole, and the area therefore has moderate intactness and unity of visual aesthetic features.

In Reaches 16–18B, rural residences and stands of mature oaks and other trees line the land side of the levee. Broad views of the landscape from Garden Highway are limited. Near views of rural residential properties along the roadway exhibit moderate intactness and unity. However, the I-80 overcrossing of the Sacramento River is prominent in views of Reaches 17–19A. Because of the incongruity of the I-5 and I-80 overcrossings with the otherwise pastoral features of views along Garden Highway, areas where these roadways are visible are of low aesthetic quality, given that they lack intactness and unity of visual features.

In Reaches 19A–20B, the area from the levee to approximately 2,500 feet landward of the levee is filled with a substantial amount of housing development, commercial buildings, and office parks. Because the elements of the landscape are a mixture of commercial, office park, residential, and utility features, the intactness and unity of the views are low. Views in this area are therefore generally of low to moderate aesthetic value. As in the upper reaches, the main viewer groups are residents and travelers on Garden Highway. In these reaches, however, much of the vehicle traffic is associated with waterside businesses and is therefore short term, and these travelers do not constitute a sensitive viewer group.

From the middle of Reach 2 through Reach 20B, the water side of the Sacramento River east levee is lined with residences, marinas, and (in Reaches 19A through 20B) restaurants and other businesses among remnants of mature riparian woodland, consisting mainly of oaks and cottonwoods, as well as ornamental trees associated with the houses there. Travelers along the length of Garden Highway that is atop the Sacramento River east levee have intermittent views of the Sacramento River through the trees on the water side of the levee.

The water side of the Sacramento River east levee is visible to boaters and other recreationists along the Sacramento River. However, all views of the interior of the basin from the Sacramento River channel are blocked by the levee, waterside structures, and waterside trees. Views of the river corridor itself are distinctive and moderately vivid, with the meandering river channel and dense riparian growth forming striking and harmonious visual elements. However, the riparian growth is interrupted throughout the length of the Natomas Basin by residences and adjacent clearings and by waterside commercial establishments. These features and the east levee limit the extent of the riparian growth and detract from the natural appearance of the corridor, reminding viewers of the presence of nearby urban and agricultural areas. The views have a moderate degree of both intactness and unity. Recreationists are generally considered a sensitive viewer group, but because the number of recreationists in this area is only moderate, the sensitivity of views is moderate. Overall, area views are of moderate aesthetic value.

3.3.17 Utilities and Service Systems

This section addresses the following public utilities and service systems: water and wastewater, solid waste, electrical and natural gas, telephone and cable, and fire and police protection services. Drainage systems are described in Section 3.3.4, “Hydrology and Hydraulics.”

3.3.17.1 Water Supply. Agricultural irrigation water is provided in the Natomas Basin in Sutter and Sacramento Counties by NMWC, a private purveyor of irrigation water to farmlands, and through on-site wells and private river pumps. NMWC provides water to more than 33,000 acres of land through pipelines, pumps, and more than 50 miles of canals. NMWC is described further in Section 2.2.2.8, “Operation and Maintenance Considerations.”

The Sacramento County Water Agency provides municipal and industrial water service within Sacramento County, although much of the Natomas Basin receives only agricultural and irrigation water service supplied by NMWC. The City of Sacramento provides domestic water service within the city limits. Domestic water is provided by a combination of surface water and groundwater sources.

3.3.17.2 Wastewater. The Sacramento Regional County Sanitation District provides regional sewage services in the unincorporated areas of Sacramento County. The City of Sacramento is responsible for providing and maintaining sewer services in incorporated Sacramento County. There are no sewer lines in the project area; residences and businesses rely on septic systems for wastewater disposal.

3.3.17.3 Solid Waste. The nearest landfills in the project region that could be used for waste disposal during project construction activities are listed in **Table 3-18**. There are no landfills in Sutter County.

Table 3-18
Major Landfills in the Project Region

Facility (County)	Location	Capacity
Kiefer Landfill (Sacramento County)	12701 Kiefer Boulevard Sloughhouse, CA 95683	Maximum permitted capacity: 117,400,000 cubic yards Remaining capacity (as of September 12, 2005): 112,900,000 cubic yards
Union Mine Disposal Sit (El Dorado County)	5700 Union Mine Road El Dorado, CA 95623	Maximum permitted capacity: 195,000 cubic yards Remaining capacity (as of November 25, 2001): 140,000 cubic yards
Western Regional Landfill (Placer County)	3195 Athens Road Lincoln, CA 95648	Maximum permitted capacity: 36,350,000 cubic yards Remaining capacity (as of June 30, 2005): 29,093,819 cubic yards

Source: California Integrated Waste Management Board 2007

3.3.17.4 Electrical and Natural Gas Service. The Sacramento Municipal Utility District (SMUD) provides electrical service to customers in the city of Sacramento and the Sacramento County portion of the Natomas Basin (Sacramento LAFCo 2007). The Pacific Gas and Electric Company (PG&E) provides electrical and natural gas services in Sutter County. There are no natural gas transmission lines in the NCC area (Sutter County 1996). In Reaches 4B and 8 along the Sacramento River east levee, gas pipelines are present that may be within the footprint of proposed flood control facilities or maintenance access (Dosanjh, pers. comm., 2007). Within the project area, there are standard 12-kilovolt electrical distribution lines supported overhead by wooden poles running roughly parallel to the existing east levee of the Sacramento River. Approximately 500 overhead power poles would need to be relocated along the east levee of the Sacramento River in Reaches 1–20A for the proposed levee improvements (Dosanjh, pers. comm., 2007). Additional overhead electrical power distribution lines on wooden poles extend parallel to the landside toe of the NCC south levee in Reach 3, approximately 30 feet away from the levee toe.

3.3.17.5 Telephone and Cable. Telecommunications service in the project area is provided by multiple providers, including AT&T, Sprint, Comcast, SBC Communications, and SureWest.

3.3.17.6 Fire and Police Protection. The Sutter County Fire Department and the Sutter County Sheriff's Department provide fire and police protection, respectively, for Sutter County. The Natomas Fire Protection District of the City of Sacramento provides fire protection services for the portion of the Natomas Basin south of Sutter County by contract between the City and County of Sacramento (Sacramento LAFCo 2007). The unincorporated areas of Sacramento County are under the jurisdiction of the Sacramento County Sheriff's Department, and the City of Sacramento Police Department provides police protection services within the Sacramento city limits.

3.3.18 Hazards and Hazardous Materials

For purposes of this section, the term "hazardous materials" refers to both hazardous substances and hazardous wastes. A "hazardous material" is defined in the Code of Federal Regulations as "a substance or material that…is capable of posing an unreasonable risk to health, safety, and property when transported in commerce" (49 CFR 171.8). California Health and Safety Code Section 25501 defines a hazardous material as follows:

> "Hazardous material" means any material that, because of its quantity, concentration, or physical, or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. "Hazardous materials" include, but are not limited to, hazardous substances, hazardous waste, and any material which a handler or the administering agency has a reasonable basis for believing that it would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment.

"Hazardous wastes" are defined in California Health and Safety Code Section 25141(b) as wastes that:

> … because of their quantity, concentration, or physical, chemical, or infectious characteristics, [may either] cause, or significantly contribute to an increase in mortality or an increase in serious illness[, or] pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

3.3.18.1 Potential Sources of Hazardous Materials. The sites of proposed construction activity are located in rural, suburban, and urban areas. Potential sources of hazardous materials and waste may exist in both the agricultural and urbanized portions of the project area. Hazardous materials may have been used in the past at the proposed construction or borrow sites that could have resulted in soil contamination. Sites where borrow material would be excavated are of particular interest. All of the potential borrow sites have been or currently are in agricultural use.

Environmental Data Resources, Inc. (EDR) conducted an independent computer-generated database search for SAFCA to identify any existing hazardous materials within and near the proposed borrow sites (excluding the Fisherman's Lake area, where particular sites have not been identified) and the proposed canal alignments. The purpose of the search was to identify documented recognized environmental conditions at and near the proposed borrow sites and canal alignments related to current and historical uses of the area, and to evaluate the potential for a release of hazardous materials from on- or off-site sources that could significantly affect environmental conditions in the project area.

The databases are based on records kept by Federal, state, and local agencies that are responsible for recording incidents of contamination and permitting transfer, storage, or disposal facilities that handle hazardous materials. EDR searched a variety of Federal and state databases, including the National Priorities List; Resource Conservation and Recovery Act (RCRA) information; and the California Department of Toxic Substances Control's (DTSC's) Hazardous Waste & Substances Site (known as the "Cortese list")

The database search revealed only one site with possible contamination issues at or near the proposed borrow sites or canal alignments: Yuki Farms located at 7800 Garden Highway, in Reaches 5B and 6A. The site was listed on the State Water Resources Control Board's California Spills, Leaks, Investigations, and Cleanup (SLIC) list (Central Valley RWQCB 2007a) and on DTSC's HAZNET list. Central Valley

Regional Water Quality Control Board records (Vogelsang, pers. comm., 2007) indicate that approximately 2,000 gallons of gasoline were discharged into the soil on this property in October 1997 and that soil sampling conducted in January 1998 showed "detectable concentrations of petroleum hydrocarbons" in two samples and "significant concentrations of the oxygenates MtBE and TAME" in another sample. Water samples from a previously used supply well and excavation showed significant impacts. To date, contaminant remediation has not been conducted on the site (Rowe, pers. comm., 2007). The entry in the HAZNET list, which tracks waste generation information, waste categorization, and disposal method, relates to photochemicals. However, the HAZNET records contain no indication of any contamination issue with regard to photochemical waste.

3.3.18.2 Hazards Associated with Land Uses around the Airport. The Airport is 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. 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 is located due south and due north of the Airport Operations Area. Sacramento County–owned property outside of the Airport Operations Area functions as aviation "bufferlands" for the purposes of operational land use compatibility (i.e., to prevent encroachment by land uses, such as residential development, that are incompatible with aircraft operations). The vast majority of these bufferlands have been historically leased to tenant farmers as an alternative to active management by Sacramento County maintenance staff. Agricultural activity on these parcels has been strictly incidental to the property's primary purpose of providing airspace protection.

The Airport has the highest number of reported wildlife strikes of all California airports (SCAS 2007). According to the FAA Bird Strike Database (FAA 2005), a total of 964 wildlife strikes were recorded at the Airport between 1990 and 2004. Birds with flocking tendencies, and birds of relatively large size, such as waterfowl, gulls, herons, egrets, pigeons, blackbirds, and raptors present the greatest threat to aviation at the Airport (SCAS 2007).

The frequency of wildlife strikes at the Airport is directly related to the airport's location. The Airport is situated in the western portion of the Natomas Basin, which is a relatively flat, low-lying area that was historically part of the Sacramento/American River floodplain. Historically, wetlands in the Natomas Basin attracted tremendous numbers of migratory waterfowl. Land reclamation and the extensive construction of canals, levees, and pumping stations have allowed more than 80% of the Natomas Basin to be converted to agricultural production (City of Sacramento, Sutter County, and TNBC 2003). Agricultural crops and open water are the primary wildlife attractants with the Airport's Critical Zone. Rice, wheat, safflower, corn, and alfalfa are all grown in the Critical Zone. However, SCAS considers rice cultivation, along with flooding of the rice fields in winter and summer, as the most incompatible current land use in the Critical Zone (SCAS 2007).

Since 1996, the FAA has required SCAS to maintain and implement a WHMP because of the significant number of wildlife strikes that occur at the Airport. The plan emphasizes the identification and abatement of wildlife hazards and outlines steps for monitoring, documenting, and reporting potential wildlife hazards and birds strikes. Implementation of the WHMP involves an integrated approach that relies on a combination of wildlife control and land management strategies (SCAS 2007). The following land management objectives in the WHMP are relevant to the proposed project:

- Maintain grasslands in the Airport Operations Area to discourage use by hazardous wildlife.
- Reduce aquatic habitat for hazardous wildlife.

- Reduce hazardous wildlife use of ditches in the Airport Operations Area.

- Reduce hazardous wildlife on Sacramento County–owned agricultural land in the 10,000-foot Critical Zone.

3.3.18.3 Wildfires. In addition to hazardous materials, wildfires also pose a hazard to both persons and property in many areas of California. Wildland fires are a particularly dangerous threat to development located in forest and shrub areas. The severity of wildland fires is influenced by four primary factors: vegetation, climate, slope, and people. The California Department of Forestry and Fire Protection (CDF) has developed a fire hazard severity scale that considers vegetation, climate, and slope to evaluate the level of wildfire hazard in all State Responsibility Area lands. A State Responsibility Area is defined as part of the state where CDF is primarily responsible for providing basic wildland fire protection assistance. CDF designates three levels of Fire Hazard Severity Zones (Moderate, High, and Very High) to indicate the severity of fire hazard in a particular geographical area (CDF 2001). According to CDF's Fire Resource Assessment Program, the majority of the land in Sacramento and Sutter Counties is located in either a "nonflammable" or "moderate" zone for wildland fires (CDF 2007a). No Very High Fire Hazard Severity Zones are located in the project area within either Sacramento County or Sutter County (CDF 2007b). In addition, Sutter and Sacramento Counties are not located in a State Responsibility Area (CDF 2007c, 2007d).

4.0 ENVIRONMENTAL CONSEQUENCES

Many of the potential impacts that may result from implementation of the action alternatives discussed in this document would be temporary effects resulting from construction activities, including hauling of borrow material and the movement of heavy construction equipment. However, many effects related to agricultural land conversion; modification of habitats, including fill of waters of the United States; and disturbance of cultural resources would be permanent.

Cumulative effects and indirect effects related to population growth are addressed in Chapter 5, "Cumulative and Growth-Inducing Effects."

As described in previous sections of this document, this EIS will be used to support USACE decisions on whether to grant Section 408 permission and permits pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act, as appropriate, for the 2008 construction phase of the project while providing for consideration of broad policy-level issues involving all phases of the project, including fundamental alternative approaches to meeting the project purpose. Consequently, the following sections address the impacts of all phases of construction (2008, 2009, and 2010) but emphasize the analysis of impacts of the 2008 construction phase, while considering the impacts of the 2009 and 2010 construction phases at a more general, programmatic level.

4.1 AGRICULTURAL RESOURCES

4.1.1 Methodology

For this analysis, the project alternatives were determined to have a significant impact on agricultural resources if project activities would convert or result in a substantial conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (referred to herein as "Important Farmland") to nonagricultural uses. Indirect effects of the project alternatives on conversion of farmland through accommodation of planned growth in the Natomas Basin are addressed in Section 5.2, "Growth Inducement."

4.1.2 Impacts and Mitigation Measures

Impact 4.1-a: Conversion of Important Farmland to Nonagricultural Uses

No-Action Alt.

There would be no improvements to the Natomas perimeter levee system associated with the No-Action Alternative; therefore, this alternative would have no direct effect related to the conversion of agricultural lands along the perimeter levee system.
If Sacramento County Airport System (SCAS) were to construct a more limited flood protection system (e.g., compartment levee) to protect the Airport in the absence of SAFCA's proposed improvements to the perimeter levee system, a substantial conversion of Important Farmland to non-agricultural uses would likely occur in the footprint of these flood protection features, given that the Airport is surrounded by agricultural land, much of which is Important Farmland. However, the amount of such conversion is uncertain because no concept plan for an Airport flood control system has been developed, and the footprint size and location are unknown.

Without the proposed improvements to the Natomas perimeter levee system to provide 100-year flood protection, the risk of a failure in this perimeter system would remain. A levee failure along the Natomas Cross Canal (NCC), the Pleasant Grove Creek Canal (PGCC), or the northern reaches of the Sacramento River east levee could indirectly

result in scouring of agricultural land and the long-term loss of top soil in areas near a levee breach and, consequently, the long-term loss of Important Farmland in those areas. Such a loss is evident at the locations of past levee failures, for example on the Feather River above Star Bend in Yuba County, where a large dense stand of willow riparian scrub grows in sediments deposited by floodwaters following the scouring of the agricultural soil by the force of in-rushing water. However, such losses are likely to be limited to localized areas within several hundred feet of a levee breach, and their occurrence, location, and magnitude cannot be predicted. Such an impact is unlikely to be significant.

Alt. 1

Alternative 1 would widen the landside footprint of the NCC south levee and associated maintenance access corridor, substantially widen the Sacramento River east levee flood control facilities and maintenance access through the construction of the adjacent levee and of seepage berms in some reaches, and widen the footprint of the PGCC west levee flood control facilities and maintenance access. In all these areas, Alternative 1 would also include acquiring additional land for maintenance activities and to prevent encroachment along the flood control facilities. Woodland corridors and groves would also be planted adjacent to the project footprint in many reaches of the Sacramento River east levee. New irrigation canals and the new GGS/Drainage Canal would be constructed west of Sacramento International Airport (Airport). Nearly all of these areas are classified as Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, and their conversion to non-agricultural uses would be a permanent effect.

Soil borrow for construction would be obtained from the borrow sites described in Section 2.2.2.1 and shown in **Plate 19**. The land in these areas is classified as Prime Farmland, Unique Farmland, or Farmland of Statewide Importance. The removal of borrow from all borrow sites would entail the preservation and replacement of the topsoil on these parcels, thus retaining their potential use for agriculture. SAFCA's intention for the Brookfield property is to return the site to rice cultivation following the completion of soil borrow removal. Therefore, the use of this site for borrow would not be a permanent conversion to non-agricultural uses. The Airport bufferlands, however, would be converted to managed marsh and managed grassland (which may include hay or alfalfa) to support their use by giant garter snakes and Swainson's hawks, respectively, and to reduce the presence of hazardous wildlife species in areas nearest to the Airport. For purposes of this analysis, the land cover changes on the Airport bufferlands as part of the 2008 and 2009 construction phases are considered conversions of Important Farmland to nonagricultural uses. Similarly, an anticipated 120 acres in the Fisherman's Lake area would be converted from agricultural use to marsh habitat in the 2010 construction phase. In addition, the Reclamation District (RD) 1001 site may be used as a soil borrow source in addition to, or in place of, the Brookfield property either in the 2008 construction phase for NCC south levee improvements or in the 2009–2010 construction phase for PGCC west levee improvements. For purposes of this analysis, it is assumed that this land would not be returned to agricultural use following the completion of borrow activities and that conversion to non-agricultural uses would therefore be permanent. Restoration of the borrow sites would be performed in compliance with the California Surface Mining and Reclamation Act (SMARA).

The activities proposed for the 2008 construction phase would convert approximately 400–520 acres of land categorized as Important Farmland to nonagricultural uses. An estimated 125 acres would be converted in the footprint of flood control facilities, adjacent land for maintenance access and prevention of encroachment into the flood

control system, and woodland planting areas. An estimated 52 acres would be converted in the footprint of the relocated Elkhorn Canal and the new GGS/Drainage Canal. Approximately 225 acres would be converted in the Airport north bufferlands for borrow removal and conversion to managed habitats. In addition, as much as 120 acres of Prime Farmland and Farmland of Statewide Importance could be converted at the RD 1001 borrow site.

The activities proposed for the 2009 and 2010 construction phases would convert approximately 855 additional acres of Important Farmland to nonagricultural uses: An estimated 245 acres would be converted in the footprint of flood control facilities, adjacent land for maintenance access and prevention of encroachment into the flood control system, and woodland areas. An estimated 85 acres would be converted in the footprint of the relocated irrigation canals and the new GGS/Drainage Canal. Approximately 405 acres in the Airport bufferlands and 120 acres in the Fisherman's Lake area would be converted for borrow removal and conversion to managed habitats. Any portion of the RD 1001 site that was not converted as a part of the 2008 construction phase could potentially be converted as part of the 2009 construction phase.

This impact would be significant for all construction phases.

Alt. 2 The raised portion of the Sacramento River east levee under Alternative 2 (south of Station 88+00, near the lower end of Reach 2) would have a smaller footprint than the adjacent setback levee in the same levee reaches under Alternative 1. However, construction of the setback levee would convert a 150-acre area of Important Farmland to nonagricultural use between Stations 5+00 and 88+00, resulting in approximately the same overall amount of Important Farmland conversion along the levees as under Alternative 1. Conversion of agricultural land within the canal footprints and at borrow sites would be substantially the same as under Alternative 1. Alternative 2 would result in a significant effect.

Alt. 3 Construction of the setback levee under Alternative 3 would convert an approximately 75-acre area of Important Farmland to nonagricultural use between Stations 5+00 and 88+00, compared to about 35 acres under Alternative 1. South of Station 88+00, the footprint of the levee improvements and maintenance access would be the same as for Alternative 1. However, the setback levee area would account for a part of the woodland planting area required for the project, reducing the amount of land needed for woodland planting south of Station 88+00 by about 40–50 acres. All other components of the footprint of this alternative (canal footprints and borrow acreage) would be substantially the same. Overall, the amount of farmland conversion would be approximately the same as under Alternative 1. Alternative 3 would result in a significant effect.

Mitigation Measure 4.1-a: Minimize Important Farmland Conversion to the Extent Practicable and Feasible

No-Action Alt. Except for substantial improvements to the Natomas perimeter levee system (i.e., implementation of one of the action alternatives), no mitigation is available to reduce the potential permanent loss of Important Farmland that may result from scouring and loss of top soil in the event of a Natomas levee failure. However, any such

loss is likely to be very minor in comparison with the total amount of Important Farmland in the basin. If SCAS were to construct flood protection in the form of a compartment levee to protect the Airport from flooding in the absence of perimeter levee improvements, no mitigation would be available to reduce the permanent conversion of Important Farmland in the footprint of these improvements below a significant level, although SCAS implementation of measures similar to those described below for Alternatives 1, 2, and 3, would reduce the impact.

Alt. 1, Alt. 2, Alt. 3

SAFCA shall ensure that the following measures are implemented with regard to Prime Farmland, Unique Farmland, and Farmland of Statewide Importance to minimize impacts on these lands:

(a) Borrow sites shall be configured to minimize the fragmentation of lands that are to remain in agricultural use. Contiguous parcels of agricultural land of sufficient size to support their efficient use for continued agricultural production shall be retained to the extent practicable and feasible.

(b) To the extent practicable and feasible, when expanding the footprint of a flood control facility (e.g., levee or berm) onto agricultural land, the most productive topsoil from the construction footprint shall be salvaged and redistributed to less-productive agricultural lands in the vicinity of the construction area that could benefit from the introduction of good-quality soil. By agreement between the implementing agencies or landowners of affected properties and the recipient(s) of the topsoil, the recipient(s) would be required to use the topsoil for agricultural purposes.

(c) During project construction, use of utilities that are needed for agricultural purposes (including wells, pipelines, and power lines) and of agricultural drainage systems shall be minimized so that agricultural uses are not substantially disrupted.

(d) Disturbance of agricultural land and agricultural operations during construction shall be minimized by locating construction staging areas on sites that are fallow, that are already developed or disturbed, or that are to be discontinued for use as agricultural land, and by using existing roads to access construction areas to the extent possible.

(e) To the extent feasible, lands acquired for flood control purposes shall also be used as mitigation land for Natomas Basin Habitat Conservation Plan (NBHCP) programs so that agricultural land conversion is minimized.

(f) Agricultural preservation easements shall be acquired at a 1:1 ratio (i.e., 1 acre on which easements are acquired to 1 acre of Prime Farmland, Unique Farmland, and Farmland of Statewide Importance removed from agricultural use), and the lands on which the easements are acquired shall be maintained in agricultural use.

Implementing this mitigation would reduce the impact, but not to a less-than-significant level.

4.1.3 Unavoidable Significant Adverse Effects

Under the No-Action Alternative, adverse effects of flood conditions on agricultural land are unlikely to be significant. However, if a separate flood protection system were constructed to protect the Airport from flooding, substantial conversion of Important Farmland would occur in the footprint of the flood protection facilities. Implementing mitigation similar to Mitigation Measure 4.1-a would reduce this impact, but not to a less-than-significant level. Therefore, with construction of an Airport compartment levee, the No-Action Alternative would likely result in an unavoidable significant impact related to conversion of Important Farmland.

Implementing Mitigation Measure 4.1-a would reduce the potential for adverse effects on Prime Farmland, Unique Farmland, and Farmland of Statewide Importance resulting from Alternatives 1, 2, and 3, but would not reduce the impact to a less-than-significant level because substantial conversion of Important Farmland could still occur. Therefore, Alternatives 1, 2, and 3 would result in an unavoidable significant effect related to conversion of Important Farmland.

4.2 LAND USE AND SOCIOECONOMICS

4.2.1 Methodology

NEPA requires consideration of possible conflicts between the proposed action and the objectives of Federal, regional, State, and local land use plans, policies, and controls for the area concerned. This section evaluates the consistency of the project alternatives with local land use plans and policies, including applicable policies regarding agricultural land uses, and Airport plans and policies. Local land use plan land use designations and policies include the Sutter County General Plan and zoning code, Sacramento County General Plan and zoning code, and the City of Sacramento General Plan and zoning code. The complex relationship between flood control improvements and Federal, California, and regional policies related to floodplain development and associated agricultural land conversion are addressed in Sections 2.1.1.2, “Reduced Natomas Urban Levee Perimeter“; 5.2, “Growth Inducement“; 6.1.10, “Executive Order 11988, Floodplain Management“; and 6.1.13, “Farmland Protection Policy Act.“

Consistency with the Natomas Basin Habitat Conservation Plan (NBHCP) is addressed in Section 4.9, “Special-Status Terrestrial Species.“ Socioeconomic effects and environmental justice issues are discussed in Section 6.1.12, “Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.“

Note that although this section includes discussion of policies on agricultural land uses, the direct physical conversion of agricultural land to non-agricultural uses is discussed above in Section 4.1, “Agricultural Resources.“

4.2.2 Impacts and Mitigation Measures

Impact 4.2-a: Conflicts with Land Use Plans and Policies

No-Action Alt. The No-Action Alternative conflicts with the City of Sacramento’s Resource Protection Policy B.10, which states: “The City shall seek to minimize or avoid adverse impacts to historic and cultural resources from natural disasters. To this end, the City shall promote seismic safety, flood protection, and other building programs that preserve, enhance, and protect these resources.“ The No-Action Alternative is inconsistent with this policy because it fails to improve flood protection.

Alt. 1, Alt. 2, Alt. 3

Alternatives 1, 2, and 3 are consistent with Policy B.10 of the *City of Sacramento General Plan 2006* (see discussion of No-Action Alternative above) because they would provide improved flood protection.

The levee footprint under the different alternatives would overlap parts of the Airport Critical Zone. The flood control improvements would not modify intended land uses within those areas or include components, such as the creation of water features, that could attract waterfowl and thereby introduce hazards into the Critical Zone. The use of Airport bufferland parcels for soil borrow and their subsequent conversion to managed habitats is being coordinated with SCAS to enhance SCAS's ability to minimize the flight safety hazards associated with wildlife attraction to these lands and, therefore, supports plans and policies intended to enhance public safety associated with Airport operations (see also Section 4.18, "Hazards and Hazardous Materials").

Improvements along the NCC south levee, the Sacramento River east levee, and the PGCC west levee would result in a widened landside footprint of flood control facilities, removing edges of agricultural parcels from agricultural use in some locations and also removing some residences, agricultural buildings, and appurtenances. These edge conversions and structure removals are not inconsistent with the land use goals or policies of Sutter and Sacramento Counties intended to retain agricultural land holding in units large enough to guarantee future and continued agricultural use.

The sites proposed for use as borrow sources are agricultural lands that would be designed and converted to habitat uses (Airport bufferlands) or returned to agricultural use (Brookfield site). The use of the Airport bufferlands for this purpose is not inconsistent with the land use goals or policies of Sacramento County because farming uses are not the primary intended land use of these lands. The conversion of the approximately 120-acre RD 1001 site in Sutter County to non-agricultural uses over time, however, would be inconsistent with the Sutter County goal of preserving high-quality agricultural land for agricultural purposes. This impact would be significant.

Mitigation Measure 4.2-a: Implement Mitigation Measure 4.1-a, described above (Minimize Important Farmland Conversion to the Extent Practicable and Feasible), for Alternatives 1, 2, and 3

No-Action Alt.

With the exception of implementing improvements to the Natomas perimeter levee system (i.e., implementing Alternative 1, 2, or 3), there is no mitigation to reduce the inconsistency of the No-Action Alternative with City of Sacramento General Plan Policy B.10 for resource protection.

Alt. 1, Alt. 2, Alt. 3

Implement Mitigation Measure 4.1-a, as described above.

This mitigation would reduce the impact, but would not eliminate the inconsistency with Sutter County policy regarding the preservation of farmland if the RD 1001 site is used as a soil borrow source.

4.2.3 Unavoidable Significant Adverse Effects

The No-Action Alternative would result in an unavoidable significant adverse effect resulting from inconsistency with the City of Sacramento General Plan Policy B.10 for resource protection.

Implementing Mitigation Measure 4.1-a would reduce the farmland conversion effects of Alternative 1, 2, or 3 but would not eliminate potential inconsistency of the project with Sutter County policy regarding the preservation of high-quality agricultural land for agricultural uses, given the potential future use of the RD 1001 site as a borrow source. This impact would remain significant.

4.3 TOPOGRAPHY, GEOLOGY, AND SOILS

4.3.1 Methodology

This section addresses issues related to geologic hazards, specifically seismicity and soil erosion. Effects associated with geology and soils that could result from project-related activities were evaluated based on expected construction practices, materials used to construct the proposed improvements, general locations, and the nature of proposed operations.

Landslides are not a concern in relation to the project alternatives because the project area is relatively flat. The proposed improvements would not involve the construction of any structures intended for human occupancy or the construction or modification of any structure in an area subject to seismic ground shaking or seismic-related ground failure. Therefore, the project alternatives would not expose people to potential substantial adverse effects, including the risk of loss, injury, or death, due to rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, or landslides.

All levee improvements, including the RD 1000 Pumping Plant 2 replacement facilities, would be designed based on the results of detailed geotechnical engineering studies and would be required to comply with standard engineering practices for levee design. The Central Valley Flood Protection Board's standards are the primary state standards applicable to the proposed levee improvements; these are stated in Title 23, Division 1, Article 8, Sections 111–137 of the California Code of Regulations. The board's standards direct that levee design and construction be in accordance with the USACE's *Engineering Design and Construction of Levees* (USACE 2000), the primary Federal standards applicable to levee improvements. Because the design, construction, and maintenance of levee improvements must comply with the regulatory standards of the USACE and the Central Valley Flood Protection Board, it is assumed that the design and construction of all levee modifications under the project alternatives would meet or exceed applicable design standards for static and dynamic stability, secondary effects related to ground shaking, and seepage.

Accordingly, for this analysis, the project alternatives were determined to have a significant impact on geology and soils they would result in substantial soil erosion and loss of topsoil in the project area.

4.3.2 Impacts and Mitigation Measures

Impact 4.3-a: Potential Localized Soil Erosion

No-Action Alt. The No-Action Alternative would have no direct impact associated with geological hazards; however, if SCAS were to construct a compartment levee for Airport flood protection, localized soil erosion similar to potential soil erosion effects described below for Alternatives 1, 2, and 3 could occur in construction areas.

Without improvements to the Natomas perimeter levee system (i.e., implementation of Alternative 1, 2, or 3), there would remain a high potential for a levee failure along the NCC, the PGCC, or the northern reaches of the Sacramento River east levee. As described under Impact 4.1-a, such a failure could indirectly result in scouring of agricultural land and permanent loss of top soil in limited areas. The magnitude of any such effect is uncertain, but the potential impact is unlikely to be significant.

Alt. 1, Alt. 2, Alt. 3

Alternatives 1, 2, and 3 would include a substantial amount of construction activity over large areas, particularly along the NCC, the Sacramento River east levee, the PGCC west levee, and at borrow sites, during the 2008, 2009, and 2010 construction phases. In all years of project construction, the construction activities would be conducted continuously, to the extent feasible, between April and November.

For the 2008 construction phase, soil borrow would be excavated from borrow sites and the alignment of the new GGS/Drainage Canal and used for construction of improvements to the NCC south levee and the Sacramento River east levee and construction of a portion of the relocated Elkhorn Canal. Installation of the seepage cutoff wall through the NCC south levee would require degradation and reconstruction of the top half of the levee. Soil stripping and site grading would be necessary in the footprint of the expanded NCC landside levee toe, the adjacent setback levee along the Sacramento River east levee under Alternatives 1 and 3 and the setback levee under Alternatives 2 and 3, areas along Reaches 4A and 4B where seepage berms would be constructed, and the canal alignments between the North Drainage Canal and Elkhorn Reservoir. Structures and trees would need to be removed from a portion of the footprint of the adjacent setback levee and berms along the Sacramento River east levee, and power poles would need to be removed and relocated.

For the 2009 and 2010 construction phases, soil would be excavated from borrow sites, excavated from the new GGS/Drainage Canal alignment, or removed from existing berms along the Sacramento River east levee, and would be used for improvements to the Sacramento River east levee, the Elkhorn and Riverside Canal relocations, and the PGCC west levee improvements. Soil stripping and site grading would be necessary in the footprint of the adjacent setback levee along the Sacramento River east levee under Alternatives 1 and 3 and areas where seepage berms would be constructed; the expanded toe of the PGCC west levee and adjacent seepage berms; and the new canal alignments south of the Elkhorn Reservoir. Structures and trees would need to be removed from a portion of the footprint of the adjacent setback levee and berms along the Sacramento River east levee, and power poles would need to be removed and relocated.

The upper 6–12 inches of topsoil from the borrow sites would be set aside and replaced on-site after project construction in each construction season. However, these activities would result in the temporary disturbance of soil and could expose disturbed areas to winter or early-season storm events. Rainfall of sufficient intensity could dislodge soil particles from the soil surface. Once particles are dislodged and the storm is large enough to generate runoff, substantial localized erosion could occur. In addition, soil disturbance during the summer months could result in substantial loss of topsoil because of wind erosion. Because of the potential for substantial erosion or loss of topsoil during construction, Alternatives 1, 2, and 3 could result in a significant effect.

Mitigation Measure 4.3-a: Implement Mitigation Measure 4.5-a, described below (Implement Standard Best Management Practices [BMPs], Prepare and Implement a Stormwater Pollution Prevention Plan [SWPPP], and Comply with National Pollutant Discharge Elimination System [NPDES] Permit Conditions)

No-Action Alt. If SCAS were to construct flood protection in the form of a compartment levee to protect the Airport from flooding in the absence of perimeter levee improvements, SCAS implementation of mitigation similar to that described below for Alternatives 1, 2, and 3 would be required to reduce the impact to a less-than-significant level.

Alt. 1, Alt. 2, Alt.3 SAFCA shall implement Mitigation Measure 4.5-a, "Implement Standard BMPs, Prepare and Implement a SWPPP, and Comply with NPDES Permit Conditions." This measure requires filing a notice of intent with the Central Valley Regional Water Quality Control Board (RWQCB); implementing standard erosion, siltation, and BMP measures; preparing a SWPPP; and complying with the conditions of the NPDES general stormwater permit for construction activity.

Implementing this mitigation would reduce the impact to a less-than-significant level.

4.3.3 Unavoidable Significant Adverse Effects

No unavoidable significant adverse effects were identified for Alternatives 1, 2, and 3 or the No-Action Alternative.

4.4 HYDROLOGY AND HYDRAULICS

4.4.1 Methodology

This section addresses seasonal flooding and flood management as defining elements of the physical environment in the project area and evaluates the potential hydraulic effects of the project alternatives on the operation of the Sacramento River Flood Control Project (SRFCP) and on the operation of the interior drainage within the Natomas Basin. It also evaluates the potential effect of seepage cutoff walls on groundwater recharge.

The surface hydrology analysis evaluated the potential flood-related effects of the proposed NLIP improvements on water surface elevations in the stream and river channels in the project area and in the larger watershed within which the project is situated. Specifically, a UNET hydraulic computer model approved by USACE was used to compare existing conditions in the waterways surrounding the Natomas Basin and in the larger SRFCP with and without the proposed NLIP improvements and other anticipated improvements to Folsom Dam and the urban levees outside the Natomas Basin. The Existing condition analysis provided an evaluation of the levee and reservoir system as it existed in April 2008. The Without Project condition assumed implementation of federally authorized improvements to Folsom Dam and anticipated "early implementation" improvements to the levees protecting existing urban areas outside the Natomas Basin (i.e., American River Basin, West Sacramento, Yuba Basin and Sutter Basin) so as to provide these areas with 200-year flood protection. The With Project condition added the improvements proposed as part of the NLIP to the Without Project condition in order to display the individual and cumulative effects of the NLIP when added to the other reasonably foreseeable urban levee improvement projects in the Sacramento Valley.

The analysis consisted of calibrating the hydraulic model to historic flood events using high-water marks and stream gage data gathered in connection with the 1997 flood and modeling the existing, "with

project," and "without project" conditions under the following flood scenarios: (1) the "1957" water surface profiles that serve as the minimum design standard for the SRFCP; (2) the 100-year flood that affects management of SRFCP protected floodplains under the National Flood Insurance Program (33 CFR. 65.10); (3) the 200-year flood that is likely to affect implementation of the floodplain management standards recently adopted by the California Legislature (Statutes of 2008, Chapter 364 [adding Water Code Section 9602(i)]); and (4) the 500-year flood that represents a worst-case scenario for analyzing project impacts. Each of these scenarios was modeled assuming that levees outside the project area would fail when overtopped. Moreover, in order to test the sensitivity of this assumption, each scenario was also modeled assuming that non-urban levees that currently do not meet the SRFCP's minimum freeboard requirements would be repaired and that no levees would fail even under the most extreme overtopping condition. For additional information about the background, approach, and results of the NLIP hydrologic and hydraulic modeling analyses, including a summary description of the legislative support for the NLIP impact methodology, see Appendix A.

4.4.2 Impacts and Mitigation Measures

Impact 4.4-a: Hydraulic Effects and Exposure to Flood Risk

Table 4-1 summarizes the conditions and assumptions associated with each of the model runs. The modeling outputs generated by these conditions under the targeted flood scenarios are displayed in Tables 4-2 through 4-8.

Table 4-2 indicates the levee failures that would occur throughout the SRFCP under each of the targeted flood conditions assuming levees fail when overtopped. These failures are generally affecting non-urban levees. However, the urban levees along the Lower American River would fail under the Existing condition 200-year flood, and urban levees along the Feather and Lower American Rivers would fail in the 500-year flood.

Tables 4-3, 4-4, and 4-5 display the comparative water surface elevations that would occur under each of the targeted flood scenarios with levee failures due to overtopping. These data indicate no change when the With Project condition is compared to the Existing and Without Project conditions.

Tables 4-6, 4-7, and 4-8 display the comparative water surface elevations that would occur under the sensitivity analysis, which assumes no levee failures. These data indicate that there would be essentially no change when the With Project condition is compared to the Without Project condition for all flood scenarios except the 500-year flood.

These modeling results are more fully discussed in Appendix A.

No-Action Alt.

Under the No-Action (or Without Project) Alternative, there would be no changes to the Natomas perimeter levee system. However, this alternative includes Federally authorized improvements to Folsom Dam and anticipated "early implementation" improvements to the SRFCP's urban levees aimed at providing other urban areas outside the Natomas Basin with 200-year flood protection. Compared to existing conditions, the anticipated improvements to Folsom Dam would slightly lower 100-year and 200-year water surface elevations in the lower portion of the Sacramento River channel between the American River and the NCC. However, without the proposed improvements to the Natomas Basin perimeter levee system, wind and wave runup or seepage conditions could cause portions of this system to fail, triggering widespread flooding and extensive damage to property within the basin. Depending on the location of the levee failure(s), some Garden Highway residences located on the water side of the Sacramento River east levee could be engulfed by the resulting levee breach.

Table 4-1 Definition of Model Assumptions for Various Conditions			
Condition	**Top of Levee Assumption**	**Levee Failure Assumption**	**Reservoir Operations Assumption**
Existing	Existing top of levee grade April 2008	Levees fail when water reaches the top of the levee	Existing reservoirs and current (2008) operation criteria
Without Project	Same as Existing with the following changes: Federally authorized improvements to Folsom Dam are implemented and urban area levees outside the Natomas Basin are assumed to have levees at 200-year water surface + 3 feet of freeboard. NLIP levees same as Existing Condition.	Levees fail when water reaches the top of levee	Same as Existing except Folsom Dam will be operated in accordance with the Joint Federal Project currently under construction
With Project	Same as Without Project except NLIP levees raised to design level	Same as Without Project	Same as Without Project
Without Project Sensitivity Analysis	Same as Without Project except that SRFCP levees with top elevations below SRFCP design standard are assumed to be raised to meet this standard	No levee failures	Same as Without Project
With Project Sensitivity Analysis	Same as With Project except that SRFCP levees with top elevations below SRFCP design standard are assumed to be raised to meet this standard	No levee failures	Same as Without Project
Source: Appendix A			

Table 4-2 Levee Failure Summary (Number of Levee Failures)				
Condition	**Design Flood**			
	USACE 1957 Design	**100-year**	**200-year**	**500-year**
Existing	0	3	36	65
Without Project	0	3	18	75
With Project	0	3	16	74
Source: Appendix A				

Table 4-3 100-year Maximum Water Surface Elevation Summary, Levees Fail When Water Reaches Top of Levee					
Location (Comp Study River Mile)	**Maximum Water Surface Elevation (feet NGVD29)**			**Change (feet)**	
	Existing	**Without Project**	**With Project**	**Existing to Without Project**	**Without Project to With Project**
Sacramento River					
at Knight's Landing (90.22)	41.46	41.46	41.46	0	0
at Fremont Weir, west end (84.75)	40.16	40.17	40.17	+0.01	0
at Natomas Cross Canal (79.21)	40.20	40.19	40.19	-0.01	0
at I-5 (71.00)	35.79	35.72	35.72	-0.07	0
at Sacramento Bypass (63.82)	31.68	30.80	30.80	-0.88	0
at NEMDC (61.0)	32.15	31.29	31.29	-0.86	0
at I Street (59.695)	31.88	31.02	31.02	-0.86	0
at Freeport Bridge (46.432)	25.64	24.90	24.90	-0.74	0
Natomas Cross Canal					
u/s Hwy 99/70 (4.82)	40.44	40.37	40.37	-0.07	0
Pleasant Grove Creek Canal					
at Sankey Road (3.65)	40.38	40.36	40.36	-0.02	0
at Fifield Road (1.49)	40.48	40.44	40.45	-0.04	+0.01
Feather River					
at Nicolaus Gage (8.00)	48.53	48.53	48.53	0	0
Yolo Bypass					
at Woodland Gage (51.10)	32.65	32.59	32.59	-0.06	0
American River					
at H Street (6.471)	43.05	40.70	40.70	-2.35	0
Source: Appendix A					

Table 4-4 200-year Maximum Water Surface Elevation Summary, Levees Fail When Water Reaches Top of Levee					
Location (Comp Study River Mile)	**Maximum Water Surface Elevation (feet NGVD29)**			**Change (feet)**	
	Existing	**Without Project**	**With Project**	**Existing to Without Project**	**Without Project to With Project**
Sacramento River					
at Knight's Landing (90.22)	41.68	41.70	41.70	+0.02	0
at Fremont Weir, west end (84.75)	40.93	40.97	40.97	+0.04	0
at Natomas Cross Canal (79.21)	41.03	41.04	41.04	+0.01	0
at I-5 (71.00)	37.37	36.63	36.63	-0.74	0
at Sacramento Bypass (63.82)	35.33	32.59	32.59	-2.74	0
at NEMDC (61.0)	36.35	33.10	33.10	-3.25	0
at I Street (59.695)	36.02	32.82	32.82	-3.2	0
at Freeport Bridge (46.432)	28.49	26.48	26.48	-2.01	0
Natomas Cross Canal					
u/s Hwy 99/70 (4.82)	41.01	41.06	41.06	+0.05	0
Pleasant Grove Creek Canal					
at Sankey Road (3.65)	41.00	41.01	41.03	+0.01	+0.02
at Fifield Road (1.49)	41.07	41.09	41.10	+0.02	+0.01
Feather River					
at Nicolaus Gage (8.00)	50.15	50.16	50.16	+0.01	0
Yolo Bypass					
at Woodland Gage (51.10)	33.68	33.60	33.60	-0.08	0
American River					
at H Street (6.471)	46.49	44.23	44.23	-2.26	0
Source: Appendix A					

Table 4-5 500-year Maximum Water Surface Elevation Summary, Levees Fail When Water Reaches Top of Levee					
Location (Comp Study River Mile)	**Maximum Water Surface Elevation (feet NGVD29)**			**Change (feet)**	
	Existing	**Without Project**	**With Project**	**Existing to Without Project**	**Without Project to With Project**
Sacramento River					
at Knight's Landing (90.22)	41.63	41.68	41.68	+0.05	0
at Fremont Weir, west end (84.75)	40.86	40.92	40.93	+0.06	+0.01
at Natomas Cross Canal (79.21)	41.01	40.99	40.99	-0.02	0
at I-5 (71.00)	37.68	37.58	37.58	-0.10	0
at Sacramento Bypass (63.82)	35.63	35.36	35.37	-0.27	+0.01
at NEMDC (61.0)	36.66	36.34	36.34	-0.32	0
at I Street (59.695)	36.33	36.02	36.02	-0.31	0
at Freeport Bridge (46.432)	28.69	28.56	28.56	-0.13	0
Natomas Cross Canal					
u/s Hwy 99/70 (4.82)	41.33	41.30	41.31	-0.03	+0.01
Pleasant Grove Creek Canal					
at Sankey Road (3.65)	41.71	41.73	41.75	+0.02	+0.02
at Fifield Road (1.49)	41.73	41.77	41.78	+0.04	+0.01
Feather River					
at Nicolaus Gage (8.00)	50.12	50.10	50.10	-0.02	0
Yolo Bypass					
at Woodland Gage (51.10)	33.75	33.63	33.63	-0.12	0
American River					
at H Street (6.471)	46.54	47.90	47.90	+1.36	0
Source: Appendix A					

Table 4-6 100-year Maximum Water Surface Elevation Summary, No Levee Failures (Sensitivity Analysis)			
Location (Comp Study River Mile)	**Maximum Water Surface Elevation (feet NGVD29)**		**Change (feet)**
	Without Project	**With Project**	**Without Project to With Project**
Sacramento River			
at Knight's Landing (90.22)	42.10	42.10	0
at Fremont Weir, west end (84.75)	40.90	40.90	0
at Natomas Cross Canal (79.21)	41.45	41.45	0
at I-5 (71.00)	36.90	36.90	0
at Sacramento Bypass (63.82)	31.45	31.45	0
at NEMDC (61.0)	32.02	32.02	0
at I Street (59.695)	31.74	31.74	0
at Freeport Bridge (46.432)	25.54	25.54	0
Natomas Cross Canal			
u/s Hwy 99/70 (4.82)	41.50	41.50	0
Pleasant Grove Creek Canal			
at Sankey Road (3.65)	41.37	41.37	0
at Fifield Road (1.49)	41.50	41.50	0
Feather River			
at Nicolaus Gage (8.00)	48.90	48.90	0
Yolo Bypass			
at Woodland Gage (51.10)	33.21	33.21	0
American River			
at H Street (6.471)	40.81	40.81	0

Table 4-7 200-year Maximum Water Surface Elevation Summary, No Levee Failures (Sensitivity Analysis)			
Location (Comp Study River Mile)	**Maximum Water Surface Elevation (feet NGVD29)**		**Change (feet)**
	Without Project	**With Project**	**Without Project to With Project**
Sacramento River			
at Knight's Landing (90.22)	43.39	43.39	0
at Fremont Weir, west end (84.75)	42.47	42.48	+0.01
at Natomas Cross Canal (79.21)	42.90	42.92	+0.02
at I-5 (71.00)	38.24	38.24	0
at Sacramento Bypass (63.82)	33.48	33.48	0
at NEMDC (61.0)	34.06	34.07	+0.01
at I Street (59.695)	33.78	33.78	0
at Freeport Bridge (46.432)	27.40	27.41	+0.01
Natomas Cross Canal			
u/s Hwy 99/70 (4.82)	42.92	42.94	+0.02
Pleasant Grove Creek Canal			
at Sankey Road (3.65)	42.65	42.67	+0.02
at Fifield Road (1.49)	42.90	42.91	+0.01
Feather River			
at Nicolaus Gage (8.00)	51.19	51.20	+0.01
Yolo Bypass			
at Woodland Gage (51.10)	34.56	34.57	+0.01
American River			
at H Street (6.471)	44.40	44.40	0

Table 4-8 500-year Maximum Water Surface Elevation Summary, No Levee Failures (Sensitivity Analysis)			
Location (Comp Study River Mile)	**Maximum Water Surface Elevation (feet NGVD29)**		**Change (feet)**
	Without Project	**With Project**	**Without Project to With Project**
Sacramento River			
at Knight's Landing (90.22)	44.27	44.31	+0.04
at Fremont Weir, west end (84.75)	43.79	43.85	+0.06
at Natomas Cross Canal (79.21)	43.68	43.85	+0.17
at I-5 (71.00)	39.76	39.85	+0.09
at Sacramento Bypass (63.82)	37.97	38.00	+0.03
at NEMDC (61.0)	37.97	38.00	+0.03
at I Street (59.695)	37.67	37.69	+0.02
at Freeport Bridge (46.432)	30.28	30.30	+0.02
Natomas Cross Canal			
u/s Hwy 99/70 (4.82)	43.45	43.71	+0.26
Pleasant Grove Creek Canal			
at Sankey Road (3.65)	43.25	43.40	+0.15
at Fifield Road (1.49)	43.50	43.71	+0.21
Feather River			
at Nicolaus Gage (8.00)	53.45	53.47	+0.02
Yolo Bypass			
at Woodland Gage (51.10)	35.96	36.01	+0.05
American River			
at H Street (6.471)	49.16	49.17	+0.01

Because of their dependence on the Garden Highway for access, all of these residences would likely become uninhabitable once the Natomas Basin becomes fully inundated. Given the severity of the storm that would be required to create these conditions, this inundation would likely last for several weeks, if not months. Interior roadways would be unusable and the landside of the Garden Highway would likely be destabilized by ponded water and wind and wave action. Portions of the roadway would slough away and the entire road would become impassable, leaving Garden Highway residents with no land-based access to their homes.

Even if SCAS were to construct a more limited flood protection system (e.g., compartment levee) to protect the Airport in the absence of SAFCA's proposed improvements to the perimeter levee system, the basin's existing residential, commercial, and industrial structures and their contents would remain subject to a relatively high risk

of flooding, the consequences of which would include the unavoidable significant effects identified above.

Consequently, the No-Action (or Without Project) Alternative would continue to expose residents of the Natomas Basin and the Garden Highway to significant risk of flooding. This impact would be significant.

Alt. 1

Under Alternative 1, portions of the perimeter levee system around the Natomas Basin, including the NCC south levee and many of the reaches of the Sacramento River east levee, would be strengthened and raised to provide the required 3 feet of freeboard above the 200-year design water surface profile. This freeboard requirement originates in FEMA regulations and the engineering practice of the California Department of Water Resources (DWR), which has been mandated to develop design standards for providing a "200-year" level of flood protection for urban areas protected by levees in the Central Valley.

As indicated in Tables 4-1 through 4-8, above, this analysis shows that the levees around the Natomas Basin are currently high enough to contain the "1957" profile and the 100-year flood profile under both the levee failure scenario and the sensitivity (no levee failure) analysis. Accordingly, the improvements that would be constructed as part of Alternative 1 would have no effect on these water surface elevations.

With respect to the 200-year design flood, the levee failure routings show that non-urban levees outside of the Natomas Basin would overtop in multiple locations by 6 inches to 1 foot. At these locations, the UNET model assumes that the overtopping would produce a 500-foot breach over a 2-hour period. The model allows water to leave the system by flowing through the breach. The water remaining in the adjacent channel is routed downstream and thus contributes to the resulting water surface elevations in the channels surrounding the Natomas Basin. The analysis shows that all of the levees around the Natomas Basin currently contain these water surface elevations. Therefore, the proposed improvements would not alter the 200-year flood profile under this levee failure scenario.

With respect to the 500-year flood, the MBK levee failure routings show that approximately 100 miles of the SRFCP levee system would be subject to overtopping by up to 2 feet in some locations. The affected levees would perform as described above for the 200-year levee failure routing. The analysis shows that all of the levees around the Natomas Basin currently contain the resulting water surface elevations in the channels surrounding the Basin. Therefore, the proposed improvements would not alter the 500-year flood profile under this levee failure scenario.

As part of the sensitivity analysis, the 200-year and 500-year routings were performed without any levee failures being allowed. Under these routings, where these floods cause levees to overtop, the UNET model assumes that the affected levees would function as weirs, allowing water to leave the system by flowing over the top of the affected levee, but without triggering a breach. As in the levee failure scenarios, the water remaining in the adjacent channel is routed downstream and thus contributes to the resulting water surface elevations in the channels surrounding the Natomas Basin. These no levee failure routings indicate that the 200-year flood would slightly overtop portions of the existing Sacramento River east levee and the existing NCC south levee but would otherwise be contained. Raising these levees as proposed in Alternative 1 would prevent this overtopping and increase the 200-year water surface elevation in the project area by 0.01 foot in the Sacramento River channel and 0.02 foot in the NCC. The 500-year flood with

no upstream levee failures would cause more substantial overtopping in these reaches of the Natomas Basin levee system. The improvements proposed as part of Alternative 1 would contain these overflows and cause the 500-year water surface elevation in the Sacramento River channel and the NCC to increase by up to 0.17 foot and up to 0.26 foot, respectively.

In summary, Alternative 1 would not measurably increase water surface elevations in the project area except in the most implausible circumstances (i.e., a 500-year flood with no levee failures despite 100 miles of levee overtopping in areas upstream of the Natomas Basin). The details of this analysis are included in Appendix A.

A number of residents of homes on the water side of the Sacramento River east levee have expressed concerns to SAFCA and to USACE during the EIS scoping process that the proposed freeboard increases would increase the risk of flooding of their residences. As described above, implementation of Alternative 1 would not cause the SRFCP operations to be altered; therefore, the principal risks of flood damage to these existing waterside Garden Highway residences would continue to be either inundation by the water surface elevations that would remain unchanged by Alternative 1 or damage by the wind and wave run-up generated during these water surface elevations. In either event, Alternative 1 would not alter the existing risk of damage associated with living along the edge of the Sacramento River channel. Moreover, this risk would be alleviated by the project because the freeboard added to the Sacramento River east levee would prevent a potential wind- and wave-induced levee failure and the improvements to address seepage potential would greatly reduce the potential for a seepage-induced failure.

For these reasons, Alternative 1 would not have a significant adverse hydraulic impact on the SRFCP or expose people or structures to a significant risk of flooding. This alternative would substantially reduce the risk of flooding of the Natomas Basin, a beneficial effect.

Alt. 2

Because the 1,000-foot setback levee would be designed to maintain the same flow split between the Yolo Bypass and the Sacramento River as under existing conditions, Alternative 2 would have the same hydraulic profile as Alternative 1. Alternative 2 would not result in a significant effect. Like Alternative 1, Alternative 2 would reduce the exposure of people and structures to a significant risk of flooding.

Alt. 3

Because the 500-foot setback levee would be designed to maintain the same flow split between the Yolo Bypass and the Sacramento River, Alternative 3 would have the same hydraulic profile as Alternative 1. Alternative 3 would not result in a significant effect. Like Alternative 1, Alternative 3 would reduce the exposure of people and structures to a significant risk of flooding.

Mitigation Measure: None

Except for substantial improvements to the Natomas perimeter levee system (i.e., implementation of one of the action alternatives), no mitigation is available to reduce the potential under the No-Action Alternative for substantial risks of flooding to people and residences and associated damages in the Natomas Basin and on the waterside of the Sacramento River east levee to a less-than-significant level.

No mitigation is required for Alternatives 1, 2, and 3.

Impact 4.4-b: Alteration of Local Drainage

No-Action Alt.

Under the No-Action Alternative, there would be no construction associated with the improvements to the Natomas perimeter levee system; therefore, this alternative would have no direct effect on the local drainage systems described in Chapter 2. Without improvements to the perimeter levee system to provide 100-year flood protection, a significantly high risk of a levee failure in the perimeter system would remain. A levee failure in the Natomas Basin could result in flooding that could alter local drainage systems. However, the potential for such an occurrence is uncertain, and the magnitude and duration of any related effects on local drainage systems cannot be predicted.

If SCAS were to construct flood protection in the form of a compartment levee to protect the Airport from flooding in the absence of Natomas perimeter levee improvements, substantial alteration of local drainage systems around the Airport, shown in **Plate 10**, and drainage patterns would result. This impact would be significant unless a substantial redesign of local drainage systems were included in the design of the Airport flood protection system.

Alt. 1, Alt. 2, Alt. 3

As part of the planning process for the project and in coordination with SAFCA, SCAS, and RD 1000, Mead & Hunt has conducted preliminary evaluations of local drainage patterns and needs in relation to proposed features of the Alternatives. Information on drainage trends and drainage collection needs in the project area have been an integral part of development of the project concept.

Project elements proposed for the 2008 construction phase include relocating the private irrigation ditch in Sacramento River east levee Reach 1 to accommodate construction of the adjacent levee under Alternative 1 or the setback levee under Alternatives 2 and 3. Elkhorn Canal would also be relocated between the North Drainage Canal and Elkhorn Reservoir, and irrigation water would be rerouted through the replacement canals. No major aspects of the Natomas Basin drainage system would be affected by 2008 construction. The borrow sites that would be used in the 2008 construction phase, the Airport northern bufferlands and the Brookfield property (alternatively, the RD 1001 borrow site), would be 3–5 feet lower following the conclusion of borrow operations. These sites would be regraded and either developed as grassland (Airport bufferlands, RD 1001 site) or returned to rice cultivation (Brookfield). Drainage from these sites would be routed to the existing drainage system for these lands. However, drainage plans have not yet been finalized.

In the 2009 and 2010 construction phases, additional Airport bufferland areas would be used as a borrow source and then converted to managed grassland that would be designed to drain to the existing drainage system for these lands. Given that the primary management objective on these lands would be to reduce hazardous wildlife populations, these lands would need to be graded to ensure their efficient drainage, as needed, to existing drainage canals. Other areas of the Airport bufferlands used as a soil borrow source would be reconfigured into managed marsh with a combination of shallow water bodies, swales, and uplands, and with water control structures that would be used to carefully manage water levels at different times of the year to optimize the intended habitat conditions. Specific grading plans are still under development.

Other project elements proposed for the 2009 and 2010 construction phases include construction of the adjacent setback levee in Reaches 5A–19A of the Sacramento River

east levee under Alternatives 1 and 3 and levee raising and backslope flattening under Alternative 2, and the associated relocation of the existing Elkhorn Canal south of Elkhorn Reservoir and the Riverside Canal. Portions of privately maintained local canals, some of which may provide a drainage function, would be overlapped by the footprint of the adjacent setback levee along the Sacramento River east levee, the widened PGCC west levee, and/or berms associated with both levees. Drainage would need to be rerouted to new replacement canals before these canals are decommissioned to ensure that local drainage and ponding areas would not be adversely affected as a result of project construction. Detailed plans for these replacements are still under development. The new GGS/Drainage Canal would become part of the local drainage system and would be designed to intercept and convey runoff from much of the area currently drained by the Airport West Ditch. Construction of the new GGS/Drainage Canal, and the repairs to infrastructure associated with the Airport West Ditch, would substantially alter drainage collection west of the Airport operations area by improving drainage in the Airport Critical Zone. Specific design of connections with the existing local drainage system is still under development.

Because specific plans have not been finalized to ensure uninterrupted conveyance of drainage from agricultural lands along the Sacramento River east levee and the PGCC west levee, and grading plans have not yet been finalized for borrow areas that would be converted to managed grassland, there is the potential for the alternatives to temporarily or permanently alter the existing drainage pattern of the project area as a result of the 2008, 2009, and 2010 construction phases, causing localized flooding. Alternatives 1, 2, and 3 could result in a significant effect.

Mitigation Measure 4.4-b: Coordinate with Landowners and Drainage Infrastructure Operators, Prepare Drainage Studies as Needed, and Remediate Impacts through Project Design

No-Action Alt.

If SCAS were to construct a flood protection system to protect the Airport in the absence of Natomas perimeter levee improvements, the Airport project proponent would likely need to implement mitigation similar to that described below for Alternatives 1, 2, and 3, to reduce impacts on local drainage to a less-than-significant level.

Alt. 1, Alt. 2, Alt.3

During project design, project engineers shall coordinate with owners and operators of local drainage systems and landowners served by the systems to evaluate pre-project and post-project drainage needs, and design features to remediate any project-related substantial drainage disruption or alteration in runoff that would increase the potential for local flooding. If substantial alteration of runoff patterns or disruption of a local drainage system could result from a project feature, a drainage study shall be prepared as part of project design. The study shall consider the design flows of any existing facilities that would be crossed by project features and shall develop appropriate plans for relocation or other modification of these facilities and construction of new facilities, as needed, to ensure equivalent functioning of the system during and after construction. If no drainage facilities (e.g., ditches, canals) would be affected, but project features would have a substantial adverse impact on runoff amounts and/or patterns, then new drainage systems shall be included in the design of project improvements to ensure that the project would not result in new or increased local flooding. Any necessary features to remediate project-induced drainage problems shall be constructed before the project

is completed or as part of the project, depending upon site-specific conditions. Implementing this mitigation would reduce the impact to a less-than-significant level.

Impact 4.4-c: Effects on Groundwater Recharge

No-Action Alt.

No activities are anticipated for the No-Action Alternative that may affect groundwater recharge. Flooding of the basin, should it occur in the absence of improvements to the perimeter levee system, would not inhibit groundwater recharge.

Alt. 1, Alt. 2, Alt. 3

For Alternatives 1, 2, and 3, the 2008 construction phase includes continuing the construction of a seepage cutoff wall from the eastern terminus of the NCC Phase 1 Improvements constructed in 2007 to the eastern end of the NCC south levee (approximately Station 54+00 to Station 287+50). The 2008 construction phase for the Sacramento River east levee would include installation of cutoff walls in Reaches 2 and 3 of the adjacent levee (approximately Station 50+00 to Station 110+00) under Alternative 1. Alternatives 2 and 3 would include 100-foot seepage berms in Reaches 1 and 2, which encompass the 1.5-mile-long setback levee. For Alternative 2, a cutoff wall would be constructed in the existing levee in Reach 3. For Alternative 3, the cutoff wall would be constructed in Reach 3 of the new adjacent levee. The total extent of cutoff walls in the 2008 construction phase would be approximately 6.5 miles for Alternative 1 and 5.5 miles for Alternatives 2 and 3.

The purpose of a cutoff wall is to dissipate the hydraulic gradient in the levee foundation and reduce seepage quantities. The effect of this dissipation is to reduce the hydraulic gradient and seepage flows through the foundation soils adjacent to the cutoff wall to safe levels. To achieve maximum effectiveness, the cutoff wall must extend completely through the permeable strata and terminate some distance into an underlying, reasonably continuous, less permeable layer. The cutoff walls in Alternatives 1, 2, and 3 would be constructed to depths of 60–70 feet below the top of the levees.

The presence of cutoff walls could restrict the movement of groundwater in either direction (away from or toward the NCC or Sacramento River). Potential consequences are increases or decreases in the water levels in shallower wells and/or localized near-surface groundwater levels in areas immediately east and west of the cutoff wall. As noted in Section 3.3.4.5, “Groundwater Hydrology,“ major recharge to the local aquifer system generally occurs along active river and stream channels where extensive sand and gravel deposits exist, particularly in the American River and Sacramento River channels (Sacramento Groundwater Authority [SGA] 2002). Other sources of recharge within the area include inflow of groundwater generally from the northeast; subsurface recharge from fractured geologic formations to the east; and deep percolation from applied surface water (crop irrigation). The NCC is not identified as a major recharge source.

An analysis completed on behalf of USACE in 2001 assessed the effects of alternative seepage cutoff wall lengths and depths on local groundwater movement and migration into and from the Sacramento River (MWH 2001). Using hydrogeologic principles, the analysis found that the installation of seepage cutoff walls would not adversely affect the ability to recharge the Natomas Basin groundwater aquifer. Even with construction of a 150-foot deep continuous cutoff wall surrounding the Natomas Basin, except along

the Natomas East Main Drainage Canal (NEMDC), deep percolation of rainfall and imported water supplies were considered sufficient to maintain local groundwater levels. One scenario that was analyzed included approximately 30 miles of cutoff walls in the total 43-mile length of levees that surround the Natomas Basin. Because the 2008 construction phase of Alternative 1 includes construction of cutoff walls only along the NCC and Reaches 2 and 3 of the Sacramento River east levee—approximately 6.5 miles—and the cutoff walls would be less than half as deep as the 150-foot depth considered in the scenario, based on the conclusion of the study, this construction phase would not adversely affect the ability to recharge the Natomas Basin groundwater aquifer. For Alternatives 2 and 3, the extent of cutoff walls in the 2008 phase of construction would be approximately 5.5 miles, or 1 mile less than under Alternative 1; therefore these alternatives also would not adversely affect recharge of the Natomas Basin groundwater aquifer.

More recently, an analysis was performed for SAFCA to estimate seepage flow from the Sacramento River into the aquifer under both existing conditions and with cutoff walls in place (SAFCA 2007b). The analysis modeled idealized cross-sections representing subsurface stratigraphy for all 20 reaches of the Sacramento River east levee. Using this model of steady-state conditions, a series of steady-state seepage analyses was performed to estimate seepage as a function of river elevation through the levee foundation with a cutoff wall in place. The analyses considered a configuration of cutoff walls installed in 14 of the 20 reaches covering approximately 8.5 of the 19 miles evaluated, including Reaches 2 and 3.

The results of the analysis indicate that total seepage from the Sacramento River through the levee foundation along Sacramento River east levee between Stations 00+00 and 960+00 under the existing conditions is about 5,650 acre-feet per year (afy). At the cutoff wall locations considered, seepage flow could be reduced locally by up to 85%, depending on stratigraphy and proposed wall depth. The analysis shows that the overall effect, assuming 14 reaches with cutoff walls, would be approximately 1,300 afy (about a 20% reduction of the total recharge rate). Loss from cutoff walls in Reaches 2 and 3 was estimated to be only a minor portion of this total, approximately 15 afy. The study indicates that a characteristic of the cutoff wall is that it likely would also reduce seepage flow out of the Natomas Basin toward the river in the summer months when the river level is low. The effect on recharge of this change in groundwater flow was not modeled.

A peer review of the seepage analysis was performed for the present study and found its estimates of the reduction in horizontal flow as a result of cutoff construction to be reasonable (LSCE 2008). The review noted that the estimates are conservative in that they do not account for increased vertical flow beneath the cutoff walls or horizontal flow around the cutoff walls.

Based on the two analyses described above and given the recognized sources of Natomas Basin aquifer recharge, the cutoff walls along the NCC south levee and Sacramento River east levee that are proposed for Alternatives 1, 2, and 3 for the 2008 phase of construction are not expected to have a significant adverse effect on groundwater recharge in the Natomas Basin or local wells.

For the 2009 and 2010 construction phases, it is anticipated that cutoff walls may be used for seepage remediation in as many as 12 additional reaches of the Sacramento

River east levee south of Reach 4B beneath the adjacent levee under Alternatives 1 and 3 or through the existing levee under Alternative 2. The exact locations of cutoff walls would be determined by geotechnical and hydro-geotechnical studies. Given the results of the preliminary analysis presented above, it is possible that these cutoff walls may have a significant effect on local well yields. Further project-specific analysis for these phases will need to be conducted based on further project design to determine the potential effect of these cutoff walls on groundwater recharge and well levels.

Mitigation Measure 4.4-c: Investigate Potential Groundwater Effects from Using Cutoff Walls in 2009–2010 Construction, Monitor Landside Production Wells along the Sacramento River East Levee for Effects on Yields, and Remediate Effects if Necessary

No-Action Alt.

No mitigation is required.

Alt. 1, Alt. 2, Alt.3

No mitigation is required for the 2008 construction phase. For the 2009 and 2010 construction phases, the following measures shall be implemented:

SAFCA shall conduct a detailed evaluation of the potential impacts of constructing cutoff walls in those segments of Sacramento River east levee Reaches 5A through 20A where, based on detailed geotechnical investigation and design considerations, seepage remediation is determined to be necessary and cutoff walls are considered a potential form of remediation. The investigation shall analyze the effect of the cutoff walls on overall groundwater recharge in the project area from the Sacramento River and also evaluate the effects of other project features, including proposed landscape changes and associated water use, on groundwater recharge and groundwater levels. SAFCA shall use the information in conjunction with the water budget of the project area, based on existing and planned land uses, to determine whether the project could affect groundwater recharge such that the yields of local wells could be substantially lowered.

SAFCA shall also implement a program to monitor the yield of domestic and agricultural production wells that may be affected following installation of cutoff walls in 2009 and 2010. In the event that the yield of any of these wells is significantly reduced, SAFCA shall reimburse the owners of affected wells for the cost of lowering well screens to a level that will restore the pre-construction yields.

Implementing this mitigation would reduce the impact to a less-than-significant level.

4.4.3 Unavoidable Significant Adverse Effects

The No-Action Alternative would result in an unavoidable significant risk of flooding to people and residences and associated damages in the Natomas Basin and on the waterside of the Sacramento River east levee.

No unavoidable significant adverse effects were identified for Alternatives 1, 2, and 3.

4.5 WATER QUALITY

4.5.1 Methodology

Water quality impacts that could result from project construction activities were evaluated based on the construction practices and materials used, the location and duration of the activities, and the potential for degradation of water quality or beneficial uses of project area waterways. For this analysis, the project alternatives were determined to have a significant impact on water quality if project activities would cause a violation of any water quality standards or otherwise substantially degrade water quality.

4.5.2 Impacts and Mitigation Measures

Impact 4.5-a: Temporary Effects on Water Quality from Stormwater Runoff, Erosion, or Spills

No-Action Alt.

There would be no construction of improvements to the Natomas perimeter levee system associated with the No-Action Alternative; therefore, this alternative would have no construction-related effect on water quality associated with these improvements. If SCAS were to construct a flood protection system (e.g., compartment levee) to protect the Airport in the absence of improvements to the Natomas perimeter levee system, adverse effects to water quality as a result of construction activity would occur. Construction activity would involve ground disturbance and the potential for contaminants to enter local waterways either from direct spills, or from stormwater runoff, as described below for construction under Alternatives 1, 2, and 3. These impacts could be significant.

Without improvements to the perimeter levee system to provide 100-year flood protection, a significantly high risk of a levee failure in the perimeter system would remain. A levee failure in the Natomas Basin could result in flooding that could introduce large quantities of agricultural pesticides, oil, gasoline, and other hazardous materials into flood waters and subsequently into stream channels and groundwater. However, the potential for such an occurrence is uncertain, and the magnitude and duration of any related effects on water quality cannot be predicted.

Alt. 1, Alt. 2, Alt.3

The project alternatives would include extensive ground-disturbing activities, many of them near local drainages and waterways that could become contaminated by soil or construction substances. These waterways include the NCC, Morrison Canal near the NCC south levee, a private irrigation ditch located long the top of an existing berm in Reach 1 of the Sacramento River east levee, the North Drainage Canal, the West Drainage Canal, and the Elkhorn and Riverside Canals. Construction in 2008 would include degradation of the upper approximately one-half of, and installation of a seepage cutoff wall through, much of the NCC south levee; subsequent reconstruction of the degraded portions; and raising of the entire levee, including reshaping of portions of the waterside levee slope. Under Alternative 1, an adjacent levee would be constructed adjoining the Sacramento River east levee from the NCC through Reach 4B, with cutoff walls installed in Reaches 2 and 3 and seepage berms in Reaches 4A and 4B. Under Alternatives 2 and 3, a setback levee would be constructed in the northern reach of the Sacramento River east levee. Under any of these alternatives, an existing irrigation canal at the current landside levee toe in Reach 1 would be dewatered and destroyed, and a replacement canal would be constructed east of the existing canal.

In addition, the relocated Elkhorn Canal and the new GGS/Drainage Canal would be constructed between the North Drainage Canal and Elkhorn Reservoir.

Fill material for levee and berm construction would be excavated from the Airport north bufferlands area and the Brookfield property, and possibly the RD 1001 site (**Plate 19**). Following excavation, the Airport bufferlands sites would be converted to grassland, the Brookfield site would be returned to agricultural use, and the RD 1001 site would likely be reclaimed as grassland or otherwise reclaimed in conformance with the state Surface Mining and Reclamation Act (SMARA). Some of these lands are bordered by agricultural canals or ditches.

Under all alternatives, the 2009 and 2010 construction phases would include reconstruction of Pumping Plant No. 2 at the western end of the North Drainage Canal, relocation of the Elkhorn and Riverside Canals, extension of the new GGS/Drainage Canal south to connect to the West Drainage Canal, modifications of the West Drainage Canal to improve giant garter snake habitat, and modifications to infrastructure at the Airport West Ditch. Other aspects of the work would be conducted near local irrigation and drainage canals.

Planned construction activities would coincide with part of the rainy season. These activities have the potential to temporarily impair water quality if disturbed and eroded soil, petroleum products, and other construction-related wastes (e.g., cement and solvents) are discharged into receiving waters or onto the ground in places where they can be carried into receiving waters. Soil and associated contaminants that enter receiving waters through stormwater runoff and erosion can increase turbidity, stimulate algae growth, increase sedimentation of aquatic habitat, and introduce compounds that are toxic to aquatic organisms. Accidental spills of construction-related substances such as oils and fuels can contaminate both surface water and groundwater. The extent of potential effects on water quality would depend on the following factors: tendency for erosion of soil types encountered, types of construction practices, extent of the disturbed area, duration of construction activities, timing of particular construction activities relative to the rainy season, proximity to receiving water bodies, and sensitivity of those water bodies to construction-related contaminants.

Slurry that would be used for construction of the new cutoff wall in the NCC south levee and in the adjacent levee along the Sacramento River east levee under Alternatives 1 and 3 or in the existing Sacramento River east levee under Alternative 2 has the consistency of liquid mud when being placed during construction. Improper handling or storage could result in releases to nearby surface water, thereby degrading water quality.

Excavated areas that fill with groundwater or surface drainage during project construction would require dewatering. Effluent from dewatering operations typically contains high levels of suspended sediment and often high levels of petroleum products and other construction-related contaminants. This effluent could be directly released to local receiving waters, thereby degrading water quality.

Because the potential for release of soil or other construction-related materials into the NCC, local drainages, and ultimately the Sacramento River channel could adversely affect river water quality, this potential effect of Alternatives 1, 2, and 3 would be significant.

Mitigation Measure 4.5-a: Implement Standard BMPs, Prepare and Implement a SWPPP, and Comply with NPDES Permit Conditions

No-Action Alt.

If flood protection in the form of a compartment levee were constructed to protect the Airport portion of the basin from flooding in the absence of Natomas perimeter levee improvements, implementation of mitigation similar to that described below for Alternatives 1, 2, and 3 would be required to reduce potential water quality impacts to a less-than-significant level.

Except for substantial improvements to the Natomas perimeter levee system (i.e., implementation of one of the action alternatives), no mitigation is available to reduce the potential effects on water quality that may result in the event of a Natomas perimeter levee failure.

Alt. 1, Alt. 2, Alt.3

SAFCA shall file a Notice of Intent (NOI) to discharge stormwater associated with construction activity with the Central Valley RWQCB. Final design and construction specifications shall require the implementation of standard erosion, siltation, and good housekeeping BMPs. Construction contractors shall be required to prepare a SWPPP and comply with the conditions of the NPDES general stormwater permit for construction activity. The SWPPP, for work conducted under NPDES authorization, shall describe the construction activities to be conducted, BMPs that will be implemented to prevent discharges of contaminated stormwater into waterways, and inspection and monitoring activities that shall be conducted.

The SWPPP shall include the following:

- pollution prevention measures (erosion and sediment control measures and measures to control nonstormwater discharges and hazardous spills),
- demonstration of compliance with all applicable Central Valley RWQCB standards and other applicable water quality standards,
- demonstration of compliance with regional and local standards for erosion and sediment control,
- identification of responsible parties,
- detailed construction timelines, and
- a BMP monitoring and maintenance schedule.

BMPs shall include the following:

- Conduct all work according to site-specific construction plans that identify areas for clearing, grading, and revegetation so that ground disturbance is minimized.
- Install silt fences near riparian areas or streams to control erosion and trap sediment, and reseed cleared areas with native vegetation.

- Stabilize disturbed soils of the new levees, existing levee removal areas, and borrow sites before the onset of the winter rainfall season.

- Stabilize and protect stockpiles from exposure to erosion and flooding.

The SWPPP also shall specify appropriate hazardous materials handling, storage, and spill response practices to reduce the possibility of adverse impacts from use or accidental spills or releases of contaminants. Specific measures applicable to the project include, but are not limited to, the following:

- Develop and implement strict onsite handling rules to keep potentially contaminating construction and maintenance materials out of drainages and waterways.

- Conduct all refueling and servicing of equipment with absorbent material or drip pans underneath to contain spilled fuel. Collect any fluid drained from machinery during servicing in leak-proof containers and deliver to an appropriate disposal or recycling facility.

- Maintain controlled construction staging and fueling areas at least 100 feet away from stream channels or wetlands to minimize accidental spills and runoff of contaminants in stormwater.

- Prevent substances that could be hazardous to aquatic life from contaminating the soil or entering watercourses.

- Maintain spill cleanup equipment in proper working condition. Clean up all spills immediately according to the spill prevention and response plan, and immediately notify California Department of Fish and Game (DFG) and the RWQCB of any spills and cleanup procedures.

BMPs shall be applied to meet the "maximum extent practicable" and "best conventional technology/best available technology" requirements and to address compliance with water quality standards. A monitoring program shall be implemented during and after construction to ensure that the project is in compliance with all applicable standards and that the BMPs are effective.

Implementing this mitigation would reduce the impact to a less-than-significant level.

4.5.3 Unavoidable Significant Adverse Effects

The No-Action Alternative could result in unavoidable significant effects related to the introduction of large quantities of agricultural pesticides, oil, gasoline, and other hazardous materials into flood waters and subsequently into stream channels and groundwater should a Natomas perimeter levee failure occur.

No unavoidable significant adverse effects were identified for Alternatives 1, 2, or 3.

4.6 FISH AND AQUATIC HABITAT

4.6.1 Methodology

This section addresses the potential impacts of the alternatives on common and sensitive fish and aquatic habitat resources found in the NCC, the lower Sacramento River, and the PGCC and the NEMDC/ Steelhead Creek.

Fish and aquatic habitat impacts that could result from project construction activities were qualitatively evaluated based on the construction practices and materials to be used, the location and duration of the activities, and the potential for adverse effects on aquatic habitats adjacent to the project area and/or the fish community that may be occupying these habitats. For this analysis, the project alternatives were determined to have a significant impact on fish and aquatic habitat if project activities would interfere substantially with the movement of any native resident or migratory fish species, or substantially reduce the habitat of a fish species.

4.6.2 Impacts and Mitigation Measures

Impact 4.6-a: Loss of Fish or Aquatic Habitat Through Increased Sedimentation and Turbidity or Releases of Contaminants

No-Action Alt.

Under the No-Project Alternative, no improvements would be made to the Natomas perimeter levee system and there would be no potential for release of contaminants or increased sedimentation or turbidity from perimeter levee improvements. If SCAS were to construct a flood protection system (e.g., compartment levee) to protect the Airport in the absence of improvements to the Natomas perimeter levee system, adverse effects on water quality in agricultural canals due to construction activity could result, as described under Impact 4.5-a. These effects could, in turn, result in localized water quality degradation in receiving water bodies (e.g., the Sacramento River) and affect habitats and the physical health of individual fish and species populations in those water bodies, as described below for construction under Alternatives 1, 2, and 3. This impact could be significant.

In addition, as described under Impact 4.5-a, a levee failure in the Natomas Basin could result in flooding that could introduce large quantities of agricultural pesticides, oil, gasoline, and other hazardous materials into flood waters and subsequently into stream channels, which could have a significant adverse effect on fish populations.

Alt. 1, Alt. 2, Alt.3

Impact 4.5-a, “Temporary Effects on Water Quality from Stormwater Runoff, Erosion, and Spills,“ in Section 4.5, “Water Quality,“ provides a detailed description of project construction activities and the potential resulting effects on water quality. Water quality impacts would affect habitats and the physical health of individual fish and species populations within the Sacramento River, NCC, and PGCC and NEMDC/Steelhead Creek. These waterways provide migratory habitat for listed adult and juvenile chinook salmon and steelhead that would be susceptible to these water quality–related effects. Furthermore, the Sacramento River provides migration and spawning habitat for green sturgeon, striped bass, and American shad.

Project construction activities would include clearing and grubbing/stripping, degrading and subsequent reconstruction of the upper half of the NCC south levee, construction of cutoff walls along the NCC south levee, extensive soil borrow excavation and

placement for all levee improvements, construction of the adjacent setback levee, finish grading, relocation and construction of canals, and demobilization/cleanup.
These activities have the potential to temporarily impair water quality if disturbed and eroded soil is discharged into receiving waters. Soil and associated contaminants that enter receiving waters through stormwater runoff and erosion can increase turbidity, stimulate algae growth, increase sedimentation of aquatic habitat, and introduce compounds that are toxic to aquatic organisms.

Fish population levels and survival have been linked to levels of turbidity and siltation in a watershed. Prolonged exposure to high levels of suspended sediment could create a loss of visual capability in fish, leading to a reduction in feeding and growth rates; a thickening of the gill epithelia, potentially causing the loss of respiratory function; clogging and abrasion of gill filaments; and increases in stress levels, reducing the tolerance of fish to disease and toxicants (Waters 1995).

Also, high levels of suspended sediments would cause the movement and redistribution of fish populations and could affect physical habitat. Once suspended sediment is deposited, it could reduce water depths in pools, decreasing the water's physical carrying capacity for juvenile and adult fish (Waters 1995). Increased sediment loading could degrade food-producing habitat downstream of the project area as well. Sediment loading could interfere with photosynthesis of aquatic flora and displace aquatic fauna. Many fish are sight feeders, and turbid waters reduce the ability of these fish to locate and feed on prey. Some fish, particularly juveniles, could become disoriented and leave areas where their main food sources are located, ultimately reducing their growth rates.

Avoidance is the most common result of increases in turbidity and sedimentation. Fish will not occupy areas unsuitable for survival unless they have no other option. Some fish, such as bluegill and bass species, will not spawn in excessively turbid water (Bell 1991). Therefore, project construction could cause fish habitat to become limited if high turbidity resulting from construction-related erosion were to preclude a species from occupying habitat required for specific life stages.

In addition, the potential exists for contaminants such as fuels, oils, and other petroleum products used in construction activities to be introduced into the water system directly or through surface runoff. Contaminants may be toxic to fish or may alter oxygen diffusion rates and cause acute and chronic toxicity to aquatic organisms, thereby reducing growth and survival.

Because sedimentation and increased turbidity or other contamination could degrade water quality and adversely affect fish habitats and fish populations, Alternatives 1, 2, and 3 would result in a significant effect.

Mitigation Measure 4.6-a: Implement Mitigation Measure 4.5-a, described above (Implement Standard BMPs, Prepare and Implement a SWPPP, and Comply with NPDES Permit Conditions)

No-Action Alt.

If SCAS were to construct flood protection in the form of a compartment levee to protect the Airport from flooding in the absence of perimeter levee improvements, implementation of mitigation similar to that described below for Alternatives 1, 2, and 3 would be required to reduce potential water quality, and thus fish and aquatic habitat, impacts to a less-than-significant level.

Except for substantial improvements to the Natomas perimeter levee system (i.e., implementation of one of the action alternatives), no mitigation is available to reduce the potential effects on fish and aquatic habitat that may result in the event of a Natomas perimeter levee failure.

Alt. 1, Alt. 2, Alt.3

SAFCA shall implement Mitigation Measure 4.5-a, "Implement Standard BMPs, Prepare and Implement a SWPPP, and Comply with NPDES Permit Conditions." This measure requires filing a notice of intent with the Central Valley RWQCB; implementing standard erosion, siltation, and BMP measures; preparing a SWPPP; and complying with the conditions of the NPDES general stormwater permit for construction activity.

Implementing this measure would reduce the potential impact to a less-than-significant level.

Impact 4.6-b: Loss of Shaded Riverine Aquatic (SRA) Habitat Associated with Levee Improvement Activities

No-Action Alt.

The No-Action Alternative would not involve any modifications of streamside habitat; therefore, this alternative would have no direct effect related to the loss of SRA habitat. Levee failure and subsequent flooding of the basin in the absence of improvements to the perimeter levee system could have adverse or beneficial effects on SRA habitat, depending on timing, location, and duration of flooding. However, conformance with UCACE guidance regarding levee encroachments would require the removal of approximately 10 acres of riparian vegetation on the water side of the NCC south levee and approximately 5 acres along Reaches 1–4B and 30 acres along Reaches 5A–20 on the water side of the Sacramento River east levee. Much of this vegetation contributes to SRA habitat, and its removal could substantially adversely affect important SRA habitat function, including moderation of water temperatures, recruitment of woody debris, and introduction of insects that provide food for fish, along these channels. This would be a significant effect.

Alt. 1, Alt. 3

Small amounts of riparian vegetation, potentially providing SRA habitat function (e.g., overhead cover for fish or contributing instream woody material to the NCC and Sacramento River [downstream] channels), would need to be removed from the waterside slope of the existing NCC south levee and the top of the Sacramento River east levee at the RD 1000 Pumping Plant 2 site to accommodate levee improvement activities.

Removal of riparian vegetation or woody material along the existing levee or otherwise in the floodplain could result in the loss of important SRA habitat function. Therefore, Alternatives 1 and 3 could result in a significant effect.

Alt. 2

Under Alternative 2, in addition to the effects described for Alternatives 1 and 3, erosion control improvements would need to be implemented along approximately 3,710 feet of river bank at the waterside toe of the Sacramento River east levee at River Miles 73.5, 69.8 and 68.8 (Sites G, J, and M). Construction of these improvements would require the removal of approximately 11 trees within sites G, J, and M, and trimming of canopies of other trees growing on the eroding bank. The trimming of canopies would be required of branching structures that extend over the proposed

cobble surfaces. This trimming would result in a reduction in riparian canopy providing overhead SRA cover along sites G, J, and M of approximately 0.5 acre; however, approximately 3.44 acres of riparian habitat would be installed under this alternative, resulting in a net change in riparian habitat of +2.94 acres. It is anticipated that any temporary construction losses of overhead SRA cover would be fully replaced by the fifth growing season. Additionally, the bank protection concept has been designed to fully compensate for impacts on habitat values through the use of suitable types of substrate, vegetation, and instream woody material.

In addition to the tree removal and trimming within the erosion control sites as described above, implementation of Alternative 2 would require the removal of approximately 35 acres of mature woody vegetation from the Sacramento River east levee to conform with USACE guidance regarding levee encroachments (approximately 5 acres along Reaches 1–4B and 30 acres along Reaches 5A–20). This extensive riparian vegetation removal could substantially adversely affect important SRA habitat function, as described for the No-Action Alternative. This impact would be significant.

Mitigation Measure 4.6-b: Restore, Replace, or Rehabilitate Loss of Degraded SRA Habitat Function, and Comply with Section 1602, Section 7, and Section 2081 Permit Conditions

No-Action Alt.

Except for levee improvements that would allow for the retention of most vegetation on the water side of the Sacramento River east levee (i.e., the adjacent setback levee described for Alternatives 1 and 3) and the NCC south levee (i.e., widening of the levee described for Alternatives 1, 2, and 3), there is no known mitigation that would adequately compensate for the likely loss of waterside vegetation, and SRA habitat function under the No-Action Alternative.

Alt. 1, Alt. 2, Alt. 3

The following measure shall be implemented to restore, replace, or rehabilitate any potential loss of SRA habitat function for fish along the NCC south levee and at the location of Pump Station No. 2.

SAFCA shall consult with DFG regarding potential disturbance to fish habitat, including SRA, and shall obtain a streambed alteration agreement, pursuant to Section 1602 of the California Fish and Game Code, for construction work associated with levee improvements made on the water side of a levee, if needed. SAFCA shall comply with all permit conditions of the streambed alteration agreement and to protect fish habitat or to restore, replace, or rehabilitate any SRA habitat on a no-net-loss basis to ensure no loss of habitat function.

USACE shall initiate Section 7 consultation with NMFS under Section 7 of the Federal Endangered Species Act (ESA) and SAFCA shall consult with DFG under the California Endangered Species Act (CESA) regarding potential effects of the loss of SRA habitat on Federally listed fish species and state-listed fish species, respectively. Any additional measures developed through the ESA Section 7 and CESA consultation processes to ensure no loss of habitat function shall be implemented. Implementing this mitigation would reduce the impact under Alternatives 1 and 3 to a less-than-significant level. However, it may not be possible to reduce the impact to a less-than-significant level under Alternative 2.

4.6.3 Unavoidable Significant Adverse Effects

No unavoidable significant adverse effects were identified for Alternatives 1 and 3. The No-Action Alternative and Alternative 2 would result in unavoidable significant effects on SRA habitat function resulting from the extensive removal of riparian vegetation on the water side of the Sacramento River east levee (No-Action and Alternative and Alternative 2) and the NCC south levee (No-Action Alternative) to conform with USACE guidance regarding levee encroachments.

4.7 SENSITIVE AQUATIC HABITATS

4.7.1 Methodology

The evaluation of potential effects on sensitive aquatic habitats of each project alternative is based on the results of field surveys and review of existing documentation. Biologists conducted multiple reconnaissance-level and focused biological surveys of the project area during 2004–2007, as part of project-related studies and planning efforts. Specific documents reviewed to support the analysis in this section include multiple wetland delineation reports that cover portions of the project area. For this analysis, the project alternatives were determined to have a significant impact if project activities would have a substantial adverse effect on waters of the United States, including wetlands.

Effects on non-jurisdictional riparian habitats are addressed with other woodland effects in Section 4.8, "Vegetation and Wildlife."

4.7.2 Impacts and Mitigation Measures

Impact 4.7-a: Effects on Jurisdictional Waters of the United States

Tables 4-9 and 4-10 identify the potential temporary and permanent effects on waters of the United States resulting from the proposed action and alternatives for the 2008 and 2009–2010 construction phases, respectively.

No-Action Alt.

Under the No-Action Alternative, the Natomas perimeter levee system would not be improved and the proposed landscape and irrigation/drainage system modifications would not be implemented. Consequently, there would be no project-related adverse effects on waters of the United States under USACE jurisdiction and no creation of the new canal or marsh habitats associated with the replacement canals or borrow site restoration described for Alternatives 1, 2, and 3. Without improvements to the perimeter levee system to provide 100-year flood protection, a significantly high risk of a levee failure in the perimeter system would remain. A levee failure in the Natomas Basin could result in flooding that could adversely or beneficially affect waters of the United States.

If SCAS were to construct a more limited flood protection system (e.g., compartment levee) to protect the Airport in the absence of SAFCA's proposed improvements to the perimeter levee system, construction of such a system would require the fill of portions of several agricultural canals in the Airport vicinity (see **Plate 10** for an overview of the

Table 4-9
Estimated Effects on Jurisdictional Waters of the United States for the 2008 Construction Phase

Feature	Functional Value[1]	Alternative 1		Alternative 2		Alternative 3	
		Temporary Effect (Acres)	Permanent Effect (Acres)	Temporary Effect (Acres)	Permanent Effect (Acres)	Temporary Effect (Acres)	Permanent Effect (Acres)
Raising of Natomas Cross Canal South Levee, Including Canal/Ditch Relocation South of the Levee							
Water Side of the NCC (Cut)	High	4.96		4.96		4.96	
Water Side of the NCC (Fill)	High		4.78		4.78		4.78
Water Side of the NCC (Staging)	High	3.28		3.28		3.28	
Seasonal Wetland Patches South of NCC (Fill)	Moderate		4.91		4.91		4.91
Drainage Ditch, Canals, Vestal Drain (Fill/Staging)	Low	<0.01	0.68	<0.01	0.68	<0.01	0.68
Construction of Sacramento River East Levee Improvements							
Irrigation Ditches (Fill)	Low		0.58		0.61		0.61
Elkhorn Main Canal (Fill)	Low		0.52		0.52		0.52
Sacramento River Waterside Drainage Outfalls (Fill)	High		0.02		0.01		0.01
Sacramento River Waterside Erosion Sites G, J, and M (Fill)	High				7.44		
Construction of New Elkhorn Irrigation Canal and GGS/Drainage Canal							
Irrigation and Drainage Ditches (Fill)	Low		0.21		0.21		0.21
Seasonal Wetland (Fill)	Moderate		1.65		1.65		1.65
Freshwater Marsh (Fill)	High		0.07		0.07		0.07
North Drainage Canal and Irrigation Ditch (Dewater)	Moderate	0.30		0.30		0.30	
Borrow Site and Haul Road Construction							
Drainage Ditches and Canals (Fill/Dewater)	Low	0.21	0.78	0.21	0.78	0.21	0.78
Seasonal Wetland (Fill/Dewater)	Moderate	0.82		0.82		0.82	
Irrigated Wetland (Fill)	Moderate	59.28	0.20	59.28	0.20	59.28	0.20
Freshwater Marsh (Fill/Dewater)	High	0.01		0.01		0.01	
Total Effects on Waters of the United States		**64.76**	**15.15**	**64.76**	**22.61**	**64.76**	**15.17**

[1] Functional value definitions: High = Natural structure and function of biotic community maintained, with minimal changes evident. Moderate = Moderate changes in structure and function of biotic community—i.e., moderate level of disturbance. Low = Severe changes in structure and/or function of biotic community evident—i.e., high level of disturbance. See Section 3.3.7 in Chapter 3 for additional information.

Source: EDAW 2008 based on data provided by Wood Rodgers 2008, Mead & Hunt 2008, HDR, Inc. 2008

Table 4-10
Potential Effects on Jurisdictional Waters of the United States in the 2009 and 2010 Construction Phases

Feature	Functional Value[1]	Alternatives 1, 2, and 3	
		Temporary Effect (Acres)	Permanent Effect (Acres)
Construction of Sacramento River East Levee Improvements			
Elkhorn Canal (Fill)	Low		5.5
Seasonal Wetland (Fill)	Moderate		2.2
Irrigation & Drainage Ditches (Fill)	Low		1.0
Freshwater Marsh (Fill)	High		0.8
Riverside Canal (Fill)	Low		4.1
Construction of Elkhorn Main Canal			
Ditch (Fill)	Low		0.1
Seasonal Wetland (Fill)	Moderate		1.3
Freshwater Marsh (Fill)	High		0.8
Construction of GGS/Drainage Canal			
Irrigation & Drainage Ditches (Fill)	Low		0.1
Pond Drain (Fill)	High		0.1
Airport West Ditch (Fill)	Low		0.03
Canal (Fill)	Low		0.05
West Drainage Canal Improvements (Excavate)	Low	23.1	
Construction of Riverside Main Canal			
Drainage Ditches, RD1000 Canal No. 3 (Fill)	Low		0.1
Riverside Main Canal (Fill)	Low		0.02
Airport West Ditch Modifications			
Airport West Ditch (Fill)	Low		4.3
Construction of Pleasant Grove Creek Canal Levee Improvements			
Irrigation Ditch (Fill)	Low		0.4
Borrow Site Haul Road Construction			
Ditch (Fill)	Low		0.6
Total Effects on Waters of the United States		**23.1**	**21.6**

1 High = Natural structure and function of biotic community maintained, with minimal changes evident. Moderate = Moderate changes in structure and function of biotic community—i.e., moderate level of disturbance. Low = Severe changes in structure and/or function of biotic community evident—i.e., high level of disturbance. See Section 3.3.7 in Chapter 3 for additional information.

Source: EDAW 2008 based on data provided by Wood Rodgers 2008, Mead & Hunt 2008, HDR, Inc. 2008

canals in the vicinity of the Airport), which may be jurisdictional waters of the United States. Like the impacts on canals described below for Alternatives 1, 2, and 3, this impact would be significant. Because there is no conceptual design for a compartment levee, the amount of fill of potentially jurisdictional waters cannot be estimated.

Alt. 1, Alt. 3

Under Alternatives 1 and 3, NCC improvements in the 2008 construction phase would result in temporary and permanent adverse effects on waters of the United States, including wetlands (**Table 4-9**). Four seasonal wetlands, totaling approximately 4.91 acres, within the maintenance zone at the landside toe of the NCC south levee, would be permanently filled to accommodate the levee expansion, eliminate depressions near the levee toe, and facilitate use of the area for maintenance. A total of approximately 0.68 acre of irrigation/drainage canal near the landside toe of the levee (where the ends of the canals approach the levee toe) would be filled or re-aligned to eliminate excavated areas in close proximity to the levee, and less than approximately 0.01 acre of drainage ditch would be temporarily affected by staging activities. Approximately 4.96 acres of waters of the United States within the ordinary high water mark of the NCC would be temporarily disturbed during construction to flatten the waterside levee slope, and approximately 4.78 additional acres would be permanently filled to accommodate waterside levee expansion in the middle and eastern reaches. In summary, a total of approximately 4.91 acres of seasonal wetland and approximately 10.37 acres of other waters of the United States would be permanently affected along the NCC south levee. However, the excavation and fill on the water side of the levee would not alter the ability of this NCC area to function as waters of the United States.

Effects on waters of the United States resulting from the 2008 construction phase improvements to the Sacramento River east levee under Alternative 1 would include fill of approximately 1.10 acres of Elkhorn Canal and irrigation ditches along the landside toe of the levee in Reaches 1, 4A, and 4B under Alternative 1 and approximately 1.13 acres under Alternative 3. Relocation of the Elkhorn Canal and construction of the new GGS/Drainage Canal in Reaches 4B–6A would result in permanent fill of 1.65 acres of seasonal wetland in the canal alignments along the west side of the Airport bufferlands and approximately 0.21 acre of irrigation and drainage ditches, and temporary disturbance of approximately 0.30 acre of open water habitat where these canals would connect to the existing North Drainage Canal. Under Alternative 3, the overall effects would be the same, although the ditch in Reach 1 of the Sacramento River east levee would not necessarily need to be filled. It might, however, become obsolete when agricultural land in the setback area is converted to woodland and is therefore included in the acreages in **Table 4-9**.

In reaches where the adjacent levee would be constructed and would be higher than the existing levee (Reaches 1 through 11B under Alternative 1 and from Station 88+00 in Reach 2 through Reach 11B under Alternative 3), filtered runoff would be conveyed in pipes from the swale between the existing levee and the new adjacent levee to new drainage outfalls in the berm along the east bank of the Sacramento River. Most of the outfalls would be placed above the ordinary high water mark and are not expected to qualify as fill of waters of the United States. A total of 23 outfalls are anticipated under Alternative 1 in the 2008 construction phase (Reaches 1 through 4B), occupying approximately 0.02 acre. Under Alternative 3, only 13 of these outfalls would be needed, occupying approximately 0.01 acre.

Under both alternatives, use of material from the Brookfield and Airport north bufferlands would require the permanent fill of 1.02 acres of wetlands and 0.78 acre of a drainage ditch, and the temporary fill of 58.56 acres of wetlands. Borrow material transport to the construction zone for the Elkhorn and GGS/Drainage canals would require temporary dewatering/fill of approximately 0.21 acre of ditches and approximately 0.73 acre of wetlands.

Under both alternatives, construction of levee improvements in the 2009 and 2010 construction phases are anticipated to result in permanent fill of approximately 23 acres of potential waters of the United States, including irrigation/drainage canals near the landside toe of the Sacramento River east levee and the PGCC west levee, as shown in **Table 4-10**. In addition, approximately 4.34 acres of open water in the Airport West Ditch would be dewatered; irrigation and drainage flows that contribute to the ditch would be rerouted and the ditch regraded to a grassy swale as part of the irrigation and drainage infrastructure reconfiguration associated with construction of the replacement canals. Drainage outfalls to the Sacramento River would be constructed at approximately twice as many locations as described for the 2008 construction phase in Reaches 5A through 11B, occupying approximately 1 acre, but most are not expected to require fill of waters of the United States. Because the locations and elevations are not yet known, this additional small acreage is not included in **Table 4-10**.

Features of both alternatives that would be designed to offset the effects described above and provide additional aquatic habitat values include the creation of approximately 45 acres of jurisdictional habitat resulting from construction of the new GGS/ Drainage Canal and expansion of the existing West Drainage Canal and creation of approximately 60 acres of new irrigation canal (i.e., the replacement Elkhorn and Riverside Canals), for a total of about 105 acres of new canal-associated habitat. In addition, managed marsh habitat would be created on an anticipated 230 acres after borrow extraction from the Airport north bufferlands borrow area and potential borrow areas in the vicinity of Fisherman's Lake. It is anticipated that seasonal wetland habitat would be incorporated into the marsh creation to offset the anticipated loss of seasonal wetland.

Under both alternatives, therefore, loss of waters of the United States, including wetlands, would be offset by the creation of more than 1 acre of irrigation/drainage canal or 1 acre of seasonal wetland for every acre that is lost in the form of new irrigation and drainage canals and wetlands at some borrow sites. A conceptual design of these aquatic features has been developed; detailed design and specific management protocols are currently being prepared by SAFCA in coordination with USACE, USFWS, and DFG. To provide adequate compensation for project impacts, new jurisdictional waters must be created and managed in a manner that provides the essential functions of the habitats that would be lost. Therefore, an overall adverse effect on waters of the United States could occur if the habitat creation and management are not properly implemented.

Alt. 2

As shown in **Tables 4-9** and **4-10**, impacts on waters of the United States under Alternative 2 would be the same as described for Alternatives 1 and 3 except that (1) there would be no drainage outfalls constructed along the east bank of the Sacramento River levee and therefore no potential for associated fill of waters of the United States, and (2) erosion control improvements would be implemented along

approximately 3,710 feet of river bank at the waterside toe of the Sacramento River east levee at River Miles 73.5, 69.8 and 68.8 (Sites G, J, and M).

The proposed erosion control improvements would involve the permanent placement of approximately 74,480 cubic yards of cobble, riprap, and soil at sites G, J, and M to provide protection of the levee foundation from catastrophic scour and erosion protection of the soil surface (**Plate 26**). The primary focus of riprap would be the submerged toe of the eroding bank (where it meets the channel bottom) to arrest retreat of the emergent upper bank and stop the reduction in berm width, thereby reducing the potential for loss of extensive mature riparian vegetation, destabilization of the levee foundation, and shortening of seepage pathways. Approximately 7.44 acres of waters of the United States would be permanently affected at sites G, J, and M under Alternative 2. While the placement of fill in the Sacramento River would alter the cross section and the type of substrate present at the bank protection sites, it would not alter the ability of the Sacramento River to function as waters of the United States. The design of the bank protection is expected to fully compensate for impacts on habitat values through the use of suitable types of substrate, vegetation, and instream woody material.

Alternative 2 would include creation of the same acreages of new irrigation and drainage canals and marsh habitat as described for Alternatives 1 and 3, more than offsetting the landside filling and dewatering of waters of the United States included in this alternative.

Therefore, the permanent impacts of Alternative 2 on waters of the United States would be approximately the same as for Alternatives 1 and 3.

Mitigation Measure 4.7-a: Minimize Effects on Jurisdictional Waters of the United States, Complete Detailed Design of Habitat Creation Components and Management Agreements to Ensure Compensation for Unavoidable Adverse Effects, and Comply with Section 404, Section 401, and Section 1602 Permit Processes

No-Action Alt.

If SCAS were to construct a flood protection system to protect the Airport under a no-action scenario, the Airport project proponent would likely need to implement mitigation similar to that described below for Alternatives 1, 2, and 3 to reduce impacts on jurisdictional waters to a less-than-significant level.

Alt. 1, Alt. 2, Alt. 3

Waters of the United States, including wetlands, shall be identified and the primary engineering and construction contractors shall ensure, through coordination with a qualified biologist, that construction is implemented in a manner that minimizes disturbance of canals, ditches, and seasonal wetlands. Temporary fencing shall be used during construction to prevent disturbance of waters of the United States that are located adjacent to construction areas but can be avoided.

At least 1 acre of irrigation/drainage canal or 1 acre of seasonal wetland shall be created for every acre that is lost. This 1:1 compensation is exceeded in the habitat components of the proposed project design, which includes the following: creation of approximately 45 acres of jurisdictional habitat resulting from construction of the new GGS/Drainage Canal and expansion of the existing West Drainage Canal; creation of approximately 60 acres of new irrigation canal; and creation of 230 acres of managed marsh habitat.

SAFCA shall complete detailed design of habitat creation components and management protocols in coordination with and subject to approval of USACE, USFWS, and DFG. SAFCA shall also enter into agreements with entities responsible for long-term management of created canals and marsh habitats to ensure that performance standards and long-term management goals will be met and provide assurances of adequate funding for habitat creation and management. Such agreements and funding assurances shall be subject to approval of USACE, USFWS, and DFG.

Applicable permits, including an individual permit pursuant to Section 404 of the CWA and Section 10 of the Rivers and Harbors Act, if appropriate, from the USACE, Section 401 certification from the Central Valley RWQCB, and a Section 1602 streambed alteration agreement from DFG, shall be obtained before any effect on the relevant resources occurs. All measures adopted through these permitting processes shall be implemented.

Overall, because all the action alternatives would include the creation of acreages of waters of the United States that are expected to more than offset the filling and dewatering of waters of the United States included in the project, and because implementing this mitigation would ensure that new jurisdictional waters would be created and managed in a manner that minimizes maintenance disturbance and provides the essential functions of the habitats that would be lost, the project, with successful implementation of this mitigation, would have a beneficial effect on overall acreage and quality of waters of the United States in the Natomas Basin.

4.7.3 Unavoidable Significant Adverse Effects

No unavoidable significant adverse effects on sensitive aquatic habitats were identified.

4.8 VEGETATION AND WILDLIFE

4.8.1 Methodology

The evaluation of potential effects on terrestrial vegetation and wildlife from each project alternative is based on the results of field surveys and review of existing documentation. Biologists conducted multiple reconnaissance-level and focused biological surveys of the project area during 2004–2007, as part of project-related studies and planning efforts. Specific documents reviewed to support the analysis in this section include the NBHCP (City of Sacramento, Sutter County, and TNBC 2003); TNBC's annual monitoring reports; and multiple wetland delineation reports that cover portions of the project area, all but one of which have been verified by USACE. For this analysis, the project alternatives were determined to have a significant impact on vegetation and wildlife if project activities would have a substantial adverse effect on native woodland habitats or would interfere substantially with the movement of any native resident or migratory wildlife species or with established native resident or wildlife corridors.

Effects on SRA habitat are described in Section 4.6, "Fish and Aquatic Habitat."

4.8.2 Impacts and Mitigation Measures

Table 4-11 summarizes the effects on woodland habitats discussed in this section.

Table 4-11 Effects of the Project Alternatives on Woodlands				
Location	**No Action**	**Alternative 1**	**Alternative 2**	**Alternative 3**
Woodland Removal in 2008 Construction Phase				
NCC South Levee: Water Side	10 acres	<1 acre	<1 acre	<1 acre
Sacramento River East Levee Reaches 1–4B: Land Side	--	Approximately 7 acres	Approximately 7 acres, but slightly less than under Alternative 1	Approximately 7 acres, but slightly less than under Alternative 1
Sacramento River East Levee Reaches 1–4B: Water Side	5 acres	--	5 acres	--
Alignments of Replacement Elkhorn Canal and New GGS/Drainage Canal North of Teal Bend	--	< 1 acre	< 1 acre	< 1 acre
Woodland Removal in 2009–2010 Construction Phases				
Sacramento River East Levee Reaches 5A–20: Land Side	--	20 acres	Somewhat less than 20 acres	20 acres
Sacramento River East Levee Reaches 5A–20: Water Side	30 acres	--	30 acres	--
Total Losses	**45 acres**	**28 acres**	**< 62 acres**	**28 acres**
Woodland Plantings and Preservation				
2008 Construction Phase	--	30 acres planted + 10–20 acres preserved	30 acres planted in levee setback area + 10–20 acres preserved	30 acres planted in levee setback area + 10–20 acres preserved
2009 Construction Phase	--	95 acres on land side	140–160 acres: 110 acres in levee setback area + 30–50 acres on land side	100 acres: 30 acres planted in levee setback area + 70 acres on land side
Total Plantings	**--**	**125 acres**	**170–190 acres**	**130 acres**
Source: Estimates based on construction data provided by Wood Rodgers 2008, Mead & Hunt 2008, HDR, Inc. 2008				

Impact 4.8-a: Effects on Woodland Habitats

No-Action Alt.

Under the No-Action Alternative, there would be no construction-related adverse effects on woodland habitat in the project area. Because no perimeter levee improvements or associated landscape modifications would be implemented, there would be no woodland planting areas acquired and developed by SAFCA and no creation of associated woodland habitats. Levee failure and subsequent flooding of the basin in the absence of

improvements to the perimeter levee system could have adverse or beneficial effects on woodlands, depending on timing, location, and duration of flooding. However, removal of approximately 10 acres of riparian vegetation from the water side of the NCC south levee and 35 acres from the Sacramento River east levee (5 acres in Reaches 1–4B and 30 acres in Reaches 5A–20) would be required for conformance with the USACE guidance regarding levee encroachments. This would be a significant adverse effect.

Alt. 1, Alt. 3

Construction of the adjacent levee under Alternatives 1 and 3, by shifting the Sacramento River east levee prism landward, would substantially reduce the need for removal of vegetation on the water side of this levee to conform with USACE guidance regarding levee encroachments but would result in the need for removal of several landside woodland groves and individual trees. Similarly, the NCC south levee improvements between Stations 0+00 and 54+00 have been designed to shift the levee prism landward such that the substantial amount of vegetation on the waterside slope would not need to be removed for conformance with USACE guidance.

Under Alternatives 1 and 3, less than 1 acre of woodland on the water side of the NCC is anticipated to require removal to accommodate levee improvements during the 2008 construction phase. The 2008 construction phase improvements to the Sacramento River east levee would remove as much as 7 acres of landside woodland habitat in Reaches 1–4B and less than 1 acre of landside woodland habitat where replacement irrigation/ drainage canal segments to be constructed in Reaches 4B–6A would intersect existing woodland and connect to existing lateral canals. Alternative 3 would result in slightly less woodland removal because less woodland acreage would be affected by the setback levee than by the adjacent levee in Reach 1. However, the overall effect to this resource would be very similar between the two alternatives.

In the 2009 and 2010 construction phases, a total of approximately 20 acres of landside woodland habitat could be removed under Alternatives 1 and 3 to accommodate construction of the adjacent levee and seepage remediation (berms and relief wells) along the Sacramento River east levee.

Beneficial effects of Alternative 1 would include creation of approximately 125 acres of woodland habitat anticipated to be planted along corridors on the land side of the adjacent levee in 2008–2010; of this total, approximately 30 acres would be planted in Sacramento River Reaches 1–4A as part of the 2008 construction phase. Additional groves may be planted in appropriate locations, such as on TNBC reserves and/or in areas where it has been necessary to acquire excess property (i.e., severed agricultural lands). A similar amount of woodland habitat (approximately 130 acres) would be planted under Alternative 3, but a large portion of the planting (approximately 60 acres) would occur within the levee setback area. In addition, it is anticipated that approximately 10–20 acres of existing woodland in Reaches 1, 2, and 4B would be acquired by SAFCA and preserved in public ownership under both alternatives.

Loss of woodland habitat would be offset by creation of new woodlands and preservation of existing woodland under Alternatives 1 and 3. A conceptual design of these habitat components has been developed and provided for resource agency review; detailed design and specific management protocols are currently being prepared by SAFCA in coordination with USACE, USFWS, and DFG. These woodland habitats must be created and managed in a manner that provides the essential functions of woodland habitat that would be lost, in order for the created habitat to provide adequate

compensation. Therefore, an overall adverse effect on woodlands could occur if the habitat creation and management are not properly implemented.

Alt. 2

Effects on woodland habitat along the NCC south levee would be the same under Alternative 2 as described above for Alternatives 1 and 3. However, effects associated with the Sacramento River east levee improvements would be somewhat different, primarily because of the lack of an adjacent setback levee in Reaches 3–19. A relatively small amount of landside woodland loss would be avoided in comparison with Alternative 1, but as much as 35 acres of riparian woodland on the water side of these levee reaches may require removal to conform with USACE guidance regarding levee encroachments and to degrade the levee to construct cutoff walls (approximately 5 acres in Reaches 1–4B and 30 acres in Reaches 5A–20). Potential adverse effects from such vegetation removal would be greater than those from the adjacent setback levee footprint on the land side of the levee, both in terms of the acreage of habitat lost and the quality of that habitat.

Habitat creation and preservation components of this alternative, including woodland restoration and preservation within the 150-acre levee setback area, would be beneficial. However, it is uncertain whether these woodlands would be adequate to compensate for the extensive loss of mature waterside vegetation, and, as with Alternatives 1 and 3, overall adverse effects could occur if the habitat creation and management are not properly implemented.

Mitigation Measure 4.8-a: Minimize Effects on Woodland Habitat, Complete Detailed Design of Woodland Creation and Management Agreements to Ensure Compensation for Unavoidable Adverse Effects, and Comply with the DFG Section 1602 Permit Process

No-Action Alt.

Without the creation of a levee setback area in the Natomas Basin to accommodate the planting of waterside riparian vegetation, there is no known mitigation that would adequately compensate for the likely loss of waterside vegetation along the NCC south levee and the Sacramento River east levee under the No-Action Alternative.

Alt. 1, Alt. 2, Alt. 3

Native woodland areas shall be identified and the primary engineering and construction contractors shall ensure, through coordination with a qualified biologist retained by SAFCA, that construction is implemented in a manner that minimizes disturbance of such areas. Temporary fencing shall be used during construction to prevent disturbance of native trees that are located adjacent to construction areas but can be avoided.

All native trees removed shall be replaced with an appropriate number of native plantings, based on the diameter at breast height (dbh) of the removed tree. The exact number of replacement plantings shall be determined in coordination with DFG but is anticipated to be consistent with the following recent DFG requirements: three replacement trees for each removed tree of 2–9 inches dbh, four replacement trees for each removed tree of 9–18 inches dbh, and one replacement tree for each inch of diameter removed of trees greater than 18 inches dbh. SAFCA shall develop a detailed woodland planting design and management protocols in coordination with and subject to approval of USFWS and DFG. SAFCA shall also enter into agreements with entities responsible for long-term management of created woodland habitats to ensure that performance standards and long-term management goals are met and provide

assurances of adequate funding for habitat creation and management. Such agreements and funding assurances shall be subject to approval of USFWS and DFG.

A Section 1602 streambed alteration agreement from DFG shall be obtained before any trees under DFG jurisdiction are removed, and all terms and conditions of the agreement shall be implemented.

Implementing this mitigation would reduce the impact to a less-than-significant level for Alternatives 1 and 3, but may not reduce the impact to a less-than-significant level for Alternative 2.

Impact 4.8-b: Effects on Wildlife Corridors

No-Action Alt.

Under the No-Action Alternative, there would be no project-related adverse or beneficial effects on wildlife corridors in the project area. Because no perimeter levee improvements would be implemented, there would be no loss or creation of habitats and features that serve as wildlife movement corridors, such as the irrigation/drainage ditches and canals along the west side of the Natomas Basin. Levee failure and subsequent flooding of the basin in the absence of improvements to the perimeter levee system could have adverse or beneficial effects on vegetation and associated wildlife corridors, depending on timing, location, and duration of flooding. However, as described under Impact 4.8-a, there could be extensive removal of the corridor of riparian vegetation on the water side of the NCC south levee and the Sacramento River east levee to conform with USACE guidance regarding levee encroachments. Removal of a large portion of this riparian vegetation would adversely affect the movement and dispersal of the native birds and wildlife species that depend on woodland cover.

In addition, if SCAS were to construct a more limited flood protection system (e.g., compartment levee) to protect the Airport in the absence of SAFCA's proposed improvements to the perimeter levee system, numerous elements of the irrigation and drainage system in the west–central portion of the Natomas Basin would likely be severed and would need to be rerouted. As described below for Alternatives 1, 2, and 3, ditches and canals in the basin serve as critical corridors for movement of aquatic species, and this movement could be significantly disrupted by construction of an Airport flood protection system.

Alt. 1, Alt. 3

Irrigation/drainage ditches and canals within the project area and larger Natomas Basin serve as critical corridors for movement of aquatic species. These corridors would be adversely affected by all of the action alternatives. Effects would include temporary disturbance and permanent loss. Adverse effects, however, would be offset by creation of the proposed new canals that would also provide movement corridors for aquatic species. The configuration and preliminary design of these canals were specifically formulated based on the goal of enhancing giant garter snake movement opportunities between populations in the northern and southern portions of the Natomas Basin. This is anticipated to result in an overall, long-term enhancement in the quality of aquatic movement corridors in the western portion of the basin. A conceptual design of the new canals has been developed and provided for USFWS and DFG agency review; detailed design and specific management protocols are currently being prepared by SAFCA in coordination with USFWS and DFG. If they are to provide adequate compensation, the canals must be created and managed in a manner that provides the essential functions of

habitats that would be lost in the affected habitats. Therefore, an overall adverse effect on the value these features provide as wildlife movement corridors could occur if the habitat creation and management are not properly implemented.

Under Alternatives 1 and 3, less than 1 acre of high quality riparian woodland on the water side of the NCC is anticipated to require removal to accommodate levee improvements, and approximately 27 acres of landside woodland habitat would be removed along the Sacramento River east levee. There would be no removal of water side riparian woodland on the Sacramento east levee. A substantial acreage of riparian woodland plantings would be included in the levee setback area under these alternatives; however, this vegetation would not mature for several years, and its value as cover would therefore be limited in the near term in comparison with the value of the existing land side woodland corridor along the Sacramento River east levee. There would be an adverse effect on the value landside woodland vegetation provides as wildlife movement corridors; however, the higher quality water side riparian woodland would be undisturbed under these two alternatives, and would provide wildlife movement corridors during the interim period while the woodland plantings within the setback area mature.

Alt. 2

Effects on aquatic species corridors under Alternative 2 would be the same as described for Alternatives 1 and 3.

Under this alternative, as described for the No-Action Alternative, there would be extensive removal of large woody vegetation from the riparian corridor on the water side of the Sacramento River east levee to conform with USACE guidance regarding levee encroachments. Removal of a large portion of this riparian vegetation would adversely affect the movement and dispersal of the native birds and wildlife species that depend on woodland cover. Although a substantial acreage of riparian plantings would be included in the levee setback area under this alternative, this vegetation would not mature for several years, and its value as cover would therefore be limited in the near term in comparison with the value of the existing woodland corridor along the Sacramento River east levee. Furthermore, these new plantings would be limited to the northern approximately 1.5 miles along the Sacramento River east levee south of the NCC. Because of the limited extent of this vegetation, it could not replace the value provided to wildlife and bird movement by the vegetation that would be removed along approximately 14 miles of the levee south of the tie-in of the setback levee. For these reasons, Alternative 2 could adversely affect wildlife movement corridors.

Mitigation Measure 4.8-b: Implement Mitigation Measure 4.9-c (Minimize the Potential for Direct Loss of Giant Garter Snake Individuals, Develop Detailed Design of Managed Marsh and New Canals and Management Agreements to Ensure Adequate Compensation for Unavoidable Adverse Effects, and Obtain Incidental Take Authorization)

No-Action Alt.

If SCAS were to construct a flood protection system to protect the Airport from flooding in the absence of improvements to the Natomas perimeter levee system, SCAS would likely need to implement mitigation similar to that described below for Alternatives 1, 2, and 3 to reduce impacts on wildlife corridors in canals to a less-than-significant level. However, there is no known mitigation that would adequately compensate for the likely degradation of wildlife corridors that would result from the

removal of substantial amounts of waterside vegetation along the NCC south levee and the Sacramento River east levee under the No-Action Alternative.

Alt. 1, Alt. 2, Alt. 3 Implementation of the project as proposed and Mitigation Measure 4.9-c would ensure that adverse effects on irrigation/drainage ditches and canals that provide wildlife movement corridors are minimized and that created canals facilitate aquatic wildlife movement. Implementing this mitigation would reduce the impact on aquatic species movement and dispersal to a less-than-significant level.
However, Alternative 2 could result in a significant and unavoidable effect on native bird and wildlife movement and dispersal corridors associated with the extensive removal of riparian vegetation from the water side of the Sacramento River east levee.

4.8.3 Unavoidable Significant Adverse Effects

No unavoidable significant adverse effects of Alternatives 1 or 3 were identified. The No-Action Alternative and Alternative 2 could result in significant and unavoidable effects associated with the extensive removal of riparian vegetation on the water side of the Sacramento River east levee to conform with USACE guidance regarding levee encroachments.

4.9 SPECIAL-STATUS TERRESTRIAL SPECIES

4.9.1 Methodology

The evaluation of potential effects on terrestrial special-status species from each project alternative is based on the results of field surveys and review of existing documentation. Biologists conducted multiple reconnaissance-level and focused special-status species surveys of the project area during 2004–2007, as part of project-related studies and planning efforts. These have included focused surveys for special-status plants, elderberry shrub mapping and stem counts, giant garter snake habitat evaluation, and nesting raptor surveys. Existing information reviewed for this analysis includes documents that discuss the status of special-status species in the region, including the NBHCP (City of Sacramento, Sutter County, and The Natomas Basin Conservancy 2003) and annual monitoring reports of TNBC. The California Natural Diversity Database (CNDDB) (2007) and NBHCP were used as the primary sources to identify previously reported occurrences of special-status species in the project vicinity. For this analysis, the project alternatives were determined to have a significant impact on special-status species if project activities would (1) have a substantial adverse effect, either directly or through habitat modification, on any species identified as a candidate, sensitive, or special-status species in local or regional plans policies, or regulations, or by DFG or U.S. Fish and Wildlife Service (USFWS), or (2) conflict with the provisions of the NBHCP.

4.9.2 Impacts and Mitigation Measures

Impact 4.9-a: Effects on Special-Status Plants

No-Action Alt. Under the No-Action Alternative, there would be no improvements to the perimeter levee system and associated modifications of irrigation and drainage facilities and, therefore, no related adverse or beneficial effects on suitable habitat for special-status plants. Because no habitat would be affected, there would be no potential for associated loss of special-status plants or expansion of potential existing populations into new areas of suitable habitat. Flooding of the basin in the absence of improvements to the perimeter levee system could have adverse or beneficial effects on special-status plants and their habitats, depending on timing, location, and duration of flooding.

If SCAS were to construct a compartment levee to provide flood protection for the Airport in the absence of improvements to the Natomas perimeter levee system, construction activities would likely affect habitat for some special-status plants in ditches and canals. Because no concept plan for such a flood protection system has been developed, however, the likelihood and extent of such an impact is not predictable.

Alt. 1, Alt. 2, Alt. 3

Of the three special-status plant species that were determined to have potential to occur in the project area (rose mallow, Delta tule pea, and Sanford's arrowhead), all would occur in aquatic habitats (Section 3.3.9.1, "Special-Status Plant Species").

Improvements to the NCC south levee and Sacramento River east levee that would be conducted as part of the 2008 construction phase under any of the action alternatives would not result in adverse effects on special-status plants, because no special-status plants were found during focused surveys of suitable habitat that would be affected. Areas within the potential project footprints for the 2009 and 2010 construction phases provide only poor- to marginal-quality habitat for special-status plants, but surveys have not been conducted to confirm that the species in question are not present. Therefore, fill and disturbance of these habitats could result in adverse effects on special-status plants, if present. Adverse effects on potentially suitable habitat would be similar under all of the alternatives and would include permanent loss of approximately 12 acres of relatively unvegetated irrigation/drainage canals adjacent to the Sacramento River east levee. Approximately 5 acres of potential habitat in the Airport West Ditch would be lost as a result of the irrigation and drainage infrastructure reconfiguration, and approximately 0.5 acre of habitat provided by an irrigation/drainage ditch along the toe of the PGCC levee would be lost as a result of the levee improvements there. Alternative 2, which has a narrower footprint than Alternatives 1 and 3 (because it does not include the adjacent levee along the Sacramento River east levee), would affect a slightly reduced amount of habitat, but the overall effect on special-status plant habitat would be similar to that of the other alternatives.

Under all three alternatives, disturbance of suitable habitat for special-status plants during the 2009 and 2010 construction phases could result in temporary loss of individual plants, but populations could persist if habitat suitability and value are maintained. Permanent loss of habitat could result in permanent loss of special-status plant populations or portions of populations, if present. Surveys for special-status plants within the 2009–2010 project area will be conducted in 2008 and potential effects further evaluated in subsequent NEPA documentation. Loss of potentially occupied special-status plant habitat in the 2009 and 2010 construction phases would be offset by creation of new irrigation and drainage canals and marsh habitat in 2008–2010. A conceptual design of these habitat components has been developed and provided for USFWS and DFG agency review; detailed design and specific management protocols are currently being prepared by SAFCA in coordination with these agencies. If they are to provide adequate compensation, these habitats must be created and managed in a manner that provides the essential functions of habitat areas that would be lost as a result of the project. Therefore, an overall adverse effect on special-status plants could occur if occupied habitat is lost in the 2009–2010 construction phases and the habitat creation and management are not properly implemented.

Mitigation Measure 4.9-a: Conduct Focused Surveys for Special-Status Plants, Minimize Effects, and Develop Detailed Design of Created Habitat and Management Agreements to Ensure Compensation for Unavoidable Adverse Effects

No-Action Alt.

If SCAS were to construct a flood protection system to protect the Airport under a no-action scenario, mitigation similar to that described below for Alternatives 1, 2, and 3 would likely be required to reduce potential impacts on special-status plants to a less-than-significant level.

Alt. 1, Alt. 2, Alt. 3

Before any ground-disturbing project activities begin within the footprint of the 2009 and 2010 construction phases, a qualified biologist retained by SAFCA shall conduct surveys for special-status plants in appropriate habitat within the project footprint, in accordance with USFWS and/or DFG guidelines and at the appropriate time of year when the target species would be clearly identifiable. If no special-status plants are found during focused surveys, no further action shall be required.

If special-status plants are found in the project area for the 2009–2010 construction phases, areas of occupied habitat shall be identified and the primary engineering and construction contractors shall ensure, through coordination with the biologist, that construction activities are implemented in a manner that minimizes disturbance of these areas. Temporary fencing shall be used during construction to protect all occupied habitat that is located adjacent to construction areas but can be avoided.

If special-status plants are present in areas that cannot be avoided, SAFCA shall coordinate with USFWS and DFG to determine whether transplantation would be appropriate to further minimize adverse effects. Affected plants may potentially be transplanted to the GGS/Drainage Canal, if feasible. At least 1 acre of irrigation/ drainage canal or marsh habitat shall be created for every acre of occupied special-status plant habitat that is lost. SAFCA shall develop detailed design of habitat creation components and management protocols in coordination with and subject to approval of the resource agencies. SAFCA shall also enter into agreements with entities responsible for long-term management of created canals and marsh habitats to ensure that performance standards and long-term management goals are met and provide assurances of adequate funding for habitat creation and management. Such agreements and funding assurances shall be subject to approval of USFWS and DFG.

Implementing this mitigation would reduce the impact to a less-than-significant level.

Impact 4.9-b: Effects on Valley Elderberry Longhorn Beetle

Table 4-12 summarizes the effects on elderberry shrubs, the host plant of the valley elderberry longhorn beetle, discussed below.

Table 4-12 Effects of the Project Alternatives on Elderberry Shrubs				
Location	**No Action**	**Alternative 1**	**Alternative 2**	**Alternative 3**
Number of Shrubs Affected by 2008 Construction Phase				
Sacramento River East Levee Reaches 1–4B: Land Side	--	23 shrubs	20 shrubs or fewer	20 shrubs
Sacramento River East Levee Reaches 1–4B: Water Side	Unknown number of shrubs removed with 5 acres of woodlands	--	Unknown number of shrubs removed with 5 acres of woodlands	--
Number of Shrubs Affected by 2009–2010 Construction Phases				
Sacramento River East Levee Reaches 5A–20: Land Side	--	15 or more shrubs	15 or more shrubs	15 or more shrubs
Sacramento River East Levee Reaches 5A–20: Water Side	Unknown number removed with 30 acres of woodlands	--	Unknown number removed with 30 acres of woodlands	--
Locations of Compensation Plantings				
Sacramento River East Levee 2008–2010 Phases	Unknown	Within 125 acres of woodland plantings and 10–20 acres of preserved woodland on land side	Within 140 acres of woodland plantings in levee setback area, 30–50 acres of woodland plantings on land side, and 10–20 acres of preserved woodland	Within 60 acres of woodland plantings in levee setback area, 70 acres of woodland plantings on land side, and 10–20 acres of preserved woodland
Source: EDAW surveys 2008, construction data provided by Wood Rodgers 2008, Mead & Hunt 2008, HDR, Inc. 2008				

No-Action Alt.

Under the No-Action Alternative, there would be no adverse or beneficial effects on valley elderberry longhorn beetle in the project area related to improvements to the perimeter levee system. Because no levee improvements would be implemented, there would be no loss or disturbance of elderberry shrubs within the footprint of such improvements and no planting of elderberry shrubs within the created woodland habitat. Levee failure and subsequent flooding of the basin in the absence of improvements to the perimeter levee system might result in improved conditions for elderberry shrub and, consequently, valley elderberry longhorn beetle, in some locations. However, there could be extensive removal of elderberry shrubs on the water side of the Sacramento River east levee to conform with USACE guidance regarding levee encroachments.

In addition, if SCAS were to construct a separate flood protection system for the Airport, the construction footprint may include areas where elderberry shrubs are present and would have to be relocated. However, because there is no concept plan for Airport flood control improvements, the magnitude of such an effect cannot be estimated.

Alt. 1, Alt. 3 Twenty-three elderberry shrubs are known to be present within the Alternative 1 footprint of the Sacramento River levee improvements in Reaches 1-4B (i.e., the 2008 construction phase). Focused surveys of these shrubs have been conducted to document the number of stem in particular size classes and presence or absence of beetle exit holes. In some cases, the stem counts were estimated because access was restricted. The shrubs support a total of approximately 200 stems greater than 1 inch in diameter. Twenty of these shrubs would also be affected under Alternative 3. The remaining three shrubs are located along the western boundary of the woodland patch in Reach 1 and may not be affected under Alternative 3. No elderberry shrubs would be affected along the NCC south levee.

Additional elderberry shrubs would require removal during the 2009 and 2010 construction phases under both alternatives, but the exact number of shrubs and stems that would be removed cannot be determined at this time because permission has not been granted for access to the properties on which these shrubs are growing. Based on reconnaissance-level surveys conducted in 2007, 15 shrubs are known to be present along the approximately 15-mile-long footprint of the 2009 and 2010 Sacramento River east levee construction phases. Focused surveys of elderberry shrubs within the 2009–2010 project area will be conducted in 2008 and potential effects further evaluated in subsequent NEPA documentation.

The loss of elderberry shrubs and potential loss of beetles under Alternatives 1 and 3 would be offset by incorporation of plantings of elderberry shrubs and other appropriate native species into the levee setback area and/or woodland corridors and other potential woodland restoration areas. Elderberry shrubs would be planted in numbers adequate to compensate for elderberry shrub loss, based on standard USFWS mitigation guidelines. A conceptual plan for woodland creation has been developed and provided for USFWS and DFG review; detailed design and specific management protocols are currently being prepared by SAFCA in coordination with these agencies. Portions of the woodland areas must be created and managed in a manner that provides the essential functions of valley elderberry longhorn beetle habitat that would be lost through project activities in order for them to provide adequate compensation. Therefore, an overall adverse effect on valley elderberry longhorn beetle could occur if this habitat creation and management are not properly implemented.

Alt. 2 Under Alternative 2, potential effects on valley elderberry longhorn beetle associated with the Sacramento River east levee improvements would be somewhat different from those under Alternatives 1 and 3. Loss of elderberry shrubs on the land side of this levee may be reduced under this alternative by the lack of an adjacent setback levee, but as much as 35 acres of riparian woodland that supports elderberry shrubs on the water side of the levee may require removal to conform with USACE guidance regarding levee encroachments. Potential adverse effects from such vegetation removal could be greater than those within the adjacent setback levee footprint on the land side of the levee under Alternatives 1 and 3, both in terms of the number of shrubs lost and the quality of that habitat. Habitat creation components of this alternative, including elderberry shrub planting within the 150-acre levee setback area, would be beneficial. However, as with Alternatives 1 and 3, overall adverse effects on the beetle could occur if the replacement habitat does not provide the essential components and is not managed in a way that maximizes habitat quality and minimizes potential adverse effects on valley elderberry longhorn beetle.

Mitigation Measure 4.9-b: Conduct Focused Surveys for Elderberry Shrubs as Needed, Minimize Effects, Complete Detailed Design of Woodland/Elderberry Habitat and Management Agreements to Ensure Adequate Compensation for Unavoidable Adverse Effects, and Obtain Incidental Take Authorization

No-Action Alt.

If SCAS were to construct a flood protection system for the Airport in the absence of improvements to the Natomas perimeter levee system, SCAS may be required to implement mitigation similar to that described below for Alternatives 1, 2, and 3 to reduce potential impacts on valley elderberry longhorn beetle to a less-than-significant level. Otherwise, no mitigation is necessary.

Alt. 1, Alt. 2, Alt. 3

A qualified biologist retained by SAFCA shall conduct focused surveys of elderberry shrubs within 100 feet of the project area for the 2009 and 2010 construction phases, in accordance with USFWS guidelines. All elderberry shrubs with potential to be affected by project activities shall be mapped, the number of stems greater than 1 inch in diameter on each shrub that requires removal shall be counted, and these stems shall be searched for beetle exit holes.

The primary engineering and construction contractors shall ensure, through coordination with the biologist, that construction is implemented in a manner that minimizes disturbance of areas that support elderberry shrubs. Temporary fencing shall be used during construction to protect all elderberry shrubs that are located adjacent to construction areas but can be avoided. Shrubs that require removal shall be transplanted to the woodland creation areas, if feasible. If none of the areas of suitable habitat to be created as part of the project would be available before the impact would occur, alternative transplantation locations (e.g., other SAFCA mitigation areas or TNBC preserves) shall be identified and shall be approved by USFWS.

The number of replacement elderberry plantings shall be determined based on USFWS guidelines, which require replacement ratios ranging from 1:1 to 8:1 for lost stems at least 1 inch in diameter, depending on the size of the affected stems and presence or absence of beetle exit holes. Associated native species shall be planted at ratios ranging from 1:1 to 2:1 for each elderberry planting. SAFCA shall develop a detailed woodland/elderberry planting design and management protocols in coordination with and subject to approval of the resource agencies. SAFCA shall also enter into agreements with entities responsible for long-term management of created woodland habitats to ensure performance standards and long-term management goals are met and provide assurances of adequate funding for habitat creation and management. Such agreements and funding assurances shall be subject to approval of the resource agencies.

USACE shall initiate Section 7 consultation with USFWS, and authorization for take of valley elderberry longhorn beetle under the Federal ESA shall be obtained if it is determined, in consultation with USFWS, that shrub removal is likely to result in such take. All measures subsequently developed through the Section 7 consultation process shall be implemented.

Implementing this mitigation would reduce the impact to a less-than-significant level.

Impact 4.9-c: Effects on Giant Garter Snake

Table 4-13 summarizes the permanent effects on giant garter snake habitat discussed in this section. See the text for discussion of temporary (construction-related) habitat effects and for discussion of the relative values of the affected habitats and those that would be created as part of the project.

Table 4-13
Permanent Effects of the Project Alternatives on Giant Garter Snake Habitat

Location	No Action	Alternative 1	Alternative 2	Alternative 3
Habitat Effects in 2008 Construction Phase				
Canal Habitat Near NCC South Levee	Unknown, but losses of TNBC preserve habitat and other agricultural habitats in the event of flooding could be very substantial	0.7 acre	0.7 acre	0.7 acre
Rice Near NCC South Levee and Sacramento River East Levee		25 acres	35 acres	30 acres
Canal/Ditch Habitat Near Sacramento River East Levee		1.1 acres	1.1 acres	1.1 acres
Airport Borrow Site (Rice)		225 acres	225 acres	225 acres
Habitat Effects in 2009–2010 Construction Phases				
Canal/Ditch and Elkhorn Reservoir Habitat Near Sacramento River East Levee	Unknown, but losses of TNBC preserve habitat and other agricultural habitats in the event of flooding could be very substantial	15 acres	15 acres	15 acres
Airport West Ditch		5 acres	5 acres	5 acres
Canal Habitat Near PGCC West Levee		0.5 acre	0.5 acre	0.5 acre
Rice Near PGCC West Levee		50 acres	50 acres	50 acres
Airport Borrow Site (Rice)		145 acres	145 acres	145 acres
Total of Permanent Effects		**22.3 acres canal/ditch 445 acres rice**	**22.3 acres canal/ditch 455 acres rice**	**22.3 acres canal/ditch 450 acres rice**
Habitat Creation in Project Design				
Canal Habitat	--	105 acres	105 acres	105 acres
Marsh Habitat	--	230 acres	230 acres	230 acres
Preserved Rice	--	170 acres	170 acres	170 acres

Source: EDAW surveys 2008, construction data provided by Wood Rodgers 2008, Mead & Hunt 2008, HDR, Inc. 2008

No-Action Alt.

Under the No-Action Alternative, there would be no direct adverse or beneficial project-related effects on giant garter snake. Because no habitat would be affected along the Natomas perimeter levee system, there would be no potential for loss of individual snakes in these areas. There would also be no beneficial effects to giant garter snake under this alternative, such as creation of habitat specifically designed to improve overall connectivity of habitat for this species in the Natomas Basin.

If SCAS were to construct a limited flood protection system (e.g., compartment levee) to protect the Airport in the absence of SAFCA's proposed improvements to the perimeter levee system, this construction would likely cross several irrigation and/or drainage canals in the west–central portion of the Natomas Basin that may provide habitat for giant garter snake, adversely affecting the habitat and potentially resulting in take of individual snakes.

In addition, in the absence of improvements to the perimeter levee system, the risk of levee failure and flooding would remain high. A levee failure could result in a significant adverse effect on the Natomas Basin giant garter snake population. Giant garter snakes require upland refugia and may not be able to escape flood waters during their inactive season (October–April), depending on the velocity of the floodwaters and speed with which they inundate the basin. A catastrophic flood of the Natomas Basin could result in direct mortality of a substantial portion of the basin's giant garter snake population. It could also result in extensive damage to habitat for the species, including TNBC preserves and the infrastructure that supports operation of the preserves.

The No-Action Alternative could have a significant adverse effect on giant garter snake.

Alt. 1

Effect Mechanisms: Alternative 1 would result in permanent loss and temporary loss and disturbance of potential giant garter snake habitat. Fill, temporary and permanent dewatering, land conversion, and staging and other construction disturbances would adversely affect snakes utilizing affected habitats, including irrigation ditches, drainage canals, rice fields, and associated uplands. Project construction activities in areas of potentially suitable habitat also could result in direct disturbance and loss of individual giant garter snakes. Adverse effects could also result from geotechnical and cultural resource investigations conducted nearby suitable habitat for the snake.

Impacts of the 2008 Construction Phase: Under this alternative, adverse effects on giant garter snake habitat within the footprint of the 2008 construction phase would occur along the NCC south levee and Reaches 1 and 4B of the Sacramento River east levee. Most of the work along the NCC south levee would occur within 200 feet of suitable aquatic habitat for giant garter snake provided by irrigation/drainage canals near the landside toe of the levee. Therefore, potentially suitable uplands adjacent to this aquatic habitat would be disturbed during construction. Effects on aquatic habitat along the NCC would be very limited. Although some waterside levee expansion would be conducted in NCC Reaches 6 and 7, the NCC provides poor-quality habitat for giant garter snake and there is little evidence to suggest the species regularly occurs in the NCC. On the land side of the NCC south levee, approximately 0.7 acre of irrigation/drainage canal near the toe of the levee (where the ends of the canals approach the levee toe) would be filled or realigned to eliminate excavated areas in close proximity to the levee; this is anticipated to result in permanent loss of approximately 0.7 acre of canal habitat.

Approximately 25 acres of rice field in Reach 1 of the NCC south levee and Reach 1 of the Sacramento River east levee would be lost to accommodate levee expansion and construction of the adjacent levee. In addition, approximately 1.1 acres of irrigation ditch in Reaches 1, 4A, and 4B would be filled. Temporary disturbance of less than 1 acre of aquatic habitat would occur where the replacement irrigation/drainage canals connect to existing lateral canals. Approximately 385 acres of rice fields would be used for borrow to support the 2008 construction phase. This borrow is anticipated to come

from the Brookfield borrow site (160 acres assumed for 2008 for habitat analysis purposes, although part of this total is expected to be used for the 2009 construction phase) and northern Airport bufferlands (225 acres). The Brookfield borrow area would be returned to rice production after borrow extraction, and the Airport borrow area would be converted to grassland. The RD 1001 borrow site (120 acres) north of the Natomas Basin also could be utilized during the 2008 construction phase, in place of the Brookfield site.

Impacts of the 2009 and 2010 Construction Phases: Construction of levee improvements in the 2009 and 2010 construction phases would result in permanent fill of approximately 15 acres of potentially suitable aquatic habitat for giant garter snake, including irrigation/drainage canals and a portion of Elkhorn Reservoir near the landside toe of the Sacramento River east levee. In addition, approximately 5 acres of potential habitat in the Airport West Ditch would be dewatered as part of the irrigation and drainage infrastructure reconfiguration associated with construction of the replacement canals. Finally, approximately 0.5 acre of irrigation/drainage canal along the toe of the PGCC levee would require relocation to accommodate the levee improvements there, and rice fields adjacent to the levee could be lost if seepage berms are constructed. Based on a maximum 100-foot-wide seepage berm that could be required in portions of the PGCC reaches, it is estimated that approximately 50 acres of rice fields could be lost. Borrow material for the 2009 and 2010 construction phases is anticipated to come from the remainder of the rice fields at the Brookfield borrow site (accounted for in the 2008 construction phase above), Airport north bufferlands, and agricultural fields in the vicinity of Fisherman's Lake. The RD 1001 borrow site could also be utilized instead of the Brookfield site. Within the Airport bufferlands, 110 acres would be converted to marsh and the rest to grassland, and 120 acres of the land used in the Fisherman's Lake area would be converted to marsh.

Habitat Creation Amounts Included in Project Design: Beneficial effects to giant garter snake under Alternative 1 include creation of approximately 45 acres of habitat resulting from construction of the new GGS/Drainage Canal and expansion of the existing West Drainage Canal and creation of approximately 60 acres of new irrigation canal. In addition, managed marsh habitat would be created on an anticipated 230 acres after borrow extraction from the Airport north bufferlands borrow area and borrow areas in the vicinity of Fisherman's Lake. Finally, approximately 160 acres of existing rice fields at the Brookfield borrow site would be acquired and returned to rice production and preserved in public ownership after borrow extraction.

Quality of Created Habitats Compared to That of Affected Habitats: The habitat quality of the GGS/Drainage Canal and West Drainage Canal is anticipated to eventually be substantially higher than that of the canal habitat that would be lost. Creation and enhancement of these canals would include a number of features designed to maximize the amount and quality of habitat, as well as minimize the need for maintenance activities that temporarily reduce habitat quality and can result in injury and mortality of giant garter snakes. In addition, the configuration and design of the GGS/Drainage Canal and West Drainage Canal enhancement were specifically formulated based on the goal of providing a functional travel corridor between giant garter snake populations in the northern and southern portions of the Natomas Basin. Loss and deterioration in the quality of existing travel corridors has been identified as a primary concern in maintaining a genetic connection between these two snake populations. Although the primary function of the new Elkhorn and Riverside Canals

would be irrigation supply, they are anticipated to provide habitat comparable to that of the irrigation canals that would be filled as a result of the project. They also are being designed to minimize maintenance and resulting habitat degradation and snake injury and mortality.

Rice fields are an important component of giant garter snake habitat, but the quality of the created marsh habitat is anticipated to be higher than the rice it would replace. The marsh areas would include uplands, which are a very important component of snake habitat that is nearly lacking in rice fields. Managed marsh would also provide habitat consistently from one year to the next, while rice fields can periodically sit fallow and fail to provide aquatic habitat during key periods. The marsh areas would also be managed in a manner that minimizes potential for snake injury and mortality that can result from typical farming practices.

Impact Summary: Loss of giant garter snake habitat would be offset by creation of new irrigation and drainage canals and marsh habitat and preservation of existing rice fields, as described above. In 2008, compensation for the permanent loss of approximately 250 acres of rice and irrigation/drainage canal would be in the form of creation of approximately 30 acres of the replacement Elkhorn Canal and the new GGS/Drainage Canal and preservation of 160 acres of rice at the Brookfield site. Over all three years of the project, compensation for anticipated loss of 445 acres of rice and 23 acres of canal habitat would be through the creation of approximately 105 acres of new canal habitat and 230 acres of new marsh, as well as preservation of 160 acres of rice. These created and preserved habitats would result in an overall improvement in habitat conditions for giant garter snake in the Natomas Basin, because the habitats would be managed to maximize their quality and improve connectivity between TNBC preserves. A conceptual design of the habitats to be created has been developed and provided for USFWS and DFG review; detailed design and specific management protocols are currently being prepared by SAFCA in coordination with these agencies. To provide adequate compensation, the canal, marsh, and rice habitats must be created and/or managed in a manner that provides the essential functions of giant garter snake habitat. Therefore, an overall adverse effect on giant garter snake could occur if the habitat creation and management are not properly implemented.

Alt. 2, Alt. 3

Adverse effects on giant garter snake under Alternatives 2 and 3 would differ from those under Alternative 1 in relation to the setback levee in Sacramento River east levee Reaches 1 and 2. A small amount of additional rice land would be converted under these alternatives (approximately 10 additional acres under Alternative 2, and 5 additional acres under Alternative 3). In the overall scope of the project, this would not be a substantive difference in the amount of habitat lost. However, the remainder of the setback area would no longer have potential to become suitable garter snake habitat in the future, because it could be vulnerable to flooding. Alternative 2, which has a narrower footprint than Alternatives 1 and 3 (because it does not include the adjacent levee), would affect a slightly lower amount of aquatic habitat, but the overall effect would be similar to that of the other alternatives.

Habitat creation components of these alternatives would be the same as those under Alternative 1. As with Alternative 1, overall adverse effects on giant garter snake could be significant if the replacement habitat does not provide the essential components and is not managed in a way that maximizes habitat quality and minimizes potential adverse effects on the species.

Mitigation Measure 4.9-c: Minimize the Potential for Direct Loss of Giant Garter Snake Individuals, Develop Detailed Design of Managed Marsh and New Canals and Management Agreements to Ensure Adequate Compensation for Unavoidable Adverse Effects, and Obtain Incidental Take Authorization

No-Action Alt.

If SCAS were to construct a flood protection system for the Airport in the absence of improvements to the Natomas perimeter levee system, SCAS would be required to implement mitigation similar to the following to reduce potential impacts on giant garter snake to a less-than-significant level.

Except for improvements to the perimeter levee system, there is no mitigation that would protect giant garter snake habitats and populations in the Natomas Basin from the potentially devastating effects of flooding in the event of a levee failure.

Alt. 1, Alt. 2, Alt. 3

The primary engineering and construction contractors shall ensure, through coordination with a qualified biologist retained by SAFCA, that construction is implemented in a manner that minimizes disturbance of giant garter snake habitat. Temporary fencing shall be used during construction to protect all aquatic and adjacent upland habitat that is located adjacent to construction areas but can be avoided.

Additional measures consistent with the goals and objectives of the NBHCP shall be implemented to minimize the potential for direct injury or mortality of individual giant garter snakes during project construction. Such measures shall be finalized in consultation with DFG and USFWS, and are likely to include conducting worker awareness training, timing initial ground disturbance to correspond with the snake's active season (as feasible in combination with project needs and minimizing disturbance of nesting Swainson's hawks), dewatering aquatic habitat before fill, conducting preconstruction surveys, and conducting biological monitoring during construction.

At least 1 acre of irrigation/drainage canal shall be created for every acre that is lost as a result of the project, and at least 1 acre of rice shall be preserved or one-half acre of marsh created for every acre of rice that is lost within the Natomas Basin in the project footprint. At least one credit of giant garter snake habitat shall be purchased from a USFWS-approved mitigation bank for every 2 acres of rice that is lost at the RD 1001 borrow site. SAFCA shall develop detailed design of habitat creation components and management protocols in coordination with and subject to approval of USFWS and DFG. SAFCA shall also enter into agreements with entities responsible for long-term management of created canals and marsh habitats to ensure that performance standards and long-term management goals are met and provide assurances of adequate funding for habitat creation and management. Such agreements and funding assurances shall be subject to approval of USACE, USFWS, and DFG.

Authorization for take of giant garter snake under the ESA and CESA shall be obtained. All measures subsequently adopted through the permitting process shall be implemented.

Implementing this mitigation would reduce the impact to a less-than-significant level.

Impact 4.9-d: Effects on Northwestern Pond Turtle

No-Action Alt.

Under the No-Action Alternative, there would be no adverse or beneficial effects on suitable habitat for northwestern pond turtle as a result of improvements to the perimeter levee system and related landscape and irrigation/drainage infrastructure improvements. In addition, no new habitat would be created that would benefit this species. In the event of a levee failure in the absence of improvements to the perimeter levee system, floodwaters could inundate habitat areas and result in direct mortality of northwestern pond turtles. Depending on the location, speed, and duration of flooding, a significant effect on the local population of this species could result.

If SCAS were to construct a limited flood protection system (e.g., compartment levee) to protect the Airport in the absence of SAFCA's proposed improvements to the perimeter levee system, this construction would likely cross several irrigation and/or drainage canals in the west–central portion of the Natomas Basin that may provide habitat for northwestern pond turtle, adversely affecting the habitat and potentially resulting in take of individual turtles. This could result in a significant adverse effect on the local population of this species.

Alt. 1, Alt. 2, Alt. 3

Improvements to the NCC south levee that would be conducted as part of the 2008 construction phase under all of the action alternatives would result in permanent loss of approximately 0.7 acre of suitable pond turtle habitat to accommodate fill and re-alignment of portions of irrigation/drainage canals near the landside toe of the levee. Permanent loss of suitable pond turtle habitat resulting from the Sacramento River east levee improvements in the 2008 construction phase would include fill of approximately 1.1 acres of ditch/irrigation canal at the toe of the levee in Reaches 1, 4A, and 4B. Temporary disturbance of approximately 0.5 acre of additional suitable habitat would occur where the replacement canals connect to existing lateral canals.

Adverse effects on suitable turtle habitat in the 2009 construction phase would include permanent loss of approximately 12 acres of relatively unvegetated irrigation/drainage canals and a portion of Elkhorn Reservoir. Approximately 5 acres of potential habitat in the Airport West Ditch would be lost as a result of the irrigation and drainage infrastructure reconfiguration, and approximately 0.5 acre of habitat provided by an irrigation/drainage ditch along the toe of the PGCC levee would be lost as a result of the improvements to this levee. Alternative 2, which has a narrower footprint that Alternatives 1 and 3 (because it does not include the adjacent levee along the Sacramento River east levee), would affect a slightly lower amount of habitat, but the overall effect would be similar to that of the other alternatives.

These habitat losses would be offset by the habitat creation components of the project. There is potential, however, for direct loss of pond turtles to occur if they are present within the affected habitats. This could have a significant adverse effect on the local population of this species.

Mitigation Measure 4.9-d: Conduct Focused Surveys for Northwestern Pond Turtles and Relocate Turtles

No-Action Alt.

If SCAS were to construct a flood protection system (compartment levee) for the Airport in the absence of improvements to the Natomas perimeter levee system, mitigation similar to that described below for Alternatives 1, 2, and 3 would be required to reduce potential impacts on northwestern pond turtle to a less-than-significant level. Except for improvements to the perimeter levee system, there is no mitigation that would protect northwestern pond turtle populations in the Natomas Basin from the potentially significant effects of flooding in the event of a levee failure.

Alt. 1, Alt. 2, Alt. 3

A qualified biologist retained by SAFCA shall conduct surveys in aquatic habitats to be dewatered and/or filled during project construction. Surveys shall be conducted immediately after dewatering and before fill of aquatic habitat suitable for pond turtles. If pond turtles are found, the biologist shall capture them and move them to nearby areas of suitable habitat that would not be disturbed by project construction. Implementing this mitigation would reduce the potential impact to a less-than-significant level.

Impact 4.9-e: Effects on Special-Status Birds

No-Action Alt.

Under the No-Action Alternative, there would be no adverse or beneficial effects on suitable habitat for special-status birds associated with improvements to the perimeter levee system or related landscape modifications. Because no habitat would be affected along the perimeter levee system or the identified borrow sites, there would be no potential for loss of active nests. However, there could be extensive removal of riparian vegetation on the water side of the NCC south levee and the Sacramento River east levee to conform with the USACE guidance regarding levee encroachments (see **Table 4-11**). The habitat along the water side of the Sacramento River east levee supports the majority of Swainson's hawk nest sites in the Natomas Basin and provides habitat for a variety of nesting special-status birds. Removal of this vegetation would have a significant effect on local special-status bird populations. Also, in the absence of improvements to the perimeter levee system, the risk of levee failure and flooding would remain high. Among special-status bird species found in the basin, burrowing owls, in particular, could be adversely affected by winter flooding, as a result of either direct mortality or inundation and destruction of burrows. Foraging and nesting habitat for other species also could be adversely affected.

In addition, if SCAS were to construct a limited flood protection system (e.g., compartment levee) to protect the Airport in the absence of SAFCA's proposed improvements to the perimeter levee system, this construction is also likely to permanently convert suitable foraging habitat in the footprint of the constructed flood control features and would have the potential to disturb nesting birds. This potential impact would be significant; however, in the absence of a concept for this construction, the extent and severity of such an impact cannot be estimated.

Alt. 1, Alt. 3

Potential adverse effects on special-status birds would be similar under Alternatives 1 and 3 and would include disturbance and loss of suitable foraging habitat and disturbance of nesting pairs. Areas of suitable habitat that would be disturbed, including the location and acreage, may differ between the alternatives but the overall magnitude

of the effect would be similar. Flood control improvements under both alternatives would result in loss of agricultural and ruderal foraging habitat within portions of the levee/berms, setback levee (under Alternative 3), replacement canal, new GGS/ Drainage Canal, and woodland planting footprints. Construction of these features would result in conversion of up to approximately 780 acres of existing grassland and agricultural fields, including row crops, field crops, and fallow fields. However, approximately 850 acres of managed grassland habitat would be created on converted ruderal, row/field crop, and rice lands, and at least 50 acres of existing row/field crop is anticipated to be preserved. Therefore, there would be an overall increase in the amount of potential foraging habitat resulting from the project. This increase is anticipated to compensate for any potential reduction in the foraging quality of row/field crop lands that are converted to managed grassland.

Potential nesting habitat for special-status birds also would be affected by Alternatives 1 and 3. There would be a loss in the 2008 construction phase of up to approximately 1 acre of woodland habitat on the water side of the NCC south levee and 7 acres along the land side of the Sacramento River east levee, within the setback levee alignment, and/or within the footprint of the replacement canals. In the 2009 and 2010 construction phases, approximately 20 acres of woodland habitat is expected to be removed from the land side of the Sacramento River east levee. This habitat provides potential nest sites for most of the special-status birds likely to nest in the project area. Although these riparian and other woodland areas support potentially suitable nesting habitat, no vegetation known to have supported nests of special-status species (including Swainson's hawk) within the past five years would be removed. However, there is potential for nests to be established in new locations and, therefore, for direct removal of active nests to occur. Visual or noise disturbance of active nests also could result in abandonment and nest loss of various special-status birds. Such disturbance could result from construction activities, as well as geotechnical and cultural resource investigations prior to construction. Destruction of burrows occupied by burrowing owls along the PGCC could also occur during the 2009 construction phase.

Compensation for adverse effects on foraging and nesting habitat and potential unavoidable loss of active nests would be provided by woodland habitat creation and preservation components of Alternatives 1 and 3, although the location and configuration of the woodland nesting habitat replacement would differ between alternatives. Under Alternative 1, this creation would occur landward of the expanded levee/berm footprint at various locations along the Sacramento River east levee improvements. Under Alternative 3, the planting would largely be concentrated in the levee setback area in Reaches 1 and 2. A conceptual design of the grassland and woodland habitats to be created has been developed and provided for USFWS and DFG review; detailed design and specific management protocols are currently being prepared by SAFCA in coordination with these agencies. To provide adequate compensation for lost habitat, the woodlands and grasslands must be created and/or managed in a manner that provides the essential habitat functions for special-status bird species. Therefore, an overall significant adverse effect on special-status birds could occur if the habitat creation and management are not properly implemented.

Alt. 2

Under Alternative 2, potential effects on special-status birds associated with the Sacramento River east levee improvements would be somewhat different from those under Alternatives 1 and 3. Loss of nesting and foraging habitat on the land side of the levee may be reduced under this alternative by the lack of an adjacent levee, but as

much as 35 acres of riparian woodland on the water side of these levee reaches that provides suitable nesting habitat for various special-status birds may require removal to conform with USACE guidance regarding levee encroachments. Potential adverse effects from such vegetation removal are likely to be greater than those from the adjacent levee footprint on the land side of the levee under Alternatives 1 and 3, in terms of both the amount and quality of that habitat. Habitat creation components of this alternative, including woodland planting within the 150-acre levee setback area and grassland creation throughout the project area, would be beneficial. However, it is uncertain whether the new woodlands would be adequate to compensate for the potential extensive loss of Swainson's hawk nest sites on the water side of the Sacramento River east levee and, as with Alternatives 1 and 3, overall significant adverse effects could occur if the habitat creation and management are not properly implemented.

Mitigation Measure 4.9-e: Minimize Potential Impacts on Burrowing Owls and Other Special-Status Bird Species, Relocate Owls as Needed, Complete Detailed Design of Woodlands and Grasslands and Management Agreements to Ensure Adequate Compensation for Unavoidable Adverse Effects, and Obtain Incidental Take Authorization

No-Action Alt.

If SCAS were to construct a flood protection system (compartment levee) for the Airport, mitigation similar to that described below for Alternatives 1, 2, and 3 would be required to reduce potential impacts on special-status birds to a less-than-significant level.

Except for construction the improvements to the NCC south levee as described for all action alternatives and the construction of an adjacent levee or a combination of an adjacent levee and setback levee along the Sacramento River east levee (i.e., implementation of Alternative 1 or Alternative 3), there is no known mitigation for the likely loss of a substantial amount of waterside vegetation that provides valuable nesting habitat for Natomas Basin special-status birds, including numerous Swainson's hawk nest trees. Except for improvements to the perimeter levee system, there is no mitigation to prevent the potentially significant adverse effects on the basin population of burrowing owls in the event of a levee failure and flooding of burrows.

Alt. 1, Alt. 2, Alt. 3

The primary engineering and construction contractors shall ensure, through coordination with a qualified biologist retained by SAFCA, that construction is implemented in a manner that minimizes disturbance of potential nesting habitat for special-status birds. Removal of potential nesting habitat shall be conducted during the non-nesting season, to the extent feasible and practicable, to minimize the potential for loss of active nests.

The biologist shall conduct preconstruction surveys to identify active special-status bird nests and occupied burrowing owl burrows in the vicinity of construction areas. Surveys for nesting birds shall be conducted before project activities are initiated during the nesting season (March 1–July 31), and surveys for burrowing owl shall be conducted before project activities are initiated at any time of year. Surveys shall be conducted in accordance with standardized protocols and NBHCP requirements. If an active nest or occupied nest burrow is found, an appropriate buffer that minimizes potential for disturbance of the nest shall be determined by the biologist, in coordination with DFG. No project activities shall commence within the buffer area until a qualified biologist

confirms that the nest is no longer active or the birds are not dependent on it. Monitoring shall be conducted by a qualified biologist to ensure that project activity does not result in detectable adverse effects on the nesting pair or their young. The size of the buffer may vary, depending on the nest location, nest stage, construction activity, and monitoring results. If implementation of the buffer becomes infeasible or construction activities result in an unanticipated nest disturbance, DFG shall be consulted to determine the appropriate course of action.

If an occupied burrowing owl burrow that does not support an active nest is found, SAFCA shall develop and implement a relocation plan, in coordination with and subject to approval of DFG and USFWS and consistent with requirements of the NBHCP. Relocation is anticipated to occur through passive exclusion of owls from the project site (using one-way doors at the burrow entrances). The owls would then be able to reoccupy the area after construction is complete. Because the project would generally result in temporary disturbance of burrowing owl habitat and conversion from one suitable habitat type to another, no mitigation for temporary burrow or habitat loss would be required.

All native trees removed shall be replaced with an appropriate number of native plantings, based on the dbh of the removed tree. The exact number of replacement plantings shall be determined in coordination with DFG, but is anticipated to be consistent with the following recent DFG requirements: three replacement trees for each removed tree of 2–9 inches dbh, four replacement trees for each removed tree of 9–18 inches dbh, one replacement tree for each inch of diameter removed of trees greater than 18 inches dbh. Each acre of grassland removed shall be replaced with 1 acre of created grassland or preserved row/field crop. SAFCA shall complete a detailed woodland and grassland planting design and management protocols in coordination with and subject to approval of USFWS and DFG. SAFCA shall also enter into agreements with entities responsible for long-term management of created woodland and grassland habitats to ensure that performance standards and long-term management goals are met and provide assurances of adequate funding for habitat creation and management. Such agreements and funding assurances shall be subject to approval of USFWS and DFG.

Authorization for take of Swainson's hawk under CESA shall be obtained. All measures subsequently adopted through the permitting process shall be implemented.

Implementing this mitigation would reduce the impact to a less-than-significant level for Alternatives 1 and 3, but may not reduce the impact to a less-than-significant level for Alternative 2.

Impact 4.9-f: Effects on Successful Implementation of the NBHCP

No-Action Alt.

Under the No-Action Alternative, there would be no direct project-related adverse or beneficial effects on successful implementation of the NBHCP. If SCAS were to construct flood protection in the form of a compartment levee to protect the Airport from flooding in the absence of Natomas perimeter levee improvements, effects on some species protected under the NBHCP (e.g., giant garter snake, Swainson's hawk) could be significant, as described previously, and successful implementation of the NBHCP could be jeopardized.

In addition, there could be significant adverse effects on the Natomas Basin giant garter snake population and TNBC preserve infrastructure in the event of levee failure, as discussed under Impact 4.9-c, and significant effects on pond turtles and burrowing owls, as described under Impacts 4.9-d and 4.9-e, respectively. Under the No-Action Alternative, there would also be extensive removal of riparian vegetation on the water side of the Sacramento River east levee to conform with USACE guidance regarding levee encroachments. This habitat is utilized by a variety of species covered by the NBHCP, and supports the majority of Swainson's hawk nest sites in the Natomas Basin. As described under Impact 4.9-e, the impact of the loss of this vegetation on Swainson's hawks would be significant. There would also be no beneficial effects to giant garter snake under this alternative, such as creation of habitat specifically designed to improve overall connectivity of habitat for this species in the Natomas Basin.

Alt. 1, Alt. 3

Potential effects on implementation of the NBHCP associated with Alternatives 1 and 3 were evaluated based on anticipated effects on the viability of populations of species covered by the NBHCP, the effectiveness of the NBHCP's conservation strategy, and attainment of the goals and objectives of the NBHCP. Adverse effects on these evaluation criteria could jeopardize successful implementation of the NBHCP. Although the alternatives would differ somewhat in their effects on these criteria, the overall issues are the same under all alternatives, and the potential to affect implementation of the NBHCP would not differ substantively between the alternatives.

Implementation of the project alternatives would not threaten the population viability of most species covered by the NBHCP because a relatively small amount of the total habitat in the Natomas Basin available to these species would be affected by the levee improvements and/or because potential direct effects would affect a very small proportion of the population. However, potential effects on some species—giant garter snake, Swainson's hawk, and tricolored blackbird—could be significant. Because of the relative scarcity of available habitat, the potential for reduced habitat quality, and/or the potential for adverse effects on the breeding success of relatively large numbers of individuals, the viability of populations of these species within the Natomas Basin could be threatened by project implementation. Habitat creation, enhancement, and preservation components of the project are anticipated to offset potential adverse effects on habitat for these species. A conceptual design of the habitats to be created has been developed and provided for USFWS and DFG review; detailed design and specific management protocols are currently being prepared by SAFCA in coordination with these agencies. For these habitats to provide adequate compensation for those that would be lost, they must be created and/or managed in a manner that provides the essential habitat functions of those being replaced. Therefore, an overall adverse effect could occur if the habitat creation and management are not properly implemented.

Key components of the NBHCP conservation strategy include a 0.5:1 mitigation ratio, site-specific management plans for reserve lands, buffers within reserve lands, connectivity, minimum habitat block size requirements for reserve lands, and foraging habitat. The project alternatives would not result in the development of land outside the permit area, but they would result in land use conversions. Land use conversion, however, would not cause a net loss in the habitat values provided by these lands for NBHCP-covered species in the Natomas Basin. Conversion from agricultural crops to managed grassland would not reduce overall habitat quality. Although up to approximately 445 acres of rice fields would be permanently lost through conversion to grassland or levee slopes, the overall habitat quality for NBHCP species that use rice

fields is unlikely to be adversely affected because up to 160 acres of existing rice fields would be acquired and preserved in public ownership, 105 acres of new canal habitat would be created, and 230 acres of rice fields would be converted to managed marsh with higher habitat quality. This increase in habitat quality is anticipated to compensate for the loss associated with conversion to grassland.

Proposed improvements to the Sacramento River east levee would encroach slightly on four existing TNBC reserves: Huffman West, Atkinson, Cummings, and Alleghany 50. Under Alternatives 1 and 3, a total of 10–15 acres of TNBC preserve land at Huffman West and Atkinson would be within the footprint of the 2008 construction phase levee improvements and the anticipated maintenance easement corridor and approximately 10 acres at Cummings and Alleghany 50 would be within the footprint and easement area of the 2010 construction phase. Encroachment onto reserves would affect their overall size, potentially jeopardizing the ability to meet the minimum-size and mitigation-ratio requirements and requiring revision of existing management plans. It could also affect revenue-generation requirements that must be met for successful implementation of the NBHCP. Based on initial discussion with TNBC, it appears that potential conflicts with these requirements can be alleviated through implementation of several options, but the specific actions are yet to be identified and agreed upon.

The project alternatives would not reduce connectivity of reserves or habitats within the Natomas Basin and would actually improve connectivity between reserves managed for giant garter snake purposes in the northern and southern portions of the basin. They would also benefit the establishment of large blocks of preserved habitat by creating and/or preserving grassland, woodland, marsh, and rice habitats near or immediately adjacent to existing TNBC reserves.

The project alternatives would not reduce the overall amount of foraging habitat available to NBHCP-covered species. Land use changes would reduce the overall amount of some habitats (i.e., agricultural crops), but these would be converted to grassland and managed marsh of comparable or higher overall foraging quality. Although agricultural crops can provide enhanced foraging opportunities during specific periods of the cultivation cycle, the grassland and marsh habitats would be more consistently available throughout the year.

Several goals and objectives of the NBHCP are relevant to the project alternatives. In general, these goals and objectives address issues similar to those of the conservation strategy, such as establishing and managing a habitat reserve system and ensuring connectivity between reserves. Relevant habitat-specific goals and objectives include establishing a mosaic of habitats and connecting corridors to provide breeding, wintering, foraging, and cover areas for wetland and upland species and providing habitat to maintain viable populations of NBHCP-covered species. As described above, components of the project alternatives would support attainment of these goals and objectives by creating, enhancing, and preserving habitat and creating a valuable aquatic corridor linking TNBC reserves in the northern and southern portions of the Natomas Basin. However, potential encroachment on existing reserves could have an adverse effect, and the population viability of some NBHCP-covered species could be threatened if adequate assurances regarding habitat management are not provided.

The potential for implementation of the project alternatives to threaten the viability of populations of certain covered species, reduce the effectiveness of the NBHCP's

conservation strategy, and adversely affect attainment of the goals and objectives of the NBHCP could jeopardize successful implementation of the NBHCP. This would be a significant adverse impact.

Alt. 2

The assessment provided above for the effects of Alternative 1 or 3 on successful implementation of the NBHCP apply to Alternative 2 as well, with the exception that under this alternative, there would also be extensive removal of riparian vegetation on the water side of the Sacramento River east levee to conform with USACE guidance regarding levee encroachments. This habitat is utilized by a variety of species covered by the NBHCP, and supports the majority of Swainson's hawk nest sites in the Natomas Basin. As described under Impact 4.9-e, the impact of the loss of this vegetation on Swainson's hawks would be significant and may not be mitigable. Effects on nesting habitat for Swainson's hawks in the near term (i.e., before compensation woodland plantings have developed sufficiently to provide replacement nesting habitat) could substantially affect the successful implementation of the NBHCP. Under Alternative 2, therefore, this impact could be significant.

Mitigation Measure 4.9-f: Ensure that Compliance with Mitigation Requirements of Established NBHCP Reserves is Not Adversely Affected, and Implement Mitigation Measures 4.7-a and 4.9-a through 4.9-e

No-Action Alt.

If SCAS were to construct a flood protection system (compartment levee) for the Airport in the absence of improvements to the Natomas perimeter levee system, SCAS would need to implement mitigation similar to that described below for Alternatives 1, 2, and 3 would need to be implemented to ensure that implementation of the NBHCP would not be adversely affected.

However, as described above, except for improvements to the perimeter levee system, there is no mitigation that would protect giant garter snake habitats and populations, burrowing owl habitats and populations, northwestern pond turtle populations, or TNBC infrastructure in the Natomas Basin from the potentially devastating effects of flooding in the event of a levee failure. Except for construction the improvements to the NCC south levee as described for all action alternatives and the construction of an adjacent levee or a combination of an adjacent levee and setback levee along the Sacramento River east levee (i.e., implementation of Alternative 1 or Alternative 3), there is no known mitigation for the likely loss of a substantial amount of waterside vegetation that provides valuable nesting habitat for Natomas Basin special-status birds, including numerous Swainson's hawk nest trees.

Alt. 1, Alt. 2, Alt. 3

SAFCA shall coordinate with TNBC, USFWS, and DFG to determine the most effective means of ensuring that the small encroachment onto reserves that would result from project implementation does not adversely affect the ability to meet the minimum-size and mitigation-ratio requirements of the NBHCP, require revision of existing management plans, and/or affect revenue-generation requirements. SAFCA shall, in coordination with TNBC, USFWS, and DFG, identify and implement necessary actions to ensure that encroachment does not jeopardize successful implementation of the NBHCP. Such actions may include direct supplementation of TNBC funding to offset losses in revenue generation, management of portions of the reserve that are encroached upon by project facilities in a manner that is consistent with current habitat requirements, and/or acquisition of additional land to replace portions of reserves that

are encroached upon. Actions shall be approved by TNBC, USFWS, and DFG and shall be implemented by SAFCA before encroachment occurs.

Implementation of the project as proposed, this measure, and Mitigation Measures 4.7-a and 4.9-a through 4.9-e would ensure that Alternatives 1 and 3 would be implemented in a manner that is consistent with and does not jeopardize successful implementation of the NBHCP. Under Alternative 2, because of the likely loss of a substantial amount of nesting habitat for Swainson's hawk, these measures could be insufficient to ensure that the project would not jeopardize successful implementation of the NBHCP.

4.9.3 Unavoidable Significant Adverse Effects

The No-Action Alternative could result in significant adverse effects, either directly or through habitat modification, on Natomas Basin populations of giant garter snakes, borrowing owls, and northwestern pond turtles and, consequently, successful implementation of the NBHCP, in the event of a failure of the perimeter levee system.

Alternative 2 could result in unavoidable significant effects on special-status birds and, consequently, on successful implementation of the NBHCP, associated with the extensive removal of riparian vegetation on the water side of the Sacramento River east levee to conform with USACE guidance regarding levee encroachments.

No unavoidable significant adverse effects were identified for Alternatives 1 and 3.

4.10 CULTURAL RESOURCES

This project is in compliance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended. Section 106 consultation with the SHPO has been formally initiated by USACE. All evaluations of resource identification, determinations of significance, and determinations of project effects and mitigation/treatment measures will meet the requirements of 36 CFR 800 (procedures for implementing Section 106) through the implementation of a Programmatic Agreement (PA) that has been developed through consultation among USACE, the State Historic Preservation Officer (SHPO), the Advisory Council on Historic Preservation, and SAFCA.

4.10.1 Methodology

This section evaluates potential effects of the project alternatives on cultural resources in the project area. Cultural resources include archaeological traces such as Native American occupation sites and artifacts, historic-era buildings and structures, and places used for traditional Native American practices or other properties with special cultural significance to Native Americans (Traditional Cultural Properties [TCPs]).

The method for determining the threshold for adverse effects on cultural resources integrates Federal criteria regarding resources that are eligible for listing on the National Register of Historic Places (NRHP) per Section 106, TCPs, and resources that are protected under the Native American Graves Protection Act of 1990 (43 CFR 10). Human remains are considered TCPs by most Native American representatives.

Any action that would alter any of the characteristics that qualify a historic property for listing in the NRHP, in a manner that would diminish the property's integrity or disturb characteristics that qualify a resource for designation as a TCP, is an adverse effect under this analysis (36 CFR 800.5[1]).

4.10.2 Impacts and Mitigation Measures

This section describes the impacts of the alternatives on cultural resources and outlines treatment measures that may avoid, minimize, rectify, reduce, or compensate for the predicted impacts. Determinations of the specific mitigation measures to be implemented will be made by USACE and SAFCA in consultation with the SHPO as part of the determination and eligibility and effect process, as required by Section 106 of the NHPA. Implementation of the selected treatment measures will be ensured through the execution of Historic Property Treatment Plans (HPTPs) prepared to prescribe the specific treatment measures for each historic property that would be adversely affected by the project. These HPTPs are stipulated by the PA being executed between USACE, the SHPO, and SAFCA.

Impact 4.10-a: Changes to Elements of Reclamation District 1000

No-Action Alt.

Without improvements to the perimeter levee system to provide 100-year flood protection, a significantly high risk of a levee failure in the perimeter system would remain. A levee failure in the Natomas Basin could result in flooding that could alter elements of RD 1000. However, the major elements and overall character of RD 1000 are unlikely to be significantly adversely affected. However, if SCAS were to pursue the construction of an interior compartment levee to protect the Airport in the absence of improvements to the Natomas perimeter levee system, elements of RD 1000 would be significantly altered.

Alt. 1, Alt. 2, Alt. 3

As previously described, an evaluation of RD 1000 was conducted both to determine the NRHP eligibility of the district and to evaluate whether the district would be significantly affected by flood control projects (levee modifications) planned and subsequently implemented by the USACE as part of the American River Watershed Project. RD 1000 was identified as eligible for inclusion in the NRHP as a Rural Historic Landscape District. The "determination of effects" statement concluded that the USACE projects would adversely affect both contributing and noncontributing elements of RD 1000 by allowing for greater development to occur in the region. As a result, mitigation measures were adopted and incorporated into the USACE's project. These consisted of Historic American Engineering Record documentation, which was prepared by Peak & Associates (1997); videotapes of historic properties; and a list of repositories where copies of the information would be made available to the public.

As part of the 2008 construction phase, Alternatives 1, 2, and 3 would alter contributing elements of RD 1000 by modifying the NCC south levee and Sacramento River east levee and realigning Sankey Road at the intersection with Garden Highway to accommodate changes to the levee resulting from adjacent setback levee construction and raising the Riego Road intersection with Garden Highway. As part of the 2009 and 2010 construction phases, SAFCA would alter contributing elements of RD 1000 by modifying the Sacramento River east levee and expanding the West Drainage Canal to provide giant garter snake habitat.

These changes are consistent with the current land use pattern and the long-term operation of a levee system and rural irrigation and drainage system. However, they may alter or diminish the integrity of contributing elements of the district. These effects of the 2008, 2009, and 2010 construction phases would be significant.

Mitigation Measure 4.10-a: Document Alterations Made to Any RD 1000 Contributing Resources and Distribute the Information to the Appropriate Repositories

No-Action Alt.

If construction of an interior compartment levee were pursued to provide flood protection for the Airport in the absence of the proposed improvements to the Natomas perimeter levee system, treatment measures similar to that described below for Alternatives 1, 2, and 3 would likely be required.

Alt. 1, Alt. 2, Alt. 3

Before any work is performed that would alter contributing elements of RD 1000, a qualified architectural historian shall be retained to assess the effect of the work on the district. Because many of the planned improvements are consistent with the operation and long-term maintenance of a levee system, they may be consistent with the character-defining elements of the district. Such effects would not require further treatment measures.

If planned improvements would alter or diminish the integrity of contributing elements of the district, the architectural historian shall examine and review existing documentation regarding the existing structures and elements (photographs, maps, drawings, and other methods specified in the Historic American Engineering Record standards) and determine whether any augmentation of this documentation is needed. Any additional documentation that is needed shall be distributed to appropriate public repositories.

Implementing this treatment measure would reduce the effects to a less-than-adverse level.

Impact 4.10-b: Construction Effects on Other Known Historic-Era Resources

No-Action Alt.

The No-Action Alternative would involve no improvements to the Natomas perimeter levee system and would result in no direct effects on historic-era resources along this levee system. If SCAS were to pursue the construction of an interior compartment levee in the absence of the proposed improvements to the Natomas perimeter levee system, it is possible that historic-era resources of significance could be encountered during construction. This would be a significant effect.

Alt. 1, Alt. 2, Alt. 3

Previous investigations by Dames & Moore and Far Western, as well as the SAFCA project effort in 2007, identified a number of historic-era residences, farm complexes, debris scatters, and light industrial remnants. The following historic-era resources would be in the footprint of the 2008 construction phase: P-51-000096H, P-34-001354H and NLIP-1 through NLIP-6. Although they date to the historic era, these resources all appear to lack association with important historic themes, stylistic values, and data potential that might make them eligible for listing on the NRHP. However, because these resources have not yet been formally evaluated for significance in accordance with the stipulations of the PA, it is concluded that effects on these resources would be potentially adverse.

Several prehistoric resources with historic-era components would be in the footprint of elements of the 2009 and 2010 construction phases. These resources are discussed below under Impact 4.10-c.

Mitigation Measure 4.10-b: Evaluate Resources for Significance in Accordance with the Stipulations of the Programmatic Agreement and, If Any Resource Is Determined Eligible for NRHP Listing, Treat It in Accordance with Measures Stipulated in an HPTP Developed in Consultation between USACE, the SHPO, and SAFCA

No-Action Alt.

If the construction of an interior compartment levee for the Airport were pursued in the absence of the proposed improvements to the Natomas perimeter levee system, treatment similar to that described below for Alternatives 1–3 would likely be required. However, it is unknown whether treatment measures as prescribed in the HPTP would reduce effects to a less-than-significant level.

Alt. 1, Alt. 2, Alt. 3

Historic-era resources shall be formally evaluated for significance in accordance with the stipulations of the PA. If any of these resources are determined to be eligible for NRHP listing and they would be adversely affected by the project, an HPTP shall be developed through consultation between USACE, the SHPO, and SAFCA. Adverse effects would be treated through measures prescribed in the HPTP. It is unknown whether the treatment measures would reduce effects to a less-than-significant level.

Impact 4.10-c: Potential Construction Effects on Known Prehistoric Resources

No-Action Alt.

Under the No-Action Alternative, no new direct effects on known prehistoric resources along the Natomas perimeter levee system would occur. In the event of a levee failure in the absence of improvements to the perimeter levee system to provide 100-year flood protection, substantial flooding could result in inundation of known subsurface prehistoric resources. However, before construction of the levee system, these resources were subject to the effects of periodic flooding over several centuries and are unlikely to be adversely affected by additional flooding. If SCAS were to pursue the construction of an interior compartment levee in the absence of the proposed improvements to the Natomas perimeter levee system, construction would likely affect known prehistoric site CA-Sac-16/H south of the Airport.

Alt. 1, Alt. 2, Alt. 3

Project work proposed for the 2008 construction phase includes canal construction in the vicinity of CA-Sac-485/H, a prehistoric mound site potentially eligible for the NRHP. Prehistoric mounds in the Sacramento region typically contain a rich assemblage of burials and associated mortuary goods as well as outlying habitation areas and debris. The majority of these sites have been destroyed by urban development. CA-Sac-485/H is potentially eligible for inclusion on the NRHP because it may contain archaeological materials that would contain information important to the understanding of prehistory and is considered a TCP by Native American representatives. The proposed alignments of the Elkhorn Canal and the new GGS/Drainage Canal were adjusted to accommodate the known boundaries of CA-Sac-485/H. However, this site may also contain outlying and ancillary deposits. Despite the adjustment of the proposed canal alignments, both the canal construction and grading associated with construction of the adjacent levee and seepage berm in this area have the potential to cause a significant adverse effect on this resource.

Levee improvements that would be part of the 2009 and 2010 construction phases may affect several prehistoric sites with mortuary components: CA-Sac-15/H, CA-Sac-16/H, CA-Sac-17, CA-Sac-160/H, and CA-Sac-164. Because these sites have mortuary components and associated prehistoric materials, they may contain information

important to the understanding of prehistory, and are therefore potentially eligible for inclusion on the NRHP and are considered TCPs by Native American representatives. CA-Sac-164 has been nominated to the NRHP. Effects on these resources would be significant and adverse.

Mitigation Measure 4.10-c(1): Avoid Ground Disturbance Near Known Prehistoric Archaeological Site CA-Sac-485/H to the Extent Feasible, and Treat the Resource in Accordance with Measures Stipulated in an HPTP Developed in Consultation between USACE, the SHPO, and SAFCA

No-Action Alt.

This mitigation would not apply to the No-Action Alternative.

Alt. 1, Alt. 2, Alt. 3

Adverse effects on CA-Sac-485/H shall be treated in accordance with measures stipulated in an HPTP developed in consultation between USACE, the SHPO, and SAFCA. These measures may include, but would not be limited to, the following:

- SAFCA and its engineers for canal design and construction and for levee improvements shall consult with a qualified professional archaeologist during project design to delineate the extent of potentially significant deposits in the vicinity of the mapped location of CA-Sac-485/H and shall design ground-disturbing work to avoid the deposits as feasible and practicable.

- If, in the judgment of the archaeologist, project activities would disturb the resource and these effects cannot be avoided, the archaeologist shall prepare and implement a research design and treatment plan in consultation with the signatories to the PA and Native American representatives, if appropriate.

- Before any construction-related ground disturbance begins in the vicinity of the resource, a professional archaeologist shall carry out a testing program based on the plan to determine whether the resource is eligible for listing on the NRHP.

- If the resource is determined to be ineligible for listing on the NRHP and is not determined to be a TCP, no further mitigation is required.

- If the resource is determined to be a historic property that contains important information to the understanding of prehistory or history, the archaeologist shall perform a program of data recovery in coordination with USACE to retrieve the information that would be destroyed by project activities.

- The archaeologist shall determine an appropriate radius around the site for monitoring adjacent construction work, and SAFCA shall provide monitors as stipulated in the HPTP to be present during this work.

- If prehistoric resources are discovered during construction work, a professional archaeologist shall assess the significance of the find and recommend additional treatment measures, such as data recovery, to retrieve the information important to the understanding of prehistory that would be destroyed by project activities.

Even though it may be possible to avoid resources or recover and preserve them through a treatment plan if disturbance is unavoidable, physical changes to resources eligible for

NRHP listing may still alter the significance of the resource. Therefore, if this site is determined to be eligible for listing, implementation of this mitigation may not fully reduce the impact to a less-than-significant level.

Mitigation Measure 4.10-c(2): Avoid Ground Disturbance near Known Prehistoric Archaeological Sites CA-Sac-15/H, CA-Sac-16/H, CA-Sac-17, CA-Sac-160/H, and CA-Sac-164 to the Extent Feasible, and Treat Resources in Accordance with Measures Stipulated in an HPTP Developed in Consultation between USACE, the SHPO, and SAFCA

No-Action Alt.

If the construction of an interior compartment levee for the Airport were pursued in the absence of the proposed improvements to the Natomas perimeter levee system, treatment similar to that described below for CA-Sac-16/H and for any other known prehistoric sites determined to be in the footprint of that project would likely be required.

Alt. 1, Alt. 2, Alt. 3

Adverse effects on CA-Sac-15/H, CA-Sac-16/H, CA-Sac-17, CA-Sac-160/H, and CA-Sac-164 shall be treated in accordance with measures stipulated in an HPTP developed in consultation between USACE, the SHPO, and SAFCA. These measures may include, but would not be limited to, the following:

- If ground disturbance may be conducted within 500 feet of known prehistoric resources CA-Sac-15/H, CA-Sac-16/H, CA-Sac-17, CA-Sac-160, or CA-Sac-164, SAFCA and its engineers for levee design and construction shall consult with a qualified professional archaeologist during project design to delineate the extent of potentially significant deposits around the recorded locations.

- If feasible and practicable, the project activities shall be designed to avoid disturbance of the resource. The archaeologist shall determine an appropriate radius around the site for monitoring adjacent construction work, and SAFCA shall retain an archaeological monitor and Native American monitor to be present during this work.

- If, in the judgment of the archaeologist, project activities would disturb the resource and these effects cannot be avoided, the archaeologist shall prepare and implement a research design and an HPTP in consultation with the signatories to the PA and Native American representatives, if appropriate.

- Before any construction-related ground disturbance begins in the vicinity of the resource, a professional archaeologist shall carry out a testing program based on the plan to determine whether the resource is eligible for listing on the NRHP.

- If the resource is determined to be ineligible for listing on the NRHP and is not determined to be a TCP, no further mitigation would be required.

- If the resource is determined to be a historic property that contains information important to the understanding of prehistory or history, the archaeologist shall perform a program of data recovery in coordination with USACE to retrieve the information that would be destroyed by project activities.

- The archaeologist shall determine an appropriate radius around the site for monitoring adjacent construction work, and SAFCA shall provide monitors as stipulated in the HPTP to be present during this work.

- If prehistoric resources are discovered during construction work, a professional archaeologist shall assess the significance of the find and recommend additional treatment measures, such as data recovery, to retrieve the information important to the understanding of prehistory that would be destroyed by project activities.

Even though it may be possible to avoid resources or recover and preserve them through a treatment plan if disturbance is unavoidable, physical changes to resources eligible for NRHP listing may still alter the significance of the resource. Therefore, if any of these sites are determined to be eligible for listing, implementation of this mitigation may not fully reduce the impact to a less-than-significant level.

Impact 4.10-d: Damage to or Destruction of Previously Undiscovered Cultural Resources

No-Action Alt.

In the event of a levee failure in the absence of improvements to the perimeter levee system to provide 100-year flood protection, substantial flooding could occur and result in inundation of unknown subsurface prehistoric resources. However, before construction of the levee system, these resources would have been subject to the effects of periodic flooding over several centuries and are unlikely to be significantly adversely affected by additional flooding.

If construction of an interior compartment levee for the Airport were pursued in the absence of the proposed improvements to the Natomas perimeter levee system, construction could encounter previously undiscovered cultural resources, as described below for Alternatives 1, 2, and 3. This potential impact would be significant.

Alt. 1, Alt. 2, Alt. 3

Sacramento Valley floodplains and riverbanks were extensively occupied and used by prehistoric populations. Prehistoric occupation sites frequently took the form of mounds raised above the natural ground surface, but the upper portions of many of these sites have been destroyed by modern agricultural cultivation of fields, and the remains of these sites are thus no longer easily visible above ground. Additionally, intermittent flooding deposited layers of alluvium over prehistoric deposits, leaving these resources intact below grade with no surface manifestations. The buried and truncated nature of these resources makes accurate prediction of their location before construction impossible.

Much of the footprint of the construction activity for the 2008 construction phase has not yet been surveyed because of lack of access or ground visibility. In these unsurveyed areas and also in areas that have been surveyed, construction excavation, grading, and other ground-disturbing activities could encounter and damage previously unknown cultural resources that are eligible for NRHP listing. This potential effect would be significant.

Mitigation Measure 4.10-d: Perform Research and/or Surveys, Brief Workers Before Construction, Monitor Construction, Halt Potentially Damaging Activities, Investigate and Avoid Resources to the Extent Feasible, and Treat Resources in Accordance with Measures Stipulated in an HPTP Developed in Consultation between USACE, the SHPO, and SAFCA

No-Action Alt.

If the construction of an interior compartment levee for the Airport were pursued in the absence of the proposed improvements to the Natomas perimeter levee system, mitigation similar to that described below for Alternatives 1, 2, and 3 would be required.

Alt. 1, Alt. 2, Alt. 3

In the event that any previously undiscovered cultural resources, including Native American Traditional Cultural Properties, are discovered during project activities, identification of those resources, evaluation of their significance, and determination of project effects on and treatment of historic properties that would be subject to adverse effects shall be conducted in accordance with measures stipulated in an HPTP developed in consultation between USACE, the SHPO, and SAFCA. These measures may include, but would not be limited to, the following:

- A qualified archaeologist shall survey of all accessible portions of the proposed areas of project disturbance if they have not been surveyed within the previous 5 years, and shall document and evaluate the significance of any resources that are found during the surveys.

- If any resources are found during the surveys that may be considered eligible for NRHP listing, the steps described in Mitigation Measure 4.10-c for known resources shall be followed.

- Before construction begins, a qualified professional archaeologist shall give a presentation and training session to all construction personnel so that they can assist with identification of undiscovered cultural materials and avoid them where possible.

- A qualified archaeologist shall monitor all ground-disturbing construction activities along the Sacramento River east levee and at other locations determined by the archaeologist to be sensitive for subsurface cultural resource deposits. If a previously unidentified archaeological resource is uncovered during construction, construction activities shall be halted within 50 feet of the find and the construction contractor, SAFCA, and other appropriate parties shall be notified regarding the discovery. The archaeologist shall determine whether the resource is potentially significant under the NHPA and shall develop appropriate mitigation.

- If the resource is found to be a potentially significant archaeological resource or a historical resource, the archaeologist shall recommend additional actions deemed necessary for the preservation or documentation of the resource. Such actions may include (but shall not be limited to) measures such as testing for subsurface features, additional background research, additional resource documentation, avoidance of the resource, or additional monitoring of construction activity to minimize any effects.

- Treatment of the site shall follow measures as stipulated in the HPTP. SAFCA shall ensure that necessary protection actions are implemented before construction

resumes within 50 feet of the site. The preferred treatment is preservation in place of as much of the resource as possible through project modification or protective measures.

- In many cases, archaeological data recovery can mitigate impacts to a less-than-significant level. However, construction activities may encounter potentially significant historic properties and archaeological resources that cannot be protected or recovered and for which adequate data recovery may not be feasible. Treatment of these resources shall follow measures stipulated in the HPTP.

- The deep excavation for levee improvements such as construction of cutoff walls requires work where monitoring may reveal resources only after they are excavated. Preconstruction studies and surveys, avoidance measures, and monitoring are the feasible treatment for these resources.

It may be possible to avoid resources or recover and preserve them through measures stipulated in the HPTP if disturbance is unavoidable; however, physical changes to resources eligible for NRHP listing may still alter the significance of the resource, and construction activities may encounter resources that cannot be protected and recovered and for which adequate data recovery may not be feasible. Therefore, this mitigation may not reduce impacts to a less-than-significant level.

Impact 4.10-e: Discovery of Human Remains during Construction

No-Action Alt.

If SCAS were to pursue the construction of an interior compartment levee in the absence of the proposed improvements to the Natomas perimeter levee system, construction could encounter human remains, as described below for Alternatives 1, 2, and 3. This potential impact would be significant.

Alt. 1, Alt. 2, Alt. 3

Prehistoric human remains have been found at several prehistoric sites in the project area. Previously unknown buried human remains may be unearthed, damaged, or destroyed during excavation activities associated with project construction. Damage to or destruction of human remains would be a significant effect.

Mitigation Measure 4.10-e: Halt Work Within 50 Feet of the Find, Notify the County Coroner and Most Likely Descendant, and Treat Remains in Accordance with Measures Stipulated in an HPTP Developed in Consultation between USACE, the SHPO, and SAFCA

No-Action Alt.

If the construction of an interior compartment levee for the Airport were pursued in the absence of the proposed improvements to the Natomas perimeter levee system, SCAS would need to implement mitigation similar to that described below for Alternatives 1, 2, and 3 in the event that human remains are encountered during construction.

Alt. 1, Alt. 2, Alt. 3

If human remains are uncovered during ground-disturbing activities, all ground-disturbing activities shall cease within a 50-foot radius of the find, and SAFCA or its designated representative, in consultation with USACE, shall be notified.

In accordance with the California Health and Safety Code, if human remains are uncovered during ground-disturbing activities, SAFCA and/or the contractor shall notify the county coroner of the county in which the remains are uncovered (Sutter or Sacramento) and a professional archaeologist to determine the nature of the remains. The coroner is required to examine all discoveries of human remains within 48 hours of receiving notice of a discovery on private or state lands (Health and Safety Code Section 7050.5[b]). If the coroner determines that the remains are those of a Native American, he or she must contact the NAHC by phone within 24 hours of making that determination (Health and Safety Code Section 7050[c]). The NAHC will designate a Most Likely Descendant (MLD) to consult with the designated parties in accordance with the stipulations of the HPTP,

Identification, evaluation of significance, and determination of project effects on and treatment of human remains that would be subject to adverse effects shall be conducted in accordance with measures stipulated in an HPTP developed in consultation between USACE, the SHPO, and SAFCA. These measures may include, but would not be limited to, the following:

- All efforts shall be made to recover information important to the understanding of prehistory and to respect the sacred values of the appropriate MLD.
- After a determination that the remains are of prehistoric Native American origin, coordination with the MLD shall follow the procedures stipulated in the HPTP and ultimate disposition of the remains may include reburial of the remains and associated grave goods in an appropriate location. If the MLD fails to make a recommendation or reinter the remains, further treatment will conform to PRC Section 5097 et seq. and other appropriate authorities.
- The discovery of prehistoric burials often reveals locations sensitive for the occurrence of additional archaeological material. After the initial discovery and management of human remains, a professional archaeologist working on behalf of the parties designated in the HPTP shall follow measures as stipulated in the HPTP.
- If possible, project features shall be designed to protect the site from future disturbance in accordance with the HPTP.

Disturbance of human remains and/or the failure to retrieve important information that the remains can provide for the understanding of prehistory would constitute a significant and adverse effect.

4.10.3 Unavoidable Significant Adverse Effects

As described under Mitigation Measures 4.10-b, 4.10-c(1), 4.10-c(2), 4.10-d, and 4.10-e, potential construction impacts on known historic-era resources, known prehistoric resources, or human remains, and damage to or destruction of previously undiscovered cultural resources, should any of these resources be determined to be eligible for NRHP listing, may remain unavoidable adverse effects under all alternatives, including the No-Project Alternative, despite the implementation of mitigation.

4.11 PALEONTOLOGICAL RESOURCES

4.11.1 Methodology

Paleontological resources (fossils) are the remains or traces of prehistoric animals and plants that are 10,000 years old or older. This section assesses the potential for earthmoving activities associated with the project alternatives to affect scientifically important fossil remains.

Geologic maps and reports covering the geology of the project area were reviewed to determine the exposed rock units and to delineate their respective aerial distributions in areas where construction-related excavation may occur. For this analysis, any action that would destroy a unique paleontological resource or site is considered a significant adverse effect.

4.11.2 Impacts and Mitigation Measures

Impact 4.11-a: Disturbance of Unknown Unique Paleontological Resources during Earthmoving Activities

No-Action Alt.

Under the No-Action Alternative, there would be no excavation activities along the Natomas perimeter levee system or the proposed borrow sites and, therefore, no potential for direct disturbance of any paleontological resources that may be present in those areas. Any paleontological resources present in the basin, which would be relatively deep within the ground and would have been present through numerous past flooding episodes, are unlikely to sustain damage in the event of flooding in the absence of improvements to the perimeter levee system.

If SCAS were to pursue the construction of an interior compartment levee in the absence of the proposed improvements to the Natomas perimeter levee system, construction could encounter unique paleontological resources, as described below for Alternatives 1, 2, and 3. This potential impact would be significant.

Alt. 1, Alt. 2, Alt. 3

By definition, sediments associated with Holocene-age alluvium are too young to contain paleontologically sensitive resources. Therefore, earthmoving activities in any of these sediments would result in no impacts on paleontological resources.

However, the discovery of Pleistocene vertebrate fossil remains in sediments referable to the Riverbank and Modesto Formations from Sutter and Sacramento Counties, as well as Davis, Woodland, and numerous other areas throughout the Central Valley, suggests there is a potential for uncovering additional similar fossil remains during construction-related deep excavation within portions of the project area.

Because of the number of recorded fossil sites in the Riverbank and Modesto Formations within the Central Valley, they are both considered paleontologically sensitive rock formations under SVP criteria. Certain construction activities in the Riverbank or Modesto Formations, such as enhancing levee embankments or forming berms on top of the existing ground surface, would not cause adverse impacts on resources because Pleistocene-age fossils would not be encountered until approximately 10 feet below ground surface. However, excavations deeper than 10 feet (e.g., for borrow excavation and for the installation of relief wells) in the Riverbank Formation or the Modesto Formation have the potential to encounter and possibly damage unique paleontological resources.

The anticipated and alternative borrow sites for the 2008 construction phase all overlie areas of Modesto and/or Riverbank Formation in whole or in part: all of the Brookfield property, portions of the Airport north bufferlands, and all of the RD 1001 site. Although the end result of excavation and restoration of the borrow sites (except possibly the RD 1001 site) would be a reduction in ground elevation of only about 5 feet, soils may be excavated to greater depths in some parts of these sites and then the remainder of the soil moved and graded to achieve an overall level landscape. Alternatives 1, 2, and 3 would all include excavations in the same areas of Riverbank or Modesto Formations. There is the potential that unique paleontological resources could be encountered in excavation at depths of 10 feet or more. Within the 2008 construction phase footprint, only a few portions of the NCC south levee and small portions of Reaches 2 and 4A along the Sacramento River east levee also overlie the Riverside and/or Modesto Formation. Deep excavation, for cutoff wall construction, would be conducted along the NCC south levee and Reach 2. Of the areas potentially excavated as part of the 2009 and 2010 construction phases, small areas around Fisherman's Lake and all of the PGCC overlie paleontologically sensitive rock units, in addition to the Brookfield and Airport north bufferlands borrow areas. Deep excavation is not anticipated for the PGCC west levee improvements, but borrow excavation on some properties in the Fisherman's Lake area could be deep enough to encounter fossils, should they be present.

Because deep excavation, mainly associated with borrow activity, in the 2008, 2009, and 2010 construction phases has the potential to destroy unique paleontological resources, this potential impact would be significant.

Mitigation Measure 4.11-a: Conduct Construction Personnel Training and, If Paleontological Resources Are Found, Cease Work in the Vicinity of the Find and Implement Mitigation in Coordination with a Professional Paleontologist

No-Action Alt.

If the construction of an interior compartment levee for the Airport were pursued in the absence of the proposed improvements to the Natomas perimeter levee system, SCAS would be required to implement mitigation similar to that described below for Alternatives 1, 2, and 3 to reduce potential impacts on paleontological resources to a less-than-significant level.

Alt. 1, Alt. 2, Alt. 3

Before the start of construction activities in the Riverbank Formation or the Modesto Formation, construction personnel involved with earthmoving activities shall be informed of the possibility of encountering fossils, the appearance and types of fossils likely to be seen during construction activities, and proper notification procedures should fossils be encountered. This worker training may be either (1) prepared and presented by an experienced field archaeologist at the same time as construction worker education on cultural resources or (2) prepared and presented separately by a qualified paleontologist.

If paleontological resources are discovered during earthmoving activities, the construction crew shall immediately cease work in the vicinity of the find. SAFCA shall retain a qualified paleontologist to evaluate the resource and prepare a proposed mitigation plan in accordance with SVP guidelines (1995). The proposed mitigation plan may include a field survey, construction monitoring, sampling and data recovery procedures, museum storage coordination for any specimen recovered, and a report of

findings. Recommendations determined by SAFCA to be necessary and feasible shall be implemented before construction activities can resume at the site where the paleontological resources were discovered.

Implementing this mitigation would reduce the impact to a less-than-significant level.

4.11.3 Unavoidable Significant Adverse Effects

No unavoidable significant adverse effects were identified.

4.12 TRANSPORTATION AND CIRCULATION

4.12.1 Methodology

This section analyzes the potential impacts of the alternatives on traffic circulation and transportation systems and potential effects related to emergency vehicle access and construction traffic hazards. Effects on flight safety related to operation of the Airport are addressed in Section 4.18, "Hazards and Hazardous Materials."

This analysis is focused on construction-related traffic effects because long-term project operation would have no effects on transportation and circulation. Traffic standards such as level of service (LOS) are used typically for analyzing potential long-term effects of projects on traffic flow and were not used in this analysis.

The following screening criterion is recommended by the Institute of Transportation Engineers (ITE) (1989) for assessing the effects of development projects that create permanent traffic increases: "In lieu of other locally preferred thresholds, a traffic access/impact study should be conducted whenever a proposed development will generate 100 or more added (new) peak-direction trips to or from the site during the adjacent roadway's peak hours or the development's peak hours." For construction projects that create temporary traffic increases, this criterion is considered conservative by ITE (1989). However, it is intended to assess the effect of a traffic mix consisting primarily of automobiles and light trucks. To account for the large percentage of heavy trucks associated with a typical construction project, the threshold level is reduced to 50 or more new peak-direction trips. Consequently, a construction project would be considered to have a significant impact on traffic (i.e., would be considered to cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system) if the project would result in 50 or more new truck trips during the a.m. or p.m. peak hour.

4.12.2 Impacts and Mitigation Measures

Impact 4.12-a: Temporary Increase in Traffic on Local Roadways

No-Action Alt.

If SCAS were to construct a compartment levee to provide flood protection for the Airport, this construction could require a substantial amount of soil borrow material. Depending on the locations of the borrow sources in relation to local roadways, borrow hauling could cause substantial temporary increases in traffic on local roadways during construction. Because no concept plan exists for such a project, it is not possible to predict whether a significant traffic impact would occur.

In the absence of improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. If any part of the levee system were to fail, flooding of Natomas Basin roadways—county roadways, SR 99/70, I-5, and I-80—could be minor

to extensive depending on the location and severity of the failure and the duration of flooding. Traffic rerouting could lead to minor to substantial traffic congestion on alternate roadways.

Alt. 1

Project construction would have a temporary but potentially significant effect on local traffic. Construction-related traffic would consist of daily commute trips by construction workers and truck trips to haul materials and supplies from outside the project vicinity, as well as truck trips to haul waste materials off-site for disposal, resulting in increased traffic levels on local roadways. In addition, project construction would require rerouting of traffic and implementing several temporary closures during construction. As part of improvements along Reaches 1–4B of the Sacramento River east levee, the intersections of Sankey Road, Riego Road, and private farm roads with Garden Highway would be reconfigured to match the elevated profile of the adjacent levee. Along Reaches 5A–20A, several public roadway and farm road intersections with Garden Highway, including intersections at West Elverta Road, West Elkhorn Boulevard, Powerline Road, and San Juan Road, would be reconstructed across the adjacent setback levee to Garden Highway. These intersections would be closed temporarily during construction in these areas and detours indicated. Lane or road closures of segments of Garden Highway may be necessary as well during construction of the adjacent setback levee crown and drainage improvements along Garden Highway. At SR 99/70, portions of the highway would need to be shut down temporarily to allow for the installation of NCC south levee improvements.

2008 Construction Phase: The labor force for construction on the Natomas Cross Canal (NCC) south levee, the Sacramento River east levee Reaches 1–4B, and the Elkhorn Canal realignment and new GGS/Drainage Canal construction is estimated to reach a high of about 175 workers. Construction-related commute traffic, therefore, could reach a total of about 175 trips during the peak morning and evening commute hours at times of peak construction activity. However, construction crew members would travel to the construction sites from different directions and by way of different sets of roadways and intersections. It is also likely that some ridesharing would take place and that construction hours would begin prior to and end after peak commute hours for the general population. Therefore, 175 trips is a conservative estimate of the maximum increase in commute traffic volume that may be associated with project construction, and this volume would likely be spread across vehicles arriving from different directions.

Approximately 90 truck round trips, over an approximately 1-week period, would be required to transport the contractor's equipment to the NCC south levee project area. A similar number of round trips would be needed to remove the equipment from both sites as the work is completed. Construction along the NCC south levee during the 2008 construction phase would involve haul trucks carrying borrow material from the Brookfield borrow site or, possibly, the RD 1001 borrow site. Haul routes are shown in **Plate 21**. The haul route from the Brookfield site would be along Howsley Road and the unpaved maintenance access road along the NCC south levee. The haul route from the RD 1001 site would be along Striplin Road and a segment of SR 99/70 to Howsley Road and the unpaved levee maintenance access road. Personnel, equipment, and other imported construction materials would reach the NCC south levee construction areas mainly via these roadways, Garden Highway, Sankey Road, Riego Road, and Powerline Road. For the NCC south levee improvements, haul trucks would make approximately

475 daily trips to deliver borrow material to the project site over an approximately 10-hour period.

Approximately 110 round trips, over an approximately 1-week period, would be required to transport the contractor's equipment to Sacramento River east levee Reaches 1–4B and the Elkhorn and GGS/Drainage Canals between the North Drainage Canal and Elkhorn Reservoir. A similar number of round trips would be needed to remove the equipment from both sites as the work is completed. Construction along Sacramento River east levee Reaches 1–4B would involve haul trucks carrying borrow material from the Airport north bufferlands borrow area. Construction along the Sacramento River east levee is conservatively estimated to require as many as 1,100–1,200 truck trips per day if a substantial portion of the levee improvements are undertaken in calendar year 2008 but is more likely to require approximately 900–950 trips per day, with most or all of the construction occurring in calendar year 2009. However, hauling from all parts of the Airport site except the portion east of Powerline Road would be accomplished off of public roadways, through the Airport bufferland parcels and along an unpaved access road that would be constructed parallel to the Sacramento River east levee to allow equipment to move up and down the levee during construction. Construction of the Elkhorn and GGS/Drainage Canals between the North Drainage Canal and Elkhorn Reservoir would generally involve a balanced channel cut and embankment placement operation. Therefore, minimal haul traffic is anticipated. If imported fill material is needed, the haul traffic would use the same maintenance access road as that used by the levee construction operation. The portion of the Airport borrow area located east of Powerline Road is not anticipated to be used during the 2008 construction phase, and haul routes from this site have not yet been decided; however, portions of Powerline and West Elverta Roads are shown in **Plate 21** as a possible haul route should this parcel be used. Personnel, equipment, and other imported construction materials would reach the Sacramento River east levee construction areas mainly via SR 99/70, Elverta Road, Powerline Road, and Garden Highway.

Although most of the soil borrow hauling for the 2008 construction phase is expected to be conducted off public roadways, hauling for the NCC south levee improvements could reach or at times exceed the ITE threshold of 50 trucks in the peak direction during the a.m. or p.m. peak hour on Howsley Road for use of either the Brookfield or RD1001 site and SR 99/70 for use of the RD1001 borrow site. Therefore, Alternative 1 may result in a significant effect due to the increase in traffic on local roadways associated with 2008 construction phase trips, although existing traffic levels on Howsley Road are very low.

2009–2010 Construction Phases: As noted above, construction work in calendar year 2009 may include most or all of the levee improvements along the NCC south levee and Reaches 1–4B of the Sacramento River east levee that are part of the 2008 construction phase, although the canal construction elements of this construction phase would likely be completed during the 2008 calendar year. It is anticipated that the 2009 construction phase could include 50%–60% of the improvements in Sacramento River east levee Reaches 5A–20A, and the construction of Elkhorn and GGS/Drainage Canals south of Elkhorn Reservoir, the Riverside Canal relocation, Airport West Ditch modifications, and a portion or all of the PGCC west levee improvements. The 2010 construction work would include the remaining 40%–50% of the Sacramento River east levee improvements in Reaches 5A–20A and any remaining PGCC west levee improvements. The Sacramento River east levee improvements and canal relocations would use borrow

from the Airport north bufferlands in 2009 and from parcels in the Fisherman's Lake area in 2010 (**Plate 19**). The NCC south levee haul routes would be as described for 2008 construction. As in the 2008 construction phase, the improvements to the Sacramento River east levee would involve haul trucks carrying borrow material to construction areas along an unpaved access road that would be constructed parallel to the Sacramento River east levee to allow equipment to move up and down the levee during construction. Personnel, equipment, and other imported construction materials would reach the construction areas via these roadways and Garden Highway via a combination of roadways that may include SR 99/70, Elverta Road, Powerline Road, Elkhorn Boulevard, Del Paso Road, San Juan Road, El Centro Road, and West El Camino Avenue. Borrow material would be hauled to the PGCC west levee improvements sites either along the levee toe from the adjacent Brookfield borrow site or from the RD 1001 borrow site via Striplin Road, SR 99/70, and Howsley Road. Personnel, equipment, and other imported construction materials would reach the construction area mainly via these roadways.

For 2009 and 2010 construction, the total of the crew sizes in each year is expected to be similar to the total of the 2008 crew sizes. Construction crew members would travel to different project sites from different directions and by way of different sets of roadways and intersections. It is also likely that some ridesharing would take place and that trips would occur prior to and after peak hours. Therefore, construction crew commute traffic is unlikely to significantly affect local roadways, even during the peak a.m. and p.m. hours. Haul trips for borrow material for the 2009 construction phase are anticipated to average 950–1,100 trips per day for the Sacramento River east levee improvements and 100–200 trips per day for the PGCC west levee improvements. In calendar year 2009, therefore, total trips for the 2008 and 2009 construction phases combined could total as much as 475 trips per day for the NCC south levee improvements, 1,900 trips per day for the Sacramento River east levee improvements, and 100–200 trips per day for the PGCC west levee improvements. Although most of the soil borrow hauling during 2009 is expected to be conducted off public roadways, hauling for the NCC south levee improvements could reach or at times exceed the ITE threshold of 50 trucks in the peak direction during the a.m. or p.m. peak hour on Howsley Road and/or SR 99/70.

Therefore, as noted for the 2008 construction season, Alternative 1 may cause a significant increase in traffic on local roadways associated with 2009 construction trips.

Haul traffic in 2010 is estimated to average 700 trips per day along the Sacramento River east levee and 100–200 trips per day along the PGCC west levee. Because most of these trips would be conducted off of public roadways, a significant effect on traffic and circulation is not expected in relation to construction in 2010.

Alternative 1 would result in a significant effect due to the increase in traffic on local roadways associated with construction trips for the 2008 and 2009 construction seasons. In addition, temporary road closures associated with levee improvements could cause or contribute to temporary significant adverse increases in traffic levels as traffic is detoured or slowed on some local roadways and SR 99/70.

Alt. 2

Under Alternative 2, construction-related trips would be the same as described for Alternative 1 except that haul trips associated with the Sacramento River east levee improvements (off of public roadways) would be lower: 750 haul trips per day in 2008,

950 trips per day in 2009, and 500 trips per day in 2010 (compared to 1,100–1,200 trips per day in 2008, 1,450 trips per day in 2009, and 700 trips per day in 2010 under Alternative 1) if a substantial portion of the levee improvements would be undertaken in 2008, with the remainder completed in 2009. Alternatively, if most or all of the Sacramento River east levee improvements for the 2008 construction phase are delayed until 2009, haul trips for both the 2008 and 2009 construction phase would total approximately 650 per day for a combined total of approximately 1,300 trips per day in calendar year 2009, compared with as many as 1,900 trips per day under Alternative 1. Haul trips associated with the NCC south levee improvements would be the same as described for Alternative 1 and therefore may exceed the thresholds based on ITE guidance for temporary traffic increases. In addition, at SR 99/70, portions of the highway would need to be shut down temporarily to allow for the installation of NCC south levee improvements as described for Alternative 1, and raising the existing Sacramento River east levee in place would require lane or road closures along portions of Garden Highway for prolonged periods during construction, causing traffic and access delays on local roadways. Alternative 2 would result in a significant effect.

Alt. 3

Under Alternative 3, construction-related trips would be the same as described for Alternative 1 in relation to the NCC south levee and PGCC west levee improvements, and haul trips associated with the Sacramento River east levee improvements (off of public roadways) would be very similar to those described for Alternative 1: approximately 1,100 haul trips per day in 2008, 1,400 trips per day in 2009, and 700 trips per day in 2010 (compared to 1,100–1,200 trips in 2008, 1,450 trips in 2009, and 700 trips in 2010 under Alternative 1) if a substantial portion of the levee improvements would be undertaken in 2008, with the remainder completed in 2009. Alternatively, if most or all of the Sacramento River east levee improvements for the 2008 construction phase are delayed until 2009, haul trips for both the 2008 and 2009 construction phases would range between 900 and 1,050 for a combined total of approximately 1,900 trips per day in calendar year 2009, as under Alternative 1. Haul trips associated with the NCC south levee improvements would be the same as described for Alternative 1 and therefore may exceed the thresholds based on ITE guidance for temporary traffic increases. Alternative 3 would result in a significant effect. In addition, temporary road closures associated with levee improvements could cause or contribute to temporary significant adverse increases in traffic levels as traffic is detoured or slowed on some local roadways and SR 99/70.

Mitigation Measure 4.12-a: Prepare and Implement a Traffic Routing Plan for Both Crew Commute Trips to the Work Sites and Construction-Related Truck Trips

No-Action Alt.

If SCAS were to construct an interior compartment levee for the Airport in the absence of improvements to the Natomas perimeter levee system, SCAS would need to implement mitigation similar to that described below for Alternatives 1, 2, and 3 to reduce potential traffic impacts to a less-than-significant level.

Except for improvements to the Natomas perimeter levee system, no mitigation is available to reduce the potentially significant effect on local traffic and circulation that may occur as a result of roadway flooding in the event of a perimeter levee failure.

Alt. 1, Alt. 2, Alt.3

Before the start of construction in each construction season, SAFCA and its primary contractors for engineering and construction shall develop a coordinated construction

traffic control plan to minimize the simultaneous use of roadways by different construction contractors for material hauling and equipment delivery to the extent feasible. The plan will outline phasing of activities and the use of multiple routes to and from off-site locations to minimize the daily amount of traffic on individual roadways. SAFCA shall ensure that the construction contractors enforce the plans throughout the construction periods.

Given the high amount of hauling required for the project alternatives and the limited number of roadways in the project vicinity that would be suitable for hauling between borrow sites and project construction sites, it is possible that the volume of traffic during some periods may still exceed ITE thresholds despite the implementation of this measure.

Impact 4.12-b: Temporary Increase in Traffic Hazards on Local Roadways

No-Action Alt.

If SCAS were to pursue the construction of an interior compartment levee in the absence of the proposed improvements to the Natomas perimeter levee system, construction could temporarily increase traffic hazards on local roadways, as described below for Alternatives 1, 2, and 3. This potential impact would be significant.

In the absence of improvements to the Natomas perimeter levee system, the risk of levee failure would remain high. If any part of the levee system were to fail, flooding of Natomas Basin roadways—county roadways, SR 99/70, I-5, and I-80—could be minor to extensive depending on the location and severity of the failure and the duration of flooding and associated traffic hazards could be minor to severe.

Alt. 1, Alt. 3

During the 2008 construction phase (NCC south levee, Sacramento River east levee Reaches 1–4B, and Elkhorn Canal and GGS/Drainage Canal), trucks delivering materials, hauling borrow material, and removing debris would be entering and exiting the project construction areas and borrow sites along rural roadways. Hauling on public roadways would be limited to Howsley Road between the Brookfield site and the NCC south levee or to Striplin Road, SR 99/70, and Howsley Road between the RD 1001 borrow site and the NCC south levee. The high volumes of slow-moving truck traffic during peak hauling periods could noticeably reduce local traffic flow and introduce driving hazards at times on these roadways. Construction workers entering and exiting construction areas at the beginning and end of work shift could also increase traffic hazards. In addition, trucks and other vehicles could track mud and gravel onto the local roadways, potentially posing driving hazards.

Project construction would require rerouting of traffic and several temporary closures during construction. At the SR 99/70 of the NCC, coordination with Caltrans would be required so that portions of the highway could be shut down to allow for the installation of NCC south levee improvements. As part of 2008 improvements along the Sacramento River east levee under Alternatives 1 or 3, the intersections of Sankey Road, Riego Road, and private farm roads with Garden Highway would be reconfigured to match the elevated profile of the adjacent levee. These intersections would be closed temporarily during construction in these areas and detours indicated. Lane closures of segments of Garden Highway may be necessary as well during construction of the adjacent setback levee crown and drainage improvements along Garden Highway under

Alternatives 1 and 3. Portions of SR 99/70 would be shut down to allow for the installation of NCC south levee improvements.

During the 2009 and 2010 construction phases along the remainder of the Sacramento River east levee (Reaches 5A–20A), several public roadway and farm road intersections with Garden Highway would be reconstructed across the adjacent setback levee to Garden Highway. These would include intersections at West Elverta Road, West Elkhorn Boulevard, Powerline Road, and San Juan Road. As described for the construction elements proposed for the 2008 construction phase, high volumes of slow-moving truck traffic could be associated with the construction activities on some rural roadways in Sutter County.

For all construction years, the combination of the high volume of slow-moving truck traffic, potentially tracking mud and debris onto roadways; workers entering and exiting construction sites; and periodic road and lane closures associated with levee improvements would increase traffic hazards on local roadways during the construction period. The potential increase in traffic hazards under Alternatives 1 and 3 would be a significant impact.

Alt. 2

Under Alternative 2, construction-related traffic hazards would be similar to but greater in magnitude than those described above for Alternatives 1 and 3.

As described for Alternatives 1 and 3, a high volume of truck traffic would utilize the rural Sutter County roadways during the 2008 construction phase, reducing local traffic flow and introducing driving hazards at times. Construction of Alternative 2 would include raising the existing Sacramento River east levee in place, requiring lane or road closures along portions of Garden Highway for prolonged periods during construction, causing traffic and access delays on local roadways. Portions of SR 99/70 would be shut down to allow for the installation of NCC south levee improvements. The intersections of Sankey Road, Riego Road, and private farm roads with Garden Highway would be reconfigured to match the elevated profile of the raised existing levee under Alternative 2. These intersections would be closed temporarily during construction in these areas and detours indicated.

During the 2009 and 2010 construction phases on the remainder of the Sacramento River east levee (Reaches 5A–20A), Garden Highway intersections at West Elverta Road, West Elkhorn Boulevard, and Powerline Road would be reconstructed to match the elevated profile of the raised existing levee.

In all construction years, construction workers entering and exiting construction areas at the beginning and end of work shift could also increase traffic hazards. In addition, trucks and other vehicles could track mud and gravel onto the local roadways, potentially posing driving hazards.

The potential increase in traffic hazards under Alternative 2 would be a significant impact.

Mitigation Measure 4.12-b: Prepare and Implement a Traffic Safety and Control Plan and Implement Measures to Avoid and Minimize Traffic Hazards on Local Roadways during Construction

No-Action Alt.

If SCAS were to construct an interior compartment levee for the Airport in the absence of improvements to the Natomas perimeter levee system, SCAS would need to implement mitigation similar to that described below for Alternatives 1, 2, and 3 to reduce potential traffic hazards to a less-than-significant level.

Except for improvements to the Natomas perimeter levee system, no mitigation is available to reduce the potentially significant hazards on local roadways that may result from roadway flooding in the event of a perimeter levee failure.

Alt. 1, Alt. 2, Alt.3

Before the start of construction in each construction season, SAFCA and its primary contractors for engineering design and construction shall ensure that the following measures are implemented for each construction season to avoid and minimize potential traffic hazards on local roadways during construction. Items (a) through (c) of this mitigation measure shall be integrated as terms of the construction contracts.

(a) The construction contractors shall develop traffic safety and control plans for the local roadways that would be affected by construction traffic. Before the initiation of construction-related activity involving high volumes of traffic, the plan shall be submitted for review by Caltrans and the agencies of the local jurisdictions (Sutter County, Sacramento County, and/or City of Sacramento) having responsibility for roadway safety at and between project sites. The plan shall call for the following elements:

- posting warnings about the potential presence of slow-moving vehicles,
- using traffic control personnel when appropriate, and
- placing and maintaining barriers and installing traffic control devices necessary for safety, as specified in Caltrans's *Manual of Traffic Controls for Construction and Maintenance Works Zones* and in accordance with city/county requirements.

The contractor shall train construction personnel in appropriate safety measures as described in the plan, and shall implement the plan. The plan shall include the prescribed locations for staging equipment and parking trucks and vehicles. Provisions shall be made for overnight parking of haul trucks to avoid causing traffic or circulation congestion.

(b) All operations shall limit and expeditiously remove, as necessary, the accumulation of project-generated mud or dirt from adjacent public streets at least once every 24 hours if substantial volumes of soil have been carried onto adjacent paved public roadways during project construction.

(c) Construction of project features along the Sacramento River east levee shall be accommodated through the creation of temporary haul roads along the land side of

the adjacent levee and berm footprint. Garden Highway shall not be used for project construction or earthen materials hauling activities.

(d) Before the start of the 2008 construction season, SAFCA shall coordinate with Sacramento and Sutter Counties to address maintenance and repair of affected roadways resulting from increased truck traffic.

Implementing this mitigation would reduce the impact to a less-than-significant level.

Impact 4.12-c: Temporary Effect on Emergency Service Response Times and Access

No-Action Alt.

If SCAS were to pursue the construction of an interior compartment levee in the absence of the proposed improvements to the Natomas perimeter levee system, construction could temporarily increase emergency service response times and interfere with emergency service access, as described below for Alternatives 1, 2, and 3. This potential impact would be significant.

Without SAFCA's improvements to the levee system to provide 100-year flood protection, the significantly high risk of a levee failure would remain. A levee failure along the NCC, the PGCC, or the Sacramento River east levee could result in minor to substantial flooding of the Natomas Basin, including the Airport, I-5, I-80, and SR 99/70, as well as local roadways. However, the potential for such an occurrence is uncertain, and the magnitude and duration of any related effect on traffic and circulation and emergency service response cannot be estimated.

Alt. 1, Alt. 2, Alt. 3

The conditions discussed above in Impacts 4.12-a and 4.12-b could result in delays in emergency service response times if emergency vehicles need to pass through or near construction areas. Alternatives 1, 2, and 3 would result in a significant effect.

Mitigation Measure 4.12-c: Notify Emergency Service Providers about Project Construction and Maintain Emergency Access or Coordinate Detours with Providers

No-Action Alt.

If SCAS were to construct an interior compartment levee for the Airport in the absence of improvements to the Natomas perimeter levee system, mitigation similar to that described below for Alternatives 1, 2, and 3 would likely need to be implemented to reduce impacts related to emergency service response times and access to a less-than-significant level.

Alt. 1, Alt. 2, Alt.3

SAFCA and its primary contractors for engineering design and construction shall ensure that the following measures are implemented to avoid and minimize the potential for increased emergency response times and access issues during construction.

(a) SAFCA shall implement Mitigation Measures 4.12-a and 4.12-b, described above.

(b) Before commencement of project construction, SAFCA shall provide notification of project construction to all appropriate emergency service providers in Sutter County, Sacramento County, and/or the City of Sacramento and shall coordinate with providers throughout the construction period to ensure that emergency access through construction areas is maintained.

Implementing this mitigation would reduce the impact to a less-than-significant level.

4.12.3 Unavoidable Significant Adverse Effects

Implementing Mitigation Measure 4.12-a would reduce the temporary increase in traffic levels during construction of Alternatives 1, 2, and 3; however, given the high amount of hauling required for portions of the project and the limited number of roadways in the project vicinity, it is possible that the volume of traffic during some periods may still exceed the ITE threshold. Therefore, Alternatives 1, 2, and 3 would result in an unavoidable significant effect.

Potential flooding of the Natomas Basin under the No-Action Alternative could have a significant unavoidable adverse effect on traffic circulation, traffic hazards, and emergency service response times and access.

4.13 AIR QUALITY

This section includes an analysis of potential short-term and long-term effects of the proposed action and alternatives on air quality.

4.13.1 Methodology

Almost all increased pollutant emissions that would be associated with the proposed levee improvements would be generated by construction-related activities. Construction emissions are described as "short term" or temporary in duration. These short-term emissions, especially emissions of criteria air pollutants (i.e., respirable particulate matter [PM_{10}]) and ozone precursors (e.g., reactive organic gases [ROG] and oxides of nitrogen [NO_X]), have the potential to represent a significant air quality impact.

Fugitive dust emissions are associated primarily with site preparation and excavation and vary as a function of such parameters as soil silt content, soil moisture, wind speed, acreage of disturbance area, and vehicle miles traveled on-site and off-site. Emissions of ROG and NO_X are associated primarily with gas and diesel equipment and asphalt paving.

The method of analysis for short-term construction-related, long-term operation-related (regional), local mobile-source, and toxic air contaminant (TAC) emissions is consistent with the recommendations of the Sacramento Metropolitan Air Quality Management District (SMAQMD) and the Feather River Air Quality Management District (FRAQMD). Because the proposed action would not involve the siting of any short- or long-term odor sources, and no receptors would be adversely affected by odorous emissions, this issue is not discussed further.

In this analysis, an alternative was considered to result in a significant air quality impact if it would: (1) conflict with or obstruct implementation of the applicable air quality plan, (2) violate any air quality standard or contribute substantially to an existing or projected air quality violation, (3) result in a cumulatively considerable net increase of a criteria air pollutant for which the project region is in nonattainment under any applicable Federal or state ambient air quality standards (including releasing emissions that exceed quantitative thresholds for ozone precursors), or (4) result in exposure of sensitive receptors to excessive concentrations of toxic air emissions, criteria air pollutants, or odorous emissions.

For portions of the proposed project that would occur in Sacramento County, based on SMAQMD's *Guide to Air Quality Assessment in Sacramento County* (SMAQMD 2004), the proposed project was determined to result in a significant effect on air quality if it would:

(1) generate construction-related emissions of criteria air pollutants or precursors that exceed the SMAQMD-recommended threshold of 85 pounds per day (lb/day) for NO_X, or result in or substantially contribute (at a level equal to or greater than 5%) to emissions concentrations (e.g., 50 micrograms per cubic meter [$\mu g/m^3$] and 2.5 $\mu g/m^3$ for PM_{10}, respectively) that exceed the National Ambient Air Quality Standards (NAAQS) or California Ambient Air Quality Standards (CAAQS); or

(2) generate long-term regional criteria air pollutant or precursor emissions that exceed the SMAQMD-recommended threshold of 65 lb/day for ROG and NO_X, or result in or substantially contribute (at a level equal to or greater than 5%) to emissions concentrations (e.g., 50 micrograms per cubic meter [$\mu g/m^3$] and 2.5 $\mu g/m^3$ for PM_{10}, respectively) that exceed the NAAQS or CAAQS.

For levee improvements conducted in Sutter County, the FRAQMD *Indirect Source Review Guidelines* and California Environmental Quality Act (CEQA) planning guidance (FRAQMD 1998, 2007) provide recommended thresholds of significance for project-generated emissions of ozone precursors and PM_{10}. In accordance with these recommended thresholds, the proposed project was determined to result in a significant effect on air quality if project construction would result in emissions that exceed:

- 25 lb/day of ROG,
- 25 lb/day of NO_X, or
- 80 lb/day of PM_{10}.

Project construction would conflict with applicable air quality planning efforts as specified under the Federal Clean Air Act, and a conformity determination would be needed, if the following emissions thresholds were exceeded:

- For construction-related emissions in Sacramento County:
  - 25 tons per year (tpy) of ROG,
  - 25 tpy of NO_X, or
  - 100 tpy of PM_{10}.
- For construction-related emissions in Sutter County:
  - 25 tpy of ROG, or
  - 25 tpy of NO_X.

4.13.2 Impacts and Mitigation Measures

Impact 4.13-a: Temporary Emissions of ROG, NO_X, and PM_{10} during Construction

No-Action Alt.

There would be no construction of Natomas perimeter levee improvements associated with the No-Action Alternative; therefore, no related construction-related emissions would result. However, if SCAS were to pursue the construction of an interior compartment levee in the absence of improvements to the Natomas perimeter levee system, construction would result in the temporary generation of ROG, NO_X, and PM_{10} emissions through construction activities similar to those described below for Alternatives 1, 2, and 3. This potential impact is likely to be significant.

Without improvements to the perimeter levee system to provide 100-year flood protection, a significantly high risk of a levee failure in the perimeter system would remain. Any effects on air quality would be indirect and cannot be predicted.

Alt. 1

With respect to the 2008 construction phase, the proposed levee improvements would result in the temporary generation of ROG, NO_X, and PM_{10} emissions from excavation, vegetation clearing, grading, cut-fill, concrete placement, asphalt paving, motor vehicle exhaust associated with construction equipment, construction employee commute trips, material transport (especially on unpaved surfaces), and other construction activities. Improvement of the NCC south levee (located entirely within Sutter County and under FRAQMD's jurisdiction) would involve cutoff wall construction and levee raise work that may be divided between the period of August through October 2008 and May through October 2009 or may be entirely conducted during May through October 2009. The Brookfield borrow site, in Sutter County, is the assumed source of soil borrow material for improvements to the NCC south levee.

Improvements to Reaches 1–3 and the majority of Reach 4A of the Sacramento River east levee portion of the project also would be located in Sutter County, and under FRAQMD's jurisdiction. Improvements to a portion of Reach 4A and all of Reach 4B would be located in Sacramento County, and under the jurisdiction of SMAQMD. The Airport north bufferlands borrow area, in Sacramento County, would be the source of soil borrow material for the Sacramento River east levee improvements. As much as 60% of the 2008 construction phase improvements to the Sacramento River east levee would be performed in the 2008 construction season (August through October), with the remainder performed in 2009. It is more likely, however, that most or all of these improvements would be conducted in calendar year 2009.

Construction of the new GGS/Drainage Canal and the relocated Elkhorn Canal between the North Drainage Canal and Elkhorn Reservoir is expected to be completed during the 2008 construction season.

Worst-case daily and annual construction emissions were calculated for completion of the 2008 construction phase using AP-42 emission factors recommended by the Environmental Protection Agency (EPA) for fugitive dust, and OFFROAD and EMFAC 2002 emission factors for mobile-equipment, as contained in the Road Construction Emissions Model version 5.2, as recommended by FRAQMD and SMAQMD. The results of the calculations are shown in **Table 4-14**.

Two values are shown for the Sacramento River east levee improvement results. In these results, the first number represents the worst-case (i.e., maximum daily) emissions for the 2008 construction phase if 60% of the levee improvements, including the improvements in Reaches 4A and 4B, were to be performed in a 3-month construction season in calendar year 2008 and the remainder in a 6-month construction season in calendar year 2009. The second number represents worst-case (i.e., maximum daily) emissions under the scenario in which all the levee improvements would be performed in a 6-month construction season (during calendar year 2009). See Appendix B for detailed emission sources and assumptions. The two values therefore bracket the range of potential emissions.

Table 4-14
Summary of Maximum Daily Emissions during the 2008 Construction Phase for Alternative 1[1]

	Pollutant		
	ROG	**NO_X**	**PM_{10}**
Worst-Case Emissions within Sutter County—FRAQMD Emissions (lb/day)			
Natomas Cross Canal			
Total unmitigated NCC emissions	68	392	197
Sacramento River East Levee			
Total unmitigated Sacramento River east levee emissions—Reaches 1– 4A	70/150	334/747	1,965/6,281
Total unmitigated emissions (lb/day)	138/218	726/1,139	2,162/6,478
FRAQMD Threshold (lb/day)	**25**	**25**	**80**
Significant?	**Yes**	**Yes**	**Yes**
Total mitigated emissions (lb/day)[2]	131/207	581/911	541/1,620
Significant with mitigation incorporated?	Yes	Yes[4]	Yes
Worst-Case Emissions within Sacramento County—SMAQMD Emissions (lb/day)			
Sacramento River East Levee			
Total unmitigated Sacramento River east levee emissions—Reaches 4A–4B	42/29	200/142	1,179/1,196
Elkhorn Canal Relocation			
Total unmitigated Elkhorn Canal emissions	54	237	265
Total unmitigated emissions (lb/day)	96/83	437/379	1,444/1,461
SMAQMD Threshold	**–**	**85**	**-[3]**
Significant?	**–**	**Yes**	**Yes[3]**
Total mitigated emissions (lb/day)[2]	91/79	350/303	361/219
Significant with Mitigation Incorporated?	–	No[4]	Yes[3]

Notes: FRAQMD = Feather River Air Quality Management District; lb/day = pounds per day; $\mu g/m^3$ = micrograms per cubic meter; NO_X = oxides of nitrogen; PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 micrometers or less; ROG = reactive organic gases; SMAQMD = Sacramento Metropolitan Air Quality Management District

[1] 2008 construction season refers to improvements to the NCC south levee, Sacramento River east levee Reaches 1-4B, and Elkhorn Canal and GGS/Drainage Canal between the North Drainage Canal and Elkhorn Reservoir. Two calculations were performed to represent the range of potential construction emissions. Where two values are shown in a cell, the first represents the worst-case daily emissions during either the 2008 or 2009 calendar year, assuming that approximately 60% of the Sacramento River east levee improvements, including those in Reaches 4A and 4B, would be performed in a 3-month construction period in 2008, while the remaining 40% would be performed in a 6-month construction period in 2009. The second values in cells represent the worst-case daily emissions if all of the 2008 construction phase levee improvements were to be delayed until the 2009 calendar year and would be performed in a 6-month period.

[2] Implementation of all recommended standard mitigation measures listed under Mitigation Measure 4.13-a would result in reductions of ROG, NO_X, and PM_{10} emissions by approximately 5%, 20%, 75%-85% for fugitive PM_{10} emissions, and 45% for mobile-source PM_{10} emissions, respectively.

[3] SMAQMD does not have an adopted mass emission-based threshold for PM_{10}.

[4] Payment into SMAQMD's Off-site Construction Mitigation Fee Program to offset NO_X emissions in excess of SMAQMD's significance threshold would reduce impacts for this pollutant in SMAQMD's jurisdiction to a less-than-significant level. Coordination of an emissions reduction agreement with the FRAQMD for calculation and fee payment by SAFCA to FRAQMD prior to project approval would be used to offset an equivalent mass of NO_X emissions in excess of EPA's applicable threshold for general conformity purposes. Successful implementation of this measure would reduce NO_X emissions in FRAQMD's jurisdiction, but not to a less-than-significant level for this impact.

See Appendix B for assumptions and modeling results for each activity and subphase.

Source: Calculations performed by EDAW based on data provided by HDR, Wood Rodgers, and Mead & Hunt in 2008

Based on the project information presented in Section 2.2.2.7, "Construction Details," construction of the Alternative 1 improvements in 2008 would result in maximum unmitigated daily emissions in excess of applicable FRAQMD thresholds for ROG, NO_X, and PM_{10} and SMAQMD thresholds for NO_X and PM_{10}. Because of the large size of the project, large extent, and high intensity of construction activities to be conducted concurrently, as well as the nonattainment status of the project area, and based on the modeling conducted, it is foreseeable that unmitigated construction-generated emissions could result in or substantially contribute to a violation of air quality standards.

SMAQMD does not have an adopted mass emission-based threshold for $PM_{10.}$ Instead, SMAQMD relies on a concentration-based threshold equivalent to the Ambient Air Quality Standard (AAQS) for PM_{10}. If construction activities would result in or substantially contribute to a violation of the AAQS at the project boundary, then construction-generated emissions of PM_{10} would be significant. Because of the intensity of earthmoving activities that would be involved during the construction of the Sacramento River east levee improvements, it is likely that a substantial contribution to a violation of the applicable air quality standard would occur.

It is assumed that in the 2009 construction phase, the following would be constructed: 50% of the improvements to Sacramento River east levee Reaches 5A–20A, all of the PGCC west levee improvements, the GGS/Drainage Canal and Elkhorn Canal south of Elkhorn Reservoir, and the relocated Riverside Canal. **Table 4-14** reflects worst-case daily emissions that would occur at any point during the 2008 construction season. It is anticipated that emissions that would occur during the 2009construction phase would be similar to those estimated for the 2008 construction phase.

It is assumed that in 2010, the remaining 50% of the improvements to the Sacramento River east levee would be completed. Again, the total unmitigated worst-case emissions for the 2010 construction season would be expected to be similar to those estimated for the 2008 construction phase. See Appendix B for detailed emission sources and assumptions.

Alternative 1 would result in construction-related emissions that could expose nearby existing sensitive receptors to substantial pollutant concentrations and/or substantially contribute to a violation of an air quality standard. As a result, this would be considered to have a direct, adverse effect on air quality.

Alt. 2

Worst-case daily and annual construction emissions associated with each alternative would occur during the levee construction phase during which most earth movement activities would occur. Emissions associated with construction of Alternative 2 were calculated based on the percent difference in earth movement relative to Alternative 1. The difference in ROG, NO_X, and PM_{10} emissions are assumed to vary as a function of change in the number of haul trips and in the total amount of borrow material relative to Alternative 1. Total unmitigated worst-case emissions under Alternative 2 would be 3% greater and 58% less than those under Alternative 1 for the 2008 and 2009 construction phases, respectively. Overall, emissions would be 35% less than under Alternative 1. These estimates assume all construction activity would take place in a 6-month construction season.

In addition, Alternative 2 would include air quality emissions associated with construction of bank protection at Sites G, J, and M. Under Alternative 2, emissions would exceed the

respective air district-adopted significance thresholds. Thus, emissions would be anticipated to expose nearby existing sensitive receptors to substantial pollutant concentrations and/or substantially contribute to an air quality violation. Alternative 2 would also be considered to have a direct, adverse effect on air quality.

Alt. 3

Emissions associated with the 2008 construction season for Alternative 3 were calculated in the same manor as described for Alternative 2. The intensity of earth movement activities would be almost identical under Alternative 3 to the intensity of earth movement activities under Alternative 1. Total unmitigated worst-case emissions under Alternative 3 would be 8% greater than those under Alternative 1 for the 2008 construction phase, and the same as Alternative 1 for the 2009 construction phase. Overall, emissions would be 3% less than under Alternative 1. These estimates assume all construction activity would take place in a 6-month construction season.

Under Alternative 3, emissions would exceed the respective air district-adopted significance thresholds. Thus, emissions would be anticipated to expose nearby existing sensitive receptors to substantial pollutant concentrations and/or substantially contribute to an air quality violation. Alternative 3 would also be considered to have a direct, adverse effect on air quality.

Mitigation Measure 4.13-a: Implement District-Recommended Control Measures to Minimize Temporary Emissions of ROG, NO_X, and PM_{10} during Construction

No-Action Alt.

If SCAS were to construct an interior compartment levee for the Airport in the absence of improvements to the Natomas perimeter levee system, SCAS would need to implement mitigation similar to that described below for Alternatives 1, 2, and 3 to reduce impacts related to construction-related emissions of ROG, NO_X, and PM_{10} to a less-than-significant level.

Alt. 1, Alt. 2, Alt. 3

SAFCA shall implement mitigation measures as recommended by FRAQMD or SMAQMD, as applicable, and shall comply with all applicable rules and regulations of, FRAQMD or SMAQMD, as described below.

Construction in Sutter County (FRAQMD)

For portions of the project occurring in Sutter County, FRAQMD's *Indirect Source Review Guidelines* and online CEQA guidance provide mitigation measures for reducing short-term air quality impacts. As recommended by FRAQMD, SAFCA shall ensure that the following mitigation measures are implemented during all project construction activities to the extent practicable. In addition, construction of the proposed levee improvements are required to comply with all applicable FRAQMD rules and regulations, in particular Rule 3.0 (Visible Emissions), Rule 3.16 (Fugitive Dust Emissions), and Rule 3.15 (Architectural Coatings).

1. SAFCA shall require the contractor to implement a Fugitive Dust Control Plan that includes the following measures:

- All earth-moving operations should be suspended when winds exceed 20 miles per hour or when winds carry dust beyond the property line despite implementation of all feasible dust control measures.

- Construction sites shall be watered as directed by the Sutter County Department of Public Works or FRAQMD and as necessary to prevent fugitive dust violations.

- An operational water truck shall be on-site at all times. Apply water to control dust as needed to prevent visible emissions violations and off-site dust impacts.

- On-site dirt piles or other stockpiled particulate matter shall be covered, wind breaks installed, and water and/or soil stabilizers employed to reduce wind blown dust emissions. Incorporate the use of approved nontoxic soil stabilizers to all inactive construction areas according to manufacturers' specifications.

- All transfer processes involving a free fall of soil or other particulate matter shall be operated in such a manner as to minimize the free-fall distance and fugitive dust emissions.

- Apply approved chemical soil stabilizers to all inactive construction areas (previously graded areas that remain inactive for 96 hours), including unpaved roads and employee/equipment parking areas, according to the manufacturers' specifications.

- To prevent track-out, wheel washers shall be installed where project vehicles and/or equipment exit onto paved streets from unpaved roads. Vehicles and/or equipment shall be washed before each trip. Alternatively, a gravel bed or rumble strip may be installed as appropriate at vehicle/equipment site exit points to effectively remove soil buildup on tires and tracks to prevent/diminish track-out.

- Paved streets shall be swept frequently (at least once per day by water sweeper with reclaimed water recommended; wet broom) if soil material has been carried onto adjacent paved, public thoroughfares from the project site.

- Provide temporary traffic control as needed during all phases of construction to improve traffic flow, as deemed appropriate by the Sutter County Department of Public Works and/or the California Department of Transportation and to reduce vehicle dust emissions. An effective measure is to enforce vehicle traffic speeds at or below 15 miles per hour on unpaved roads.

- Reduce traffic speeds on all unpaved surfaces to 15 miles per hour or less and reduce unnecessary vehicle traffic by restricting access. Provide appropriate training, on-site enforcement, and signage.

- Reestablish ground cover on the construction site as soon as possible, through seeding and watering.

- Open burning is yet another source of fugitive gas and particulate emissions, and it shall be prohibited at the project site. No open burning of vegetative waste (natural plant growth wastes) or other legal or illegal burn materials (trash, demolition debris, etc.) may be conducted at the project site. Vegetative wastes should be chipped or delivered to waste to energy facilities (permitted biomass facilities), mulched, composted, or used for firewood. It is unlawful to haul waste materials off-site for disposal by open burning.

2. Construction equipment exhaust emissions shall not exceed FRAQMD Regulation III, Rule 3.0, Visible Emissions Limitations (40% opacity or Ringelmann 2.0). Operators of vehicles and equipment found to exceed opacity limits shall take action to repair the equipment within 72 hours or remove the equipment from service. Failure to comply may result in a notice of violation.

3. The primary contractor shall be responsible for ensuring that all construction equipment is properly tuned and maintained before and during on-site operation.

4. Minimize idling time to 10 minutes, to conserve fuel and minimize emissions.

5. Use existing power sources (e.g., power poles) or clean fuel generators rather than temporary diesel-powered generators.

6. Portable engines and portable engine-driven equipment units used at the project work site, with the exception of on-road and off-road motor vehicles, may require California Air Resources Board (ARB) Portable Equipment Registration with the state or a local district permit. The owner/operator shall be responsible for arranging appropriate consultations with ARB or FRAQMD to determine registration and permitting requirements before equipment is operated at the site.

7. The contractor shall assemble a comprehensive inventory list (i.e. make, model, engine year, horsepower, and emission rates) of all heavy-duty off-road (portable and mobile) equipment (50 horsepower [hp] and greater) that will be used an aggregate of 40 or more hours for the construction project and apply the following mitigation measure:

   - Reduce NO_X emissions from off-road diesel-powered equipment: The contractor shall provide a plan for approval by FRAQMD demonstrating that the heavy-duty (equal to or greater than 50 hp) off-road equipment to be used in the construction project, including owned, leased and subcontractor vehicles, shall achieve a project wide fleet-average 20% NO_X reduction and 45% particulate reduction[1] compared to the most recent ARB fleet average at time of construction.

Implementing the FRAQMD-recommended measures is expected to achieve a conservative 75% reduction in fugitive dust emissions, 5% reduction in ROG emissions from construction equipment, 20% reduction in NO_X emissions from construction

[1] Acceptable options for reducing emissions may include use of late-model engines, low-emission diesel products, alternative fuels, engine retrofit technology (Carl Moyer Guidelines), and after-treatment products; voluntary off-site mitigation projects; providing funds for air district off-site mitigation projects; and/or other options as they become available. FRAQMD should be contacted to discuss alternative measures.

equipment, and 45% reduction in PM_{10} emissions from construction equipment (SMAQMD 2004). The resulting maximum average daily construction-generated emissions in Sutter County, with mitigation incorporated, are conservatively calculated to be as high as 207 lb/day of ROG, 911 lb/day of NO_X, and 1,620 lb/day of PM_{10} for Alternative 1.

SAFCA shall implement the following measure to further mitigate NO_X emissions through off-site reductions:

8. SAFCA shall enter into a voluntary emissions reduction agreement with the FRAQMD to mitigate the portion of construction-generated emissions of NO_X that exceeds FRAQMD's emission threshold of 25 lb/day. The calculation of the fee shall be determined in coordination with the FRAQMD and paid prior to the occurrence of any construction-related activities within areas under the jurisdiction of the FRAQMD.

Implementation of the mitigation measures described above would reduce project-generated construction-related emissions, but emissions would remain in excess of the FRAQMD-recommended thresholds of 25 lb/day for ROG and NO_X and 80 lb/day for PM_{10}. Therefore, although the effect would be reduced, implementing the mitigation measures described above would not reduce project-generated construction-related emissions of ROG and PM_{10} in Sutter County to levels less than FRAQMD's significance thresholds. However, it is worth noting that not meeting FRAQMD-suggested impact criteria, post-mitigation, is not a violation of any FRAQMD rules or guidelines, and authorization to construct would be provided by FRAQMD if the listed mitigation measures are implemented.

Construction in Sacramento County (SMAQMD)

SAFCA shall reduce ROG, NO_X, PM_{10}, and visible emissions from heavy-duty diesel equipment by implementing the following measures:

- The contractor shall submit a construction emissions dust control plan(s) to SMAQMD that reduces fugitive dust emissions by at least 85% (or shall provide calculations based on SMAQMD-approved methodologies showing that emissions would be reduced to less than 100 tons per year assuming a conservative reduction of 75% with typical mitigation) and shall receive approval of the plan(s) (or revised calculations) before groundbreaking. All grading operations shall be suspended when fugitive dust levels exceed levels specified by SMAQMD rules. SAFCA and its primary construction contractors shall ensure that dust is not causing a nuisance beyond the property line of the construction site.

- The contractor shall develop a plan, in consultation with SMAQMD, demonstrating that the heavy-duty (>50 hp), off-road vehicles to be used in the construction project (including owned, leased, and subcontractor vehicles) shall achieve a project-wide fleet-average 20% NO_X reduction and 45% particulate reduction compared to the most recent ARB fleet average at the time of construction. Acceptable options for reducing emissions include the use of late-model engines, low-emission diesel products, alternative fuels, particulate-matter traps, engine retrofit technology, after-treatment products, and/or such other options as become available.

- A comprehensive inventory of all off-road construction equipment equal to or greater than 50 hp that will be used for an aggregate of 40 or more hours during any portion of project construction shall be submitted to SMAQMD. The inventory shall be updated and submitted monthly throughout the duration of the project, except that an inventory shall not be required for any 30-day period in which no construction operations occur. At least 48 hours before heavy-duty off-road equipment is used, SAFCA shall provide SMAQMD with the anticipated construction timeline, including the start date, and the name and phone number of the contractor's project manager and on-site foreman.

- Emissions from off-road, diesel-powered equipment used on the project site shall not exceed 40% opacity for more than 3 minutes in any 1 hour. Any equipment found to exceed 40% opacity (or Ringelmann 2.0) shall be repaired immediately, and SMAQMD shall be notified of noncompliant equipment within 48 hours of identification. A visual survey of all in-operation equipment shall be made at least weekly. A monthly summary of visual survey results shall be submitted to SMAQMD throughout the construction period, except that the monthly summary shall not be required for any 30-day period in which no construction operations occur. The monthly summary shall include the quantity and type of vehicles surveyed, as well as the dates of each survey. SMAQMD and/or other officials may conduct periodic site inspections to determine compliance.

- SAFCA shall pay SMAQMD an off-site mitigation fee for implementation of any proposed alternatives for the purpose of reducing impacts to a less-than-significant level. Based on the construction information presented in Chapter 2 and the emissions calculations shown in Appendix B, if Alternative 1 (the preferred alternative) is selected for implementation, the specific fee amount to offset NO_X emissions for elements of the 2008 construction phase that would occur in Sacramento County would be $393,876 (see Appendix B for fee calculations) plus a 5% administrative fee of $19,694. Thus, the total mitigation fee for project-related work conducted in Sacramento County during the 2008 construction phase is currently estimated to be $413,569. Mitigation fees for work to occur in during the 2009 and 2010 phases are expected to be similar and would be calculated when the construction emissions can be more accurately determined. This calculation would occur when an alternative has been selected, improvement plans have been prepared, and accurate project-specific information is available. Calculation of fees associated with subsequent improvement plans/project phases shall be conducted at the time of project approval. The applicable fee rate shall be determined and the total fee shall be calculated based on the fee rate in effect at the time that subsequent environmental documents are prepared. The fee for subsequent construction projects shall be remitted to SMAQMD before groundbreaking.

  SAFCA shall pay into SMAQMD's off-site construction mitigation fund to further mitigate construction-generated emissions of NO_X that exceed SMAQMD's daily emission threshold of 85 lb/day. The calculation of daily NO_X emissions is based on the cost to reduce 1 ton of NO_X at the time when the document is prepared (currently $14,300 per ton). The determination of the final mitigation fee shall be conducted in coordination with SMAQMD before any demolition or ground disturbance occurs for any project phase.

Calculation of and payment of the fee for all subsequent project phases shall also be included in the Mitigation Monitoring and Reporting Program for the project.

Implementing the SMAQMD-recommended measures is expected to achieve a conservative 75%–85% reduction in fugitive dust emissions, 5% reduction in ROG emissions from construction equipment, 20% reduction in NO_X emissions from construction equipment, and 45% reduction in PM_{10} emissions from construction equipment (SMAQMD 2004). The resulting maximum average daily construction-generated emissions with mitigation incorporated, are shown in **Table 4-14**.

Implementation of the mitigation measures described above would reduce project-generated construction-related emissions in Sacramento County to a less-than-significant level for NO_X. However, it is anticipated that the project could still result in emissions that substantially contribute to a violation of the ambient air quality standard for PM_{10}. Therefore, although the effect would be reduced, implementing the mitigation measures described above would not reduce project-generated construction-related emissions of PM_{10} in Sacramento County to a less-than-significant level.

All Project Construction

SAFCA shall implement the following additional measures to reduce construction emissions of PM_{10} comprising fugitive dust and mobile-exhaust and ozone precursors throughout the project area:

- Open burning of removed vegetation shall be prohibited. Vegetation material shall be chipped on-site or delivered to waste-to-energy facilities to the extent feasible.

- An operational water truck shall be on-site at all times. Water shall be applied to control dust as needed to prevent dust impacts off-site.

- Unpaved areas subject to vehicle traffic, including employee parking areas and equipment staging areas, shall be stabilized by being kept wet, treated with a chemical dust suppressant or soil binders, or covered.

- The track-out of bulk material onto public paved roadways as a result of operations, or erosion, shall be minimized by the use of track-out and erosion control, minimization, and preventive measures, and removed within 1 hour from adjacent streets such material anytime track-out extends for a cumulative distance of greater than 50 feet onto any paved public road during active operations. All visible roadway dust tracked out upon public paved roadways as a result of active operations shall be removed at the conclusion of each work day when active operations cease, or every 24 hours for continuous operations. Wet sweeping or a HEPA filter equipped vacuum device shall be used for roadway dust removal.

- Low-sulfur fuel shall be used for stationary construction equipment.

- Existing power sources or clean fuel generators shall be used rather than temporary power generators to the extent feasible.

- Low-emission on-site stationary equipment shall be used.
- Vehicle speeds on unpaved roadways shall be limited to 15 miles per hour.
- Idling time for all heavy-duty equipment shall be limited to 10 minutes.
- Diesel-fueled construction equipment that will operate on the project site for more than 40 hours shall be equipped with diesel particulate filters (DPFs) that meet ARB "Level 3" verification standards. A list of currently verified DPF technologies can be found at http://arb.ca.gov/diesel/verdev/vt/cvt.htm.

Impact 4.13-b: General Conformity with the Applicable Air Quality Plan

No-Action Alt.

There would be no construction of Natomas perimeter levee improvements associated with the No-Action Alternative; therefore, no construction emissions associated with such construction would result. If SCAS were to pursue the construction of an interior compartment levee in the absence of improvements to the Natomas perimeter levee system, a conformity applicability analysis would be required only if a federal action were required for project approval. If a federal action were required, it is anticipated that a conformity determination would likely not be required for the reasons described below for Alternatives 1, 2, and 3 because construction-generated emissions would generally be similar to those estimated for Alternatives 1, 2, and 3.

Alt. 1

The General Conformity Rule, which addresses whether a project conforms to the State Implementation Plan (SIP) approved and promulgated under section 110 of the federal Clean Air Act (CAA), applies to federal actions that would generate emissions of criteria air pollutant or precursor emissions in nonattainment or maintenance areas. The Sacramento and Sutter County portions of the Sacramento Valley Air Basin (SVAB) are currently designated as serious nonattainment areas with respect to the national 8-hour ozone standard. In addition, the Sacramento County portion of the SVAB is designated as moderate nonattainment for the national PM_{10} standard, while Sutter County is unclassified for PM_{10}. General conformity requirements would apply to actions where the total project-generated direct or indirect emissions would be equal to or exceed the applicable emissions levels, known as the *de minimis* thresholds, or would be greater than 10% of the area's annual emissions budget, known as regionally significant thresholds. If either of the thresholds is exceeded, a conformity determination would be needed prior to project approval. The *de minimis* thresholds applicable to Sacramento and Sutter Counties are:

- For construction-related emissions in Sacramento County:
  - 25 tons per year (tpy) of ROG,
  - 25 tpy of NO_X, or
  - 100 tpy of PM_{10}.
- For construction-related emissions in Sutter County:
  - 25 tpy of ROG, or
  - 25 tpy of NO_X.

The regionally significant thresholds applicable to Sacramento and Sutter Counties are:

- For construction-related emissions in Sacramento County:
  - 2,351 tpy of ROG,
  - 2,985 tpy of NO_X, or
  - 1,622 tpy of PM_{10}.
- For construction-related emissions in Sutter County:
  - 377 tpy of ROG, or
  - 740 tpy of NO_X.

As discussed above, ozone precursor emissions of ROG and NO_X would occur associated primarily with construction equipment exhaust and asphalt paving. Fugitive PM_{10} emissions are associated primarily with site preparation and earth-movement activities. Because general conformity is determined by calendar year, and activity associated with the 2008 construction phase may all occur in 2009, overlapping with the 2009 construction phase, total emissions were calculated for the 2009 calendar year using this worst-case assumption (i.e., that all of the levee improvements for the 2008 construction phase would occur simultaneously with all activities in the 2009 construction phase). It was assumed that construction of the replacement Elkhorn Canal and the new GGS/Drainage Canal between the North Drainage Canal and Elkhorn Reservoir would occur in calendar year 2008.

Construction-generated emissions that would occur during calendar year 2009 under worst-case assumptions for air quality analysis are shown in **Table 4-15**, and are categorized by the respective jurisdiction in which they would occur. Total worst-case emissions for Sutter and Sacramento Counties combined, with mitigation proposed under Mitigation Measure 4.13-a incorporated, were calculated to be 23 tpy of ROG, 104 tpy of NO_X, and 209 tpy of PM_{10}. See **Table 4-15** for detailed emissions that would occur in each jurisdiction. See Appendix B for detailed emission sources and assumptions.

Based on the project information presented in Chapter 2, construction of the proposed levee improvements of the 2008 construction phase and all of the assumed 2009 construction phase would result in maximum unmitigated and mitigated annual emissions in excess of the *de minimis* threshold for NO_X in the Sutter County portion of the SVAB, as summarized in **Table 4-15**. Based on the modeling conducted, it is foreseeable that unmitigated construction-generated emissions would result in or substantially conflict with applicable air quality planning efforts. However, with implementation of mitigation identified under Impact 4.13-a, emissions would be reduced below the federal *de minimis* thresholds.

Finally, project operation (discussed below under Impact 4.13-c) would result in minimal emissions of pollutants for which the region is in nonattainment. Construction under Alternative 1 is not anticipated to conflict with implementation of the SIP, and a conformity determination would not be required prior to project approval.

Table 4-15
Summary of Maximum Annual Construction Emissions during the 2009 Calendar Year Associated with the 2008 and 2009 Phases of Construction

	Pollutant		
	ROG	**NO_X**	**PM_{10}**
Worst-Case Emissions within Sutter County—FRAQMD Emissions (tons/year)			
Natomas Cross Canal			
Total unmitigated NCC emissions	8	42	118
Pleasant Grove Creek Canal West Levee			
Total unmitigated PGCC emissions	5	22	102
Sacramento River East Levee			
Total unmitigated Sacramento River east levee emissions—Reach 1-4A	4	23	325
Total unmitigated emissions (TPY)	17	87	545
General Conformity Thresholds: De minimis/Regional Significance (TPY)	25/377	25/740	-
Significant?	No	Yes	-
Total mitigated emissions (TPY)[1]	16	70	
Significant with mitigation incorporated?	No	No [2]	-
Worst-Case Emissions within Sacramento County—SMAQMD Emissions (lb/day)			
Sacramento River East Levee			
Total unmitigated Sacramento River east levee emissions—50% of Reaches 4A–20A	6	36	509
Elkhorn Canal Relocation			
Total unmitigated Elkhorn Canal emissions	1	6	4
Total unmitigated emissions (TPY)	7	42	499
General Conformity Thresholds: De minimis/Regional Significance (TPY)	**25/2,351**	**25/2,985**	**100/1,622**
Significant?	**No**	**No**	**Yes**
Total mitigated emissions (TPY)[1]	7	34	75
Significant with Mitigation Incorporated?	No	No[2]	No[1]

Notes: FRAQMD = Feather River Air Quality Management District; lb/day = pounds per day; $\mu g/m^3$ = micrograms per cubic meter; NO_X = oxides of nitrogen; PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 micrometers or less; ROG = reactive organic gases; SMAQMD = Sacramento Metropolitan Air Quality Management District

[1] Implementation of all recommended standard mitigation measures listed under Mitigation Measure 4.13-a would result in reductions of ROG, NO_X, and PM_{10} emissions by approximately 5%, 20%, 75%-85% for fugitive PM_{10} emissions, and 45% for mobile-source PM_{10} emissions, respectively.

[2] Payment into SMAQMD's Off-site Construction Mitigation Fee Program to offset NO_X emissions in excess of SMAQMD's significance threshold would reduce impacts for this pollutant in SMAQMD's jurisdiction to a less-than-significant level. Coordination of an emissions reduction agreement with the FRAQMD for calculation and fee payment by SAFCA to FRAQMD prior to project approval would be used to offset an equivalent mass of NO_X emissions in excess of EPA's applicable threshold for general conformity purposes. Successful implementation of this measure would reduce NO_X emissions in FRAQMD's jurisdiction, but not to a less-than-significant level for this impact.

See Appendix B for assumptions and modeling results for each activity and subphase.

Source: Calculations performed by EDAW based on data provided by HDR, Wood Rodgers, and Mead & Hunt in 2008

Alt. 2, Alt. 3 A conformity applicability analysis is required only for the preferred alternative (Alternative 1); however, it is anticipated that because construction-generated emissions would be similar under Alternatives 2 and 3, a conformity determination would not be required for either of these alternatives, if selected for implementation.

Mitigation Measure: None

Impact 4.13-c: Long-Term Changes in Emissions of ROG, NO_X, and PM_{10} Associated with Project Implementation

No-Action Alt. No new major stationary emission sources would be created under the No-Action Alternative, even if SCAS were to pursue the construction of an interior compartment levee in the absence of the proposed improvements to the Natomas perimeter levee system; therefore, no long-term changes in emissions would result.

Alt. 1, Alt. 2, Alt. 3 Long-term operation of Alternatives 1, 2, and 3 would not result in increased regional emissions of ROG, NO_X, and PM_{10} from mobile-, stationary-, or area-source emissions. Alternatives 1, 2, and 3 would require a negligible increase in operational maintenance activities at the proposed facilities, and associated vehicle trips. In addition, the levee system would not require extensive landscape maintenance or other activities that would result in a substantial net increase in emissions in comparison with existing conditions.

Furthermore, implementation of any Alternatives would not result in the operation of any new major stationary emission sources. A replacement RD 1000 Pump Station No. 2 would be constructed as part of the 2009–2010 work program at the end of the North Drainage Canal, and would include a backup power generator and, therefore, would be a minor stationary source of emissions, located in Sacramento County. The pump station would consist of two 300-hp pumps that would be operated by electricity. A diesel-powered backup generator would be used in emergency situations and would be tested monthly. Stationary equipment such as diesel-powered generators would be subject to the respective air district's permitting process and Best Available Control Technology (BACT) and offset requirements. The air district's permitting process would ensure that emissions from equipment are within acceptable limits. Emissions of ozone precursors and PM_{10} associated with pump station operation would be negligible. No other stationary sources of emissions would be associated with Alternatives 1, 2, and 3. Alternatives 1, 2, and 3 would not result in a significant effect. Thus, long-term operational emissions of criteria air pollutants or precursors would not result in or substantially contribute to a violation of the applicable air quality standards. Thus, project operation would not result in a direct, adverse effect on air quality.

Mitigation Measure: None

Impact 4.13-d: Exposure of Sensitive Receptors to Toxic Air Emissions

No-Action Alt. If SCAS were to pursue the construction of an interior compartment levee in the absence of the proposed improvements to the Natomas perimeter levee system, construction is likely result in the short-term generation of diesel exhaust emissions similar to those described below for Alternatives 1, 2, and 3. Construction would be unlikely to result in the prolonged exposure of individuals to toxic air emissions.

No other stationary sources of emissions would be created. The No-Action Alternative would not result in a significant effect.

Without improvements to the perimeter levee system to provide 100-year flood protection, a significantly high risk of a levee failure in the perimeter system would remain. Toxic air emissions could be associated with the use of equipment during cleanup operations. However, effects on sensitive receptors would depend on many factors (e.g., magnitude and duration of emissions, proximity to sensitive receptors) cannot be predicted.

Alt. 1, Alt. 2, Alt. 3

Construction and operation of Alternatives 1, 2, and 3 would generate emissions of diesel PM, which is identified by ARB as a toxic air contaminant (TAC). TAC emission sources are discussed separately below.

Construction of Alternatives 1–3 would result in short-term generation of diesel exhaust emissions from the use of off-road diesel equipment required for site grading and excavation, paving, and other construction activities, in addition to diesel-fueled on-road haul trucks used for hauling borrow material. The dose to which the receptors are exposed (a function of concentration and duration of exposure) is the primary factor used to determine health risk (i.e., potential exposure to TAC emission levels that exceed applicable standards). According to the Office of Environmental Health Hazard Assessment, health risk assessments (HRAs), which determine the exposure of sensitive receptors to TAC emissions, should be based on a 70-year exposure period; however, such assessments should be limited to the period/duration of activities associated with the project (Salinas, pers. comm., 2004).

The duration of mobilized equipment used near sensitive receptors located along the levee system and borrow sites would be short (less than 3 full years for the entire project (construction seasons would last approximately 3 months in 2008 and 6 months each in 2009 and 2010). In addition, as improvements are completed, mobile equipment would progress along the levees and canal alignments and would not operate near (within approximately 500 feet of) any one receptor for more than a maximum of a few weeks at a time. Receptors located near (within 500 feet of) the borrow areas would likely experience longer exposure periods than receptors located along the levee alignments but would be located a greater distance from most of the borrow activities. Alternatives 1, 2, and 3 would represent less than 0.1% of the 70-year exposure period for any nearby sensitive receptor in the area. Finally, neither FRAQMD nor SMAQMD has any current guidance on TAC emissions from mobile equipment, and neither has a threshold of significance for exposure to emissions from this equipment. Because the exposure period for receptors in the vicinity of the project would be minimal, and because the local air districts do not have guidance for preparation of HRAs for construction equipment, an HRA is not recommended for all Alternatives' construction activities.

As discussed above under Impact 4.13-b, a replacement pump station would be constructed as part of the 2009–2010 work program at the west end of the North Drainage Canal and would be a minor stationary source of TAC emissions, located in Sacramento County. A diesel-powered backup generator would be used in emergency situations and would be tested monthly. Consequently, diesel PM emissions associated with the pump station would be infrequent. Furthermore, this category of stationary source (i.e., portable equipment), in addition to any other stationary sources that may

emit TACs, would be subject to SMAQMD permitting and toxic best available control technology (T-BACT) requirements. If the implementation of T-BACT would not reduce emissions to an acceptable level, then SMAQMD would deny the required permit for this piece of equipment. Therefore, operation of this stationary source would not result in the exposure of sensitive receptors to substantial concentrations of TACs. No other stationary sources of emissions would be associated with any Alternatives. Alternatives 1, 2, and 3 would not result in a significant effect.

Mitigation Measure: None

4.13.3 Unavoidable Significant Adverse Effects

Because of the intensity of construction operations, time constraints to which it is assumed all alternatives must adhere to avoid other environmental impacts and adverse weather conditions, and the nonattainment status of the project area, Mitigation Measure 4.13-a is not expected to be sufficient to reduce 2008 construction emissions of ROG or PM10 associated with Alternatives 1, 2, and 3 below the applicable threshold. As described under Impact 4.13-a and summarized in **Table 4-14**, emissions of ROG and PM10 that would occur in Sutter County would still exceed the applicable FRAQMD significance criteria of 25 and 80 lb/day, respectively. Similarly, mitigated emissions of PM from earth movement activities in Sacramento County would still be expected to result in or substantially contribute to a violation of applicable air quality standards. This impact would be similar for the 2009 and 2010 construction seasons. This effect would be unavoidable and significant for Alternatives 1, 2, and 3.

4.14 NOISE

4.14.1 Methodology

Construction-noise and stationary-source noise impacts were calculated based on the National Cooperative Highway Research Program, Synthesis 218. The Federal Highway Administration (FHWA) Roadway Noise Prediction Model (FHWA-RD-77-108) was used to calculate traffic noise levels along haul routes, based on estimates described in Chapter 2.

For the purposes of this analysis, alternatives were considered to have a significant effect on the noise environment if they would (1) result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project, (2) expose people residing or working in the project area to excessive noise levels, or (3) expose persons to or generate excessive groundborne vibration or groundborne noise levels.

The following considerations were applied:

- Short-term construction noise effects: Short-term construction noise effects are considered significant if construction-generated noise levels exceed the applicable standards at nearby noise-sensitive land uses.

- Noise effects from haul truck traffic: For all affected residential land uses, noise that would be generated by haul truck traffic is considered significant if it would cause the overall exterior noise level to exceed the “normally acceptable” exterior land use compatibility noise standard of 60 A-weighted decibels (dBA) L_{dn}/CNEL (day-night average noise level/community noise equivalent level) for residential land uses or would exceed the interior noise standard of 45 dBA L_{dn}/CNEL in any inhabitable residence.

- Exposure of sensitive receptors to, or generation of, excessive vibration levels. Short- and long-term vibration effects would be significant if construction or operation of the project would result in the exposure of sensitive receptors to, or would generate, vibration levels that exceed California Department of Transportation's (Caltrans') recommended standard of 0.2 inches per second (in/sec) peak particle velocity (PPV) with respect to the prevention of structural damage for normal buildings (Caltrans 2002) or the Federal Transit Administration's (FTA's) maximum acceptable vibration standard of 80 vibration decibels (VdB) with respect to human response for residential uses (i.e., annoyance) (FTA 2006) at any nearby existing sensitive land uses.

4.14.1.1 Local Noise Standards

City of Sacramento. The City of Sacramento General Plan Noise Element establishes an exterior noise level of 60 dBA L_{dn} and an interior noise level of 45 dBA L_{dn} as acceptable.

The City's noise ordinance states that the exterior noise standard shall be 55 dBA during the hours of 7:00 a.m. to 10:00 p.m. for residential and agricultural uses. The standard then adjusts to 50 dBA between 10:00 p.m. and 7:00 a.m. for residential and agricultural uses. The noise ordinance also exempts construction noise during the hours of 7:00 a.m. and 6:00 p.m. Monday through Saturday and from 9:00 a.m. to 6:00 p.m. on Sundays. The ordinance further states that the operation of an internal combustion engine shall not be exempt if the engine is not equipped with suitable exhaust and intake silencers in good working order (8.68.080 Exemptions, Noise Control Standards, City of Sacramento Municipal Code).

Sacramento County. The Sacramento County General Plan Noise Element states that noise created by a new non-transportation noise sources may not exceed the standards outlined in **Table 4-16** when measured at the property line of the noise-sensitive land use.

Table 4-16
Local Government Non-transportation Noise Standards (dBA)

Noise Element Jurisdiction/Land Use Category	Maximum Allowable Exterior Noise Levels					
	Daytime 7 a.m.–7 p.m.		**Evening 7 p.m.–10 p.m.**		**Nighttime 10 p.m.–7 a.m.**	
Sutter County	**Daytime Hourly**		**Evening Hourly**		**Nighttime Hourly**	
	L_{eq}	L_{max}	L_{eq}	L_{max}	L_{eq}	L_{max}
	50	70	50	70	45	65
	Construction noise is not exempt from Sutter County noise standards during any hours of the day.					
Sacramento County Residential Areas	**Hourly**		**Hourly**		**Hourly**	
	L_{50}	L_{max}	L_{50}	L_{max}	L_{50}	L_{max}
	50	70	50	70	45	65
	Construction noise is exempt from the Sacramento County noise regulations provided that construction does not take place before 6 a.m. or after 8 p.m. Monday through Friday, and before 7 a.m. or after 8 p.m. on Saturday and Sunday.					

Notes: dBA = A-weighted decibel; L_{50} = noise level exceeded 50% of the time; L_{max} = maximum noise level; L_{dn} = day-night average noise level; CNEL = community noise equivalent level; L_{eq} = energy-equivalent noise level.
Sources: Sacramento County 1998, Sutter County 1996

The Sacramento County noise ordinance states that a standard of 55 dBA is applied during the hours of 7:00 a.m. and 10:00 p.m. and standard of 50 dBA is applied during the hours of 10:00 p.m. and 7:00 a.m. for residential and agricultural uses. The noise ordinance also states that construction activities are exempt during the hours of 6:00 a.m. and 8:00 p.m. Monday through Friday and from 7:00 a.m. and 8:00 p.m. on Saturdays and Sundays (Chapter 6.68 Noise Control, County of Sacramento Code).

Sutter County. The Sutter County General Plan Noise Element has established noise standards for noise-sensitive land uses. The County has established an exterior noise level of 60 dBA L_{dn} and an interior noise level of 45 dBA L_{dn} as considered acceptable. For non-transportation noise sources, the standards outlined in **Table 4-16** would apply. Sutter County does not contain provisions to exempt construction noise within the County; therefore, the standards shown in **Table 4-16** would also apply to construction noise.

General. Construction noise may affect receptors in unincorporated areas of Sutter and Sacramento Counties and in the city of Sacramento. These jurisdictions either have non-transportation noise standards based on time of day and land use sensitivity or provide exemptions for construction as long as those activities occur during the daytime. Residential areas are considered the most noise-sensitive land use, and the most restrictive noise standards apply.

Noise generated by a transportation source is also regulated according to land use. All the jurisdictions with standards for transportation noise impacts have adopted a normally acceptable L_{dn}/CNEL noise standard of 60 dBA for residential land uses and a conditionally acceptable L_{dn}/CNEL noise standard of 65 dBA, provided that the best available noise reduction measures have been applied. Many of the jurisdictions have adopted a maximum L_{dn}/CNEL noise limit of 70 dBA for playgrounds, parks and riding stables.

For the purposes of this analysis, the local noise level standards presented above and in **Table 4-16** are applied to evaluate the impacts of noise generated by construction equipment, and the local noise level standards presented above are applied to evaluate the impacts of noise generated by construction-related truck trips.

4.14.2 Impacts and Mitigation Measures

Impact 4.14-a: Generation of Short-Term Construction Noise

No-Action Alt. The No-Action Alternative would not involve construction of perimeter levee improvements and therefore would have no effect on noise in the vicinity of the perimeter levee system. If SCAS were to pursue the construction of an interior compartment levee in the absence of improvements to the Natomas perimeter levee system, construction would generate temporary and intermittent noise that could be near individual noise-sensitive locations. This potential impact could be significant; however, because no concept design for such a levee has been developed, it is not possible to estimate the potential magnitude or location of an impact.

Alt. 1, Alt 3 General construction activities that would apply to levee improvements and drainage and irrigation infrastructure construction would generate temporary and intermittent noise at or near the individual noise-sensitive locations. Much of the construction activity would proceed in a linear manner along the levee and canal alignments and would have the maximum noise effect on individual residences for approximately 2–3 weeks in most locations. Noise levels would fluctuate depending on the particular type, number, duration of use of various pieces of construction equipment, and physical location of construction

activities. On-site equipment required for levee improvement and canal construction activities is anticipated to include excavators, backhoes, bulldozers, scrapers, rollers, graders, loaders, compactors, and various trucks. Individual equipment maximum noise levels produced by these operations could range from 79 to 101 dBA without the implementation of feasible noise control and from 75 to 95 dBA with implementation of feasible noise control at a distance of 50 feet from the nearest noise source, as indicated in **Table 4-17**.

Table 4-17
Typical Construction Equipment Noise Levels

Type of Equipment	Noise Level in dBA at 50 feet[1]	
	Without Feasible Noise Control	With Feasible Noise Control[2]
Dozer or tractor	80	75
Pile driver	101	95
Excavator	88	80
Scraper	88	80
Front-end loader	79	75
Backhoe	85	75
Grader	85	75
Crane	83	75
Truck	91	75

Notes: dBA = A-weighted decibel
1 Estimates correspond to a distance of 50 feet from the noisiest piece of equipment and 200 feet from the other equipment.
2 Feasible noise control includes the use of intake mufflers, exhaust mufflers, and engine shrouds in accordance with manufacturers' specifications.
Source: EPA 1971

Noise-sensitive land uses (in this case, primarily residential uses) are scattered throughout the areas in which construction would occur in the 2008 construction phase and are located throughout the construction areas for the 2009 and 2010 construction phases. A few residences are located close to the eastern end of the NCC (see **Plate 20a**); all but one of these would be removed before construction of levee improvements would take place in this area. Scattered residences are also present between one-third and one-half mile north and south of the NCC. Numerous residences are present along the water side of the Sacramento River east levee as far north as Station 90+00 in Reach 2 (see **Plate 14**). Three residences are present near the land side of the Sacramento River east levee in Reaches 1–4B (2008 construction phase); there would be removed before construction would proceed in their vicinity. Other scattered residences are present in the general area but are more than one-half mile from the levee. One residence abuts the northeast corner of the Airport borrow site (see **Plate 20b**). A few residences are as close as 50–100 feet from canal, levee, and borrow areas where construction activity would occur. This is the case for the residence that would remain in Reach 6 of the NCC south levee construction area (2008 construction phase), at the RD 1001 borrow site (potential borrow source for the NCC south levee 2008 construction phase), and in Sacramento River east levee Reaches 19B and 20A (2009–2010 construction). Residences are present along the length of the water side of the Sacramento River east levee from the lower part of Reach 2 through Reach 20A. The

density of residences increases in the lower levee reaches.

Construction noise attributable to the project was estimated using the FTA noise methodology for the prediction of stationary noise sources (FTA 2006). **Table 4-18** shows the results for the various stages of construction activities associated with the proposed levee and canal improvements, based on the equipment requirements for construction shown in Chapter 2, and the distances to the mitigated 45-dBA and 50-dBA noise contours assuming no intervening barriers. Appendix C shows the complete listing of inputs and the methodology for predicting noise levels from construction.

Table 4-18
Predicted Noise Levels Attributable to Major NLIP Construction Activities

Action	Project Improvement Type	Resulting Noise Level in dBA L_{eq} at 100 Feet		Distance to Mitigated[1] Noise Contour (Feet)	
		Unmitigated	Mitigated[1]	50 dBA[2]	45 dBA[2]
Clearing and grubbing/ stripping	Levee, canal	79.3	63.6	478	850
Levee degrading	Levee	79.3	63.8	488	868
Demolish canal and remove trees	Levee	79.3	72.3	1,301	2,313
Cutoff wall construction	Levee	79.3	72.3	1,301	2,313
Borrow site excavation	Levee, canal	79.3	72.3	1,301	2,313
Levee raising	Levee	79.6	63.8	488	868
Dewatering	Canal	79.3	73.3	1,460	2,500+
Excavation	Canal	67.3	63.3	462	821
Foundation construction	Canal	79.3	73.3	1,460	2,595
Concrete construction	Canal	70.6	67.3	730	1,298
Pipeline construction	Canal	79.3	65.3	581	1,033
Backfill and finish grading	Canal	79.3	65.3	581	1,033
Electrical and mechanical equipment installation	Canal	67.3	59.3	292	519
Pile driving	Canal	95.0	89.0	2,500+	2,500+
Erosion control	Levee, canal	72.3	63.3	462	821
Demobilization and cleanup	Levee, canal	67.3	63.3	462	821

Notes: dBA = A-weighted decibel; Leq = energy-equivalent noise level.
1 Outfitted with noise control equipment
2 Distances to noise contours do not take into account intervening topography or existing structure facades.
Sources:
Reference noise levels were obtained from the National Cooperative Highway Research Program, Synthesis 218, Table 3, Construction Equipment Noise Emission Levels, page 8.
The equation: Leq(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50) is found in the NCHRP, Synthesis 218, page 11 "Noise Impact Assessment."
Data modeled for SAFCA by EDAW 2007.

As shown in **Table 4-18**, the predicted highest noise level during construction would be 89.0 dBA L_{eq} at a distance of 100 feet from pile driving. Pile driving would be used only in the reconstruction of Pumping Plant No. 2 at the west end of the North Drainage Canal, a location that is approximately 50 feet from a single residence. The next predicted highest noise level associated with construction activities would be 79.3 dBA L_{eq} at 100 feet from construction activities without noise control device outfitting for heavy construction equipment, for both the levee improvement and canal improvement construction activities. In some work locations, construction noise would be short term, and impacts would generally not result in sleep disruption or annoyance. In other instances, the levee itself may serve as a sound barrier that provides some protection to sensitive land uses. For instance, this may occur when construction activity takes place at the landside toe of the Sacramento River east levee in reaches where there are waterside residences. Along the NCC, construction of the cutoff wall along NCC south levee Reaches 3–7 or in some reaches of the Sacramento River east levee could occur 24 hours per day. Thus, sustained construction-generated noise could occur, resulting in significant noise effects on residents, riding stables (located to the south of NCC Reach 6 and west of NCC Reach 7), and other noise-sensitive groups, depending on the type of construction activity and its proximity to noise-sensitive land uses.

Assuming a standard exterior-to-interior attenuation rate of 25 dBA for typical residential buildings with doors and windows closed, noise generated by construction equipment could result in interior noise levels that exceed the state's Title 24 noise standard of 45 dBA L_{dn} for interior spaces, as well as the interior noise standard of 45 dBA L_{dn}/CNEL for residential land uses established by the City of Sacramento for non-transportation noise sources. Although construction activity is expected to take place during daytime hours in Sacramento County and the City of Sacramento, because of the need to complete levee improvements outside of the flood season and because of other environmental constraints on project schedule, it is possible that construction may need to be conducted outside of these hours. Therefore, noise may be generated by construction equipment operating near homes during the more noise-sensitive early morning and nighttime hours (i.e., during hours that are not exempted by the applicable local ordinances in the City and County of Sacramento) and could result in sleep disturbance at nearby residences.

In all construction phases (2008–2010), construction of the proposed levee and canal improvements could result in noise levels that exceed the applicable daytime and nighttime standards for non-transportation sources (**Table 4-18**), resulting in increased annoyance and/or sleep disruption to occupants of residential dwellings and other sensitive receptors. This impact would be significant.

Alt 2. Under Alternative 2, the levee improvements would raise the Sacramento River east levee in place. This alternative would expose more noise-sensitive uses along the Sacramento River east levee to the highest noise levels shown in **Table 4-18** without the benefit of shielding provided by the levee itself. As a result, this alternative would likely cause significant noise disturbance to residents along the Sacramento River east levee.

Mitigation Measure 4.14-a: Implement Noise-Reducing Construction Practices, Prepare a Noise Control Plan, and Monitor and Record Construction Noise Near Sensitive Receptors

No-Action Alt.

If the construction of an interior compartment levee for the Airport were pursued in the absence of improvements to the Natomas perimeter levee system, SCAS should implement mitigation similar to that described below for Alternatives 1, 2, and 3 to reduce construction noise effects on sensitive receptors to a less-than-significant level.

Alt. 1, Alt. 2, Alt. 3

SAFCA and its primary contractors for engineering design and construction shall ensure that the following measures are implemented at each work site in any year of project construction to avoid and minimize construction noise effects on sensitive receptors. These measures are consistent with SAFCA's standard contract specifications for noise control.

The primary construction contractors shall employ noise-reducing construction practices. Measures that shall be used to limit noise shall include the following:

- Equipment shall be used as far away as practical from noise-sensitive uses.
- All construction equipment shall be equipped with noise-reduction devices such as mufflers to minimize construction noise and all internal combustion engines shall be equipped with exhaust and intake silencers in accordance with manufacturers' specifications.
- Equipment that is quieter than standard equipment shall be used, including electrically powered equipment instead of internal combustion equipment where use of such equipment is a readily available substitute that accomplishes project tasks in the same manner as internal combustion equipment.
- Construction site and haul road speed limits shall be established and enforced.
- The use of bells, whistles, alarms, and horns shall be restricted to safety warning purposes only.
- Noise-reducing enclosures shall be used around stationary noise-generating equipment (e.g., compressors and generators).
- Fixed construction equipment (e.g., compressors and generators), construction staging and stockpiling areas, and construction vehicle routes shall be located at the most distant point feasible from noise-sensitive receptors.
- When noise sensitive uses are within close proximity and subject to prolonged construction noise, noise-attenuating buffers such as structures, truck trailers, or soil piles shall be located between noise generation sources and sensitive receptors.
- Before construction activity begins within 500 feet of one or more residences, written notification shall be provided to the potentially affected residents, identifying the type, duration, and frequency of construction activities. Notification materials shall also identify a mechanism for residents to register complaints with the appropriate jurisdiction if construction noise levels are overly intrusive. The distance of 500 feet

is based on the 60-dBA contour of the loudest anticipated construction activity other than pile driving.

- If noise-generating activities are conducted within 100 feet of noise-sensitive receptors (the 70-dBA noise contour of construction noise), the primary contractor shall continuously measure and record sound generated as a result of the proposed work activities. Sound monitoring equipment shall be calibrated before taking measurements and shall have a resolution within 2 dBA. Monitoring shall take place at each activity operation adjacent to sensitive receptors. The recorded noise monitoring results shall be furnished weekly to SAFCA.

- The primary contractor shall prepare a detailed noise control plan based on the construction methods proposed. This plan shall identify specific measures to ensure compliance with the noise control measures specified above. The noise control plan shall be submitted to and approved by SAFCA before any noise-generating construction activity begins.

Implementing this mitigation would reduce the impact but may not reduce noise levels at all times to a less-than-significant level.

Impact 4.14-b: Exposure of Sensitive Receptors to or Generation of Excessive Groundborne Vibration or Noise

No-Action Alt.

The No-Action Alternative would not involve construction of Natomas perimeter levee improvements and therefore would have no noise or groundborne vibration effects on the project area or surrounding vicinity. If SCAS were to pursue the construction of an interior compartment levee in the absence of improvements to the Natomas perimeter levee system, construction could generate excessive groundborne vibration, as described below for Alternatives 1, 2, and 3, resulting in a significant impact. However, because no design concept has been developed for such construction, the likelihood and magnitude of such an effect cannot be determined.

Alt. 1, Alt 2, Alt 3

Construction activities have the potential to result in varying degrees of temporary ground vibration, depending on the specific construction equipment used and operations involved. Vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance. **Table 4-19** displays vibration levels for typical construction equipment.

On-site construction equipment for the proposed improvements would include pile drivers (for the reconstruction of Pumping Plant No. 2), excavators, backhoes, bulldozers, scrapers, rollers, graders, loaders, compactors, and various trucks. With the exception of pile driving, the most intense generation of ground vibration would be associated with large bulldozers that generate levels of 0.089 in/sec PPV and 87 VdB. These levels would attenuate to 0.031 in/sec PPV or 78 VdB at a distance of 50 feet. Because there are no residential buildings within 50 feet of the construction areas, vibration generated by other off-road construction equipment would not exceed the Caltrans or FTA standards. Ground vibration would also be generated by haul trucks operating on area haul routes. As shown in **Table 4-19**, vibration levels generated by trucks could reach as high as 0.076 in/sec PPV or 86 VdB at a distance of 25 feet. At a

Table 4-19 Typical Construction Equipment Vibration Levels			
Equipment		**PPV at 25 feet (in/sec)[1]**	**Approximate Lv at 25 feet[2]**
Pile driver (impact)	Upper range	1.518	112
	Typical	0.644	104
Pile driver (sonic)	Upper range	0.734	105
	Typical	0.170	93
Large bulldozer		0.089	87
Trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

[1] Where PPV is the peak particle velocity
[2] Where Lv is the velocity level in decibels and based on the root mean square velocity amplitude.
Source: FTA 2006

distance of 50 feet, these levels would attenuate to 0.027 in/sec PPV and 77 VdB. These levels are also less than Caltrans' and FTA's standards and, therefore, would be less than significant.

Vibration levels associated with pile driving could be as high as 1.518 in/sec PPV) or 112 VdB (referenced to 1 µin/sec and based on the root mean square velocity amplitude) at a distance of 25 feet. Using FTA's recommended procedure for applying a propagation adjustment to these reference levels, predicted worst-case vibration levels would exceed Caltrans' recommended standard of 0.2 in/sec PPV with respect to the prevention of structural damage for normal buildings within 100 feet and FTA maximum acceptable vibration standard of 80 VdB with respect to human annoyance for residential uses within 300 feet. There is one existing residence located approximately 50 feet from the site where pile driving would be performed for the reconstruction of Pumping Plant No. 2 at the west end of the North Drainage Canal. While the structure is not considered to be historically significant or particularly vulnerable to groundborne vibration, the resulting vibration levels would exceed both FTA's human disturbance-based standard and Caltrans' structural damage-based standard. This would be a significant effect.

Mitigation Measure 4.14-b: Implement Measures to Avoid Construction-Related Vibration Effects

No-Action Alt.

If the construction of an interior compartment levee for the Airport were pursued in the absence of improvements to the Natomas perimeter levee system, SCAS may be required to implement mitigation similar to that described below for Alternatives 1, 2, and 3 to reduce construction-related vibration effects to a less-than-significant level.

Alt. 1, Alt. 2, Alt. 3

SAFCA and its primary contractors for engineering design and construction shall ensure that the following measures are implemented to avoid and minimize construction

vibration effects on sensitive receptors and the structure near the Pumping Plant No. 2 site:

- Pile driving shall be conducted as far as practicable from the residential structure.
- Vibration monitoring equipment shall be placed at the property line adjacent to large equipment and, with owner approval, at the back of the residential structure adjacent to the large equipment.
- A pre- and post-construction survey shall be conducted to assess potential architectural damage from pile driving at the residence near the Pumping Plant No. 2 site. The survey shall include visual inspection of the structure, documentation of the structure by means of photographs and video. This documentation shall be reviewed with the individual owner prior to any construction activity. Post-construction monitoring of the structure shall be performed to identify (and repair, if necessary) damage, if any, from construction vibrations. Any damage shall be documented with photographs and video. This documentation shall also be reviewed with the individual property owners.

Performing pile driving as far as feasibly possible from residential structures would reduce the probability of generating structural damage and/or human disturbance. However, these measures would not necessarily reduce ground vibration to levels below Caltrans' recommended standard of 0.2 in/sec PPV with respect to the prevention of structural damage for normal buildings or the FTA maximum acceptable vibration standard of 80 VdB with respect to human response for residential uses.

Impact 4.14-c: Exposure of Residents to Increased Traffic Noise Levels from Hauling Activity

No-Action Alt.

The No-Action Alternative would not involve construction of Natomas perimeter levee improvements and therefore would not result in increased traffic noise levels in the vicinity of the perimeter levee or borrow sites proposed for use under Alternatives 1, 2, and 3. If SCAS were to pursue the construction of an interior compartment levee in the absence of improvements to the Natomas perimeter levee system, construction could expose residents to increased traffic noise levels from hauling activity, as described below for Alternatives 1, 2, and 3. This potential impact would be significant; however, because there is no concept design for such construction, the potential location and magnitude of such an impact cannot be determined.

Alt. 1

Construction during all construction years would generate high volumes of haul truck trips on area roads, as described in Section 4.12, "Transportation and Circulation." Associated traffic noise levels were estimated using the Federal Highway Administration (FHWA) Federal Highway Traffic Noise Prediction Model (FHWA 1978) and are displayed in **Table 4-20**. These estimates are based on the amount of material to be hauled, number of days of construction, and the hours per day in which hauling would occur.

As shown in **Table 4-20**, noise levels attributable to haul truck traffic in 2008 would range from 65.0 to 68.8 dBA L_{eq} at a distance of 50 feet from the roadway centerline. Noise levels generated by 2009–2010 truck trips are expected to be similar, with 2009

noise levels expected to be highest, given the higher number of truck haul trips anticipated.

Table 4-20
Summary of Modeled Haul Truck Noise Levels[1]

Construction Site	Number of One-Way Trips Required per Hour	Resulting Noise Level (dBA L_{eq} 50 Feet from Haul Route Centerline)
Natomas Cross Canal south levee	50	65.0
Sacramento River east levee 2008	120	68.8
Sacramento River east levee 2009	145	69.6

Notes: dBA = A-weighted decibels; Leq = energy-equivalent noise level

1 Traffic noise levels were modeled using the Federal Highway Traffic Noise Prediction Model (FHWA 1978). Calculated noise levels do not consider any shielding or reflection of noise by existing structures or terrain features or noise contribution from other sources. Estimates are based on the amount of material to be hauled, number of days of construction, and the number of hauling hours per day as provided in Chapter 2, "Alternatives," and assuming a speed of 35 mph. See modeling results in Appendix C for further detail.

Source: Data compiled for SAFCA by EDAW in 2008

Because most of the project area roadways currently serve a limited volume of residential traffic, it is assumed that the modeled noise levels represent substantial increases compared to existing traffic noise levels. Not only would the project result in substantially more vehicle trips on some roads in Sutter County and along the toe of the Sacramento River east levee near residences, but the vehicles would be predominantly haul trucks, which generate considerably more noise than passenger vehicles. Predicted traffic noise levels along area roads would exceed local exterior noise standards at residential land uses located along these haul routes.

Assuming a standard exterior-to-interior attenuation rate of 25 dBA for residential buildings, noise generated by haul trucks supplying material for the Sacramento River east levee improvements could result in interior noise levels of 44.7 dBA L_{eq}. Assuming haul trucks would be operational for 10 daytime hours, average interior noise levels associated with daily haul truck trips would be 40.7 dB L_{dn}. Based on these results, haul truck noise levels are not expected to result in an exceedance of the interior noise standard of 45 dBA L_{dn}/CNEL for residential land uses established by Sutter County, Sacramento County, and the City of Sacramento for transportation noise sources, although they would exceed local exterior noise standards at residential land uses, as noted above. In addition, although hauling activity is expected to take place during daytime hours, because of the need to complete levee improvements outside of the flood season and because of other environmental constraints on project schedule, it may be necessary to conduct some hauling activity during some noise-sensitive early morning and nighttime hours, potentially resulting in sleep disturbance at nearby residences.

Alt. 2

Alternative 2 haul truck trips would decrease in comparison with Alternative 1, due to the difference in the amount of haul material needed for each alternative. However, while haul trips to the Sacramento River east levee construction sites would be reduced,

trips associated with the NCC would remain the same as for Alternatives 1. In addition, hauling may remain at levels similar to those calculated for Alternative 1 in some locations, resulting in similarly increased noise levels during some periods over ambient noise levels and, although not planned, haul trips may need to be conducted during some noise-sensitive early morning and nighttime hours. Therefore, the impact under Alternative 2 would be significant.

Alt. 3 The number of haul truck trips under Alternative 3 would be very similar to the number of trips described for Alternative 1. This impact would be significant.

Mitigation Measure 4.14-c: Implement Noise-Reduction Measures to Reduce the Effects of Haul Truck Traffic Noise

No-Action Alt. If the construction of an interior compartment levee for the Airport were pursued in the absence of the proposed improvements to the Natomas perimeter levee system, SCAS may be required to implement mitigation similar to that described below for Alternatives 1, 2, and 3 to reduce haul truck traffic noise effects to a less-than-significant level.

Alt. 1, Alt. 2, Alt. 3 SAFCA and its primary contractors for engineering design and construction shall ensure that the following measures are implemented at each work site in any year of project construction to minimize construction traffic noise effects on sensitive receptors.

- All heavy trucks shall be equipped with noise control (e.g., muffler) devices in accordance with manufacturers' specifications.
- All haul trucks shall be inspected before use and a minimum of once per year to ensure proper maintenance and presence of noise-control devices (e.g., lubrication, nonleaking mufflers, and shrouding).
- Before haul truck trips are initiated during a construction season on roads within 600 feet of residences (the 60-dBA noise contour of haul truck traffic), written notification shall be provided to the potentially affected residents identifying the hours and frequency of haul truck trips. Notification materials shall also identify a mechanism for residents to register complaints with the appropriate jurisdiction if haul truck noise levels are overly intrusive or occur outside the exempt daytime hours for the applicable jurisdiction.

These measures would reduce interior and exterior noise levels generated by haul truck traffic that passes noise-sensitive receptors. However, the mitigated noise levels may not meet the applicable standards for local exterior noises for residential land uses.

Impact 4.14-d: Long-Term Increases in Noise

No-Action Alt. No long-term increases in noise would result from implementation of the No-Action Alternative, even if SCAS were to pursue the construction of an interior compartment levee in the absence of the proposed improvements to the Natomas perimeter levee system.

Alt. 1, Alt. 2, Alt. 3 The proposed replacement of Pumping Plant No. 2 would be located east of the Sacramento east levee near the west end of the North Drainage Canal and would involve the long-term operation of noise-generating stationary equipment. The pumping station would contain two 300-horsepower pumps and a backup generator. Without proper noise control or enclosure, such equipment could result in noise levels in the range of 78–88 dBA at 3–5 feet from the source depending on the exact type and size (EPA 1971).

The two pumps would replace similarly sized pumps that existed at the Plant No. 2 site prior to removal of the pump station. The only increase in stationary and area source noise associated with the proposed replacement pump station would be mechanical equipment, such as an emergency standby generator. The generator would be used only during emergency situations and during monthly testing. Operational noise levels associated with proposed pump station would be in compliance with applicable performance standards at nearby receptors. Therefore, no significant noise impact would occur.

Mitigation Measure: None

4.14.3 Unavoidable Significant Adverse Effects

Even with mitigation, Alternatives 1, 2, and 3 would result in a significant unavoidable impacts associated with the generation of short-term construction noise, exposure of sensitive receptors to or generation of excessive groundborne vibration or noise, and exposure of residents to increased noise levels from hauling activity.

4.15 RECREATION

4.15.1 Methodology

No recreational facilities exist along the NCC or PGCC or at the proposed and potential borrow sites. No institutionally recognized recreational activities or substantial recreational uses take place along the NCC or the PGCC or at or near the borrow sites. Therefore, the impact analysis is limited to the proposed modifications of the flood control facilities along the Sacramento River east levee and associated construction activity. For this analysis, the project alternatives were determined to have a significant impact on recreation if they would substantially restrict or reduce the availability or quality of existing recreational opportunities in the project vicinity or would cause a substantial long-term disruption of any institutionally recognized recreational activities.

4.15.2 Impacts and Mitigation Measures

Impact 4.15-a: Temporary Changes in Recreational Opportunities during Project Construction Activities

No-Action Alt.

There would be no construction of Natomas perimeter levee improvements associated with the No-Action Alternative; therefore, this alternative would have no direct effect on recreational opportunities along the levee system. If SCAS were to pursue the construction of an interior compartment levee in the absence of the proposed improvements to the Natomas perimeter levee system, it is unlikely that any recreational uses would be affected, as there are no recreational facilities in the vicinity of the Airport.

Alt. 1, Alt. 3

Several marinas, parks, and golf courses are located in the vicinity of the Sacramento River east levee within the project area. Construction of the adjacent setback levee and cutoff walls and seepage berms along the Sacramento River east levee would entail the use of heavy construction equipment, with construction potentially operating 24 hours per day at times for installation of seepage cutoff walls. Lane closures, and possibly periodic closures of roadway segments with detours for nonlocal traffic, would be needed along Garden Highway during some phases of the construction effort: reconstruction of intersections with lateral county roads, finishing of the adjacent setback levee waterside slope and crown, and installation of drainage features between the existing levee crown and the adjacent levee crown. Access to recreational facilities along the Sacramento River, such as boat launches, could be temporarily affected during project construction if construction activities would result in traffic delays and/or lane closures along Garden Highway, which is a primary travel route to marinas along the Sacramento River in the vicinity of the project site. Access to Teal Bend Golf Club on the land side of the levee would need to be rerouted from Garden Highway during the construction of levee improvements in Reach 6B.

The quality of recreational opportunities is also likely to be somewhat reduced, temporarily, in the project vicinity as a result of noise and visual disturbance from construction activities associated with levee improvement activities, particularly at Teal Bend Golf Club, Sand Cove Park, Shorebird Park, Natomas Oaks Park, and Discovery Park. The relocation of the Elkhorn Canal and construction of the new GGS/Drainage Canal during the 2009 construction phase could also directly disturb recreational uses at Teal Bend Golf Club, depending on the alignment of these canals.

Although temporary closure of sections of Garden Highway would be an inconvenience for recreationists, other travel routes would be available and could be used to access recreational facilities during the construction period. For example, Powerline Road can be used as an alternative route to Garden Highway for north-south travel between Sankey Road in the north to south of I-5 in the south. Disturbance of recreational uses in any area of the project site would be temporary, and recreationists would be able to use other nearby recreation areas in South Natomas, other parts of Sacramento, or elsewhere in the region that provide similar recreational opportunities during the construction period in the affected area. Alternatives 1 and 3 would not result in a significant effect.

Alt. 2

Temporary changes in recreational opportunities during project construction for Alternative 2 would be similar to those described for Alternative 1, although reconstruction of the Sacramento River east levee crown would require sequential

closing of sections of Garden Highway, which would likely inconvenience recreational travelers somewhat more. Nevertheless, traffic and facility access disruptions would be temporary.

Under Alternative 2, erosion control improvements would be implemented along approximately 3,710 feet of river bank at the waterside toe of the Sacramento River east levee at River Miles 73.5, 69.8 and 68.8 (Sites G, J, and M). Water-based construction would be conducted by tugboats and barges on the Sacramento River to move construction equipment and materials to the erosion control sites. Barges in the river channel would displace any boating from the east bank zone and cause passing boats to move to the west side of the river. The displacement would be temporary, with construction at each site generally constructed in one season (although the contractor may choose to conduct work at specific sites over an additional construction season).

Alternative 2 would not result in a significant effect on recreation.

Mitigation Measure: None

Impact 4.15-b: Permanent Encroachment on Parkland along Garden Highway

No-Action Alt. There would be no levee widening of the perimeter levee system associated with the No-Action Alternative; therefore, this alternative would have no effect on planned recreational uses along Garden Highway.

Alt. 1, Alt. 2, Alt. 3 Under Alternatives 1, 2, and 3, levee widening along Garden Highway in Reaches 5A–19A of the Sacramento River east levee during the 2009 and 2010 construction phases could permanently adversely affect recreational opportunities on the land side of the levee at the Costa Park site (see **Plate 33**). Depending on final design, an adjacent setback levee or expanded levee footprint with easements for levee maintenance access areas could permanently occupy the portion of the site that is closest to the existing levee, reducing its potential for development as a city park. Alternatives 1, 2, and 3 would result in a significant effect.

Mitigation Measure 4.15-b: Compensate the City of Sacramento for Encroachments that Cause Permanent Loss of the Recreational Use of Affected Recreational Facilities

No-Action Alt. No mitigation is necessary.

Alt. 1, Alt. 2, Alt.3 Before the start of construction, SAFCA shall compensate the City of Sacramento for any loss of land on the Costa Park site. The negotiated compensation may be in the form of payment, replacement land, or other in-kind compensation for the permanent loss of recreational use at the affected site. Implementing this mitigation would reduce the impact to a less-than-significant level.

4.15.3 Unavoidable Significant Adverse Effects

No unavoidable significant adverse recreation effects were identified.

4.16 VISUAL RESOURCES

4.16.1 Methodology

For this analysis, the project alternatives were determined to have a significant impact on visual resources if they would have a substantial adverse effect on a scenic vista, substantially degrade the existing visual character or quality of the site and its surroundings, or create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

4.16.2 Impacts and Mitigation Measures

Impact 4.16-a: Changes in Scenic Vistas, Scenic Resources, and Existing Visual Character of the Project Area

No-Action Alt.

If SCAS were to pursue the construction of an interior compartment levee in the absence of the proposed improvements to the Natomas perimeter levee system, the presence and movement of heavy construction equipment and construction-related generation of dust and the presence of the compartment levee in the landscape would likely degrade the existing visual character and/or quality of the Natomas landscape. In addition, approximately 10 acres of woody vegetation along the water side of the NCC south levee and 35 acres along the water side of the Sacramento River east levee would need to be removed for conformance with USACE guidance regarding levee encroachments. This removal would have a substantial adverse effect on scenic resources ad the visual character of the water side of the levees. This impact would be significant.

Alt. 1, Alt. 3

The presence and movement of heavy construction equipment and construction-related generation of dust would have the potential to temporarily degrade the existing visual character and/or quality of project sites during construction. However, construction activities would not take place in areas of high aesthetic qualities or viewer sensitivity; would be temporary; would be distant from most residences; and would not be visible for prolonged periods to any recreationists, who would generally be on the water side of the Sacramento River east levee. For these reasons, the presence of construction equipment and crews would not substantially affect scenic vistas or substantially degrade the visual character or quality of the project area.

The proposed levee improvements would include constructing a cutoff wall in Reaches 3–7 of the NCC south levee, which would require degrading the upper half of the levee and, therefore, clearing this portion of the levee of sparse vegetation on the water side of the levee crown (the land side does not have any large vegetation). The NCC south levee improvements also would include raising the entire levee by approximately 3 feet and flattening the landside levee slope from an approximately 2:1 horizontal-to-vertical (2H:1V) slope to a 3H:1V slope. The Sacramento River east levee improvements would entail constructing an adjacent levee with a 3H:1V landside slope along the existing levee, which would widen the levee embankment by approximately 50 feet and flatten its landside slope; under Alternative 3, the levee would be set back as much as 1,000 feet in the northern 1.5 miles. The setback levee, either the adjacent levee or the 1,000-foot setback levee, would be as much as 3 feet higher than the existing levee in the northern 11 reaches, with a crown elevation tapering down to the elevation of the existing levee by Reach 12. The PGCC west levee would be strengthened through the

construction of seepage berms approximately 100 feet wide along the land side of the levee.

From the land side of the levees, the changes in levee dimensions and the removal of some vegetation from the water side of the levee crown on the NCC south levee are unlikely to be noticeable to most viewers. The landside levee slopes would appear the same as the existing slopes because they would be maintained with a grass cover, as under existing conditions. Any perceived differences in views of these features would not constitute substantial degradation of the existing visual character or quality of a site or the area because neither the levees nor the general landscape are of high aesthetic value, the levee improvements would not substantially change the overall visual character of the area, and the number of sensitive viewers is low.

The raised and widened Sacramento River east levee would be noticeable to travelers on Garden Highway, but variations in the height and width of flood control features are common throughout the flood control system, and the levees themselves are not distinctive scenic resources. For this reason and the reasons stated with regard to changes in views from the land side of the levees, these changes in the appearance of the flood control system would not be a substantial change in scenic vistas or the character or quality of views.

The proposed borrow operations would lower the elevation of borrow sites by about 5 feet over very large areas and would result in the replacement of some areas of cultivated or fallowed rice fields with managed marsh and managed grasslands. The proposed elevation changes would not be discernible at the scale at which they would be implemented (hundreds of acres), and the proposed land cover types would be consistent with adjacent land uses and overall land cover types in the surrounding portions of the Natomas Basin. Long-term effects of these changes on scenic resources would be negligible.

Alternatives 1 and 3 would require the removal of numerous large, mature trees in scattered locations along the landside toe of the Sacramento River levee, with an overall, combined canopy area of approximately 27 acres. In some locations, these trees are portions of larger groves, the major part of which would not be affected by the project. Many of these trees tower above the surrounding features and are striking, distinctive elements in local settings along the levee system, visible to residents on both sides of the levee and travelers along Garden Highway and other local roadways, I-5, and I-80. As reminders of the oak woodlands that formerly occupied much of the region and sometimes the only remnants of farmsteads that once stood in locations along the levee toe, these trees have a high aesthetic value. Alternatives 1 and 3 includes offsetting the removal of the trees with approximately 125 acres of woodland plantings, consisting largely of oaks and faster-growing cottonwoods, spread throughout the western portion of the basin. In time, these new trees would enhance the visual qualities of the landscape; however, it would take many years for the new plantings to reach the size of the existing trees that are proposed to be removed, which in some cases are likely 100 years old or older. The removal of the existing trees from the proposed footprint of the Sacramento River east levee and berms would substantially degrade the quality of scenic resources and the existing visual character and quality of local sites and their surroundings. The effect of tree losses under Alternatives 1 and 3 would be a significant effect near-term impact on visual resources.

Alt. 2 The impacts of Alternative 2 on visual resources would be similar to those of Alternative 1 on the land side of the Sacramento River east levee where trees would need to be removed, although fewer trees would need to be removed from the land side of the levee south of Reach 3 because there would be no adjacent levee constructed in these reaches. The modifications of the levee system would not substantially affect scenic vistas. However, approximately 35 acres of woody vegetation (about 5 acres in the 2008 construction phase and 30 acres in the 2009 and 2010 construction phases) would be required to be removed from the water side of the levee to comply with USACE guidance regarding levee encroachments. Removal of this vegetation, including many large, mature trees, would substantially reduce aesthetic values. The effect of tree losses on both the land side and the water side of the levee under Alternative 2 would be a significant near-term impact on visual resources.

Mitigation Measure: None

No mitigation is available to reduce the impact to a less-than-significant level.

Impact 4.16-b: Changes in Light and Glare

No-Action Alt. No construction of Natomas perimeter levee improvements would occur under this alternative. Therefore, no changes in light and glare along the perimeter levee system would result. If SCAS were to pursue the construction of an interior compartment levee in the absence of improvements to the Natomas perimeter levee system, it is likely that no new permanent sources of light or glare would be created; however, equipment staging areas could be temporarily lit for security reasons during construction. Any such nighttime lighting is unlikely to create a new source of substantial light or glare that would adversely affect day or nighttime views in the area. The No-Action Alternative would not result in a significant effect.

Alt. 1, Alt. 3 No new permanent sources of light or glare would be associated with Alternatives 1 or 3. However, equipment staging areas would be temporarily lit for security reasons during construction. Nighttime construction activity could be required for the installation of the cutoff walls in the NCC south levee and in the adjacent levee along the Sacramento River east levee. Other construction is not generally anticipated to be conducted after 8 p.m.; however, it is possible that occasional construction activities may be required during later hours, in which case additional construction areas may require temporary nighttime lighting. There are no residences on the land side of the levee that are close to the proposed levee improvement sites and that would not be removed before construction in these areas except in Reach 6 of the NCC south levee and Sacramento River east levee Reaches 16–20. Where residences do exist, the landside construction areas would often be screened from direct views of the construction area by trees. Along the Sacramento River east levee from Reach 2 to Reach 19A, where many residences are present on the water side of the levee, the existing levee itself, trees, and other vegetation would shield residences from lighting on the land side of the levee, where the work would be performed.

Security night lighting would be provided at the replacement of RD 1000 Pumping Plant No. 2. It would be situated such that no residences would be affected by this source of night light.

Additionally, construction work would typically move linearly down the levees, and construction activities generally would not take place in any one location for more than a few weeks. Therefore, where nighttime construction lighting (if needed) would be clearly visible from nearby residences, the activity would be short term and temporary and therefore would not constitute a substantial source of light or glare. For the reasons listed above, nighttime lighting related to project construction would not create a new source of substantial light or glare that would adversely affect day or nighttime views in the area. Alternatives 1 and 3 would not result in a significant effect.

Alt. 2 No new permanent sources of light or glare would be associated with Alternative 2. The same considerations described for Alternative 1 and 3 would apply to Alternative 2 except that if nighttime construction work is needed for cutoff wall installation in the existing Sacramento river east levee, it is much more likely to be visible and to cause temporary disturbance to residents of homes along the water side of the Garden Highway. However, because the construction work would move linearly down the levee and would not take place in any one location for more than a few weeks, where nighttime construction lighting (if needed) would be clearly visible from nearby residences, the activity would be short term and temporary and therefore would not constitute a significant source of light or glare.

Mitigation Measure: None

No mitigation is required.

4.16.3 Unavoidable Significant Adverse Effects

Alternatives 1, 2, and 3 include measures to limit the extent of visual resource impacts caused by the loss of woodland areas in the near term (e.g., transplanting existing trees outside the project footprint where feasible) and to offset them over the longer term (through substantial woodland planting). No feasible mitigation is available to reduce Impact 4.16-a to an insignificant level in the near term. Furthermore, there is no mitigation to reduce the substantial adverse effect on scenic resources and visual character of the Sacramento River east levee area that would result under the No-Action Alternative and Alternative 2 from the removal of a substantial number of trees along the water side of this levee. The impact therefore would be significant and unavoidable for the No-Action Alternative and Alternatives 1, 2, and 3.

Under the No-Action Alternative, if SCAS were to construct a compartment levee to provide flood protection for the Airport, significant and unavoidable impacts on visual resources resulting from the presence of the new levee in the landscape would also be likely.

4.17 UTILITIES AND SERVICE SYSTEMS

4.17.1 Methodology

This section addresses the following public utilities and service systems: water and wastewater, solid waste, electrical and natural gas, telephone and cable, and fire and police protection services.

The project would not involve any changes in land use that would increase short-term or long-term demand for public services, including fire and police protection, schools, parks, and other public facilities, thus necessitating the construction of new or altered government service facilities. Similarly, the project would not result in demand for increased natural gas facilities, electrical transmission lines,

communication systems, water infrastructure, sewer lines, or solid-waste services beyond their current capacity. Therefore, increased demand for these services and utilities is not addressed further.

For this analysis, the project alternatives were determined to have a significant impact on utilities and service systems if they would (1) generate waste materials that would exceed the permitted capacity of local landfills or fail to comply with Federal, state, and local statutes and regulations related to solid waste or (2) physically interfere with a service provider's ability to continue to provide an existing level of service that meets established standards for the project area.

4.17.2 Impacts and Mitigation Measures

Impact 4.17-a: Potential Temporary Disruption of Irrigation Supply

No-Action Alt.

If SCAS were to pursue the construction of an interior compartment levee in the absence of improvements to the Natomas perimeter levee system, significant temporary interruptions of irrigation supply could occur if construction activities result in damage to irrigation infrastructure or otherwise render the infrastructure inoperable at a time when it is needed (e.g., reconnections to water supply sources are not completed by the time crop irrigation must begin), as described below for Alternatives 1, 2, and 3. This potential impact would be significant; however, because there is no conceptual plan for such a levee construction project, the extent and location of potential disruptions cannot be predicted.

Without SAFCA's improvements to the levee system to provide 100-year flood protection, the risk of a levee failure would remain. A levee failure in the Natomas Basin could cause flooding that would damage canals, potentially disrupting irrigation of cropland. However, the potential for such an occurrence is uncertain, and the magnitude and duration of any related effect on these services cannot be predicted.

Alt. 1, Alt. 2, Alt. 3

Irrigation and drainage pipeline penetrations of the existing NCC south levee would be raised as part of the 2008 and 2010 construction phases and pipeline penetrations of the Sacramento River east levee would be raised during all construction phases to meet current USACE regulations. Wells and pumps in the footprint of the proposed flood control facilities along the Sacramento River east levee would be removed and replaced in locations farther from the project footprint in all construction phases. The Elkhorn and Riverside Canals, which are constructed above the surrounding terrain, would be relocated away from the toe of the Sacramento River east levee in 2008 and 2009, and the replacement canals would need to be operable and lateral irrigation canals connected to them before the existing canals are demolished. Additional buried irrigation lines may exist that would need to be removed or reconnected.

Significant temporary interruptions of irrigation supply could occur if irrigation infrastructure is damaged or otherwise rendered inoperable at a time when it is needed (e.g., reconnections to water supply sources are not completed by the time crop irrigation must begin). Given the extent and intensity of project construction activities, it is possible that these activities could impede the repair of damaged infrastructure or cause a delay in the provision of irrigation supply to some areas such that existing levels of service that meet established standards for the project area are not met. Therefore, Alternatives 1, 2, and 3 could result in a significant effect.

Mitigation Measure 4.17-a: Coordinate with Irrigation Water Supply Users Before and During All Irrigation Infrastructure Modifications and Minimize Interruptions of Supply

No-Action Alt.

If the construction of an interior compartment levee for the Airport were pursued in the absence of the proposed improvements to the Natomas perimeter levee system, SCAS would need to implement mitigation similar to that described below for Alternatives 1, 2, and 3 to minimize impacts related to the disruption of irrigation supply to a less-than-significant level.

Alt. 1, Alt. 2, Alt.3

SAFCA and its primary contractors for engineering design and construction shall ensure that the following measures are implemented to minimize the potential for irrigation water supply interruptions during construction activities:

- Coordinate the timing of all modifications to irrigation supply infrastructure with the affected infrastructure owners and water supply users, either directly or through NMWC.
- Include detailed scheduling of the phases of modifications/replacement of existing irrigation infrastructure components in project design and in construction plans and specifications.
- Plan and complete modifications of irrigation infrastructure for the non-irrigation season to the extent feasible.
- Provide for alternative water supply, if necessary, when modification/replacement of irrigation infrastructure must be conducted during a period when it would otherwise be in normal use by an irrigator.
- Ensure either that (1) users of irrigation water supply do not, as a result of physical interference associated with the project, experience a significant interruption in irrigation supply when such supply is needed for normal, planned farming operations (i.e., a decrease in level of service in comparison with the existing level of service), or (2) users of irrigation water supply that experience a significant decrease in an existing level of service that meets the established standards for the project area are compensated in kind for losses associated with the reduction in level of service.

Implementing this mitigation would reduce the potential impact to a less-than-significant level.

Impact 4.17-b: Potential Disruption of Utility Service

No-Action Alt.

The No-Project Alternative would have no direct effect on utilities and service systems along the Natomas perimeter levee system. If SCAS were to pursue the construction of an interior compartment levee in the absence of improvements to the Natomas perimeter levee system, construction activity could damage public utility infrastructure, resulting in temporary interruptions of service, as described below for Alternatives 1, 2, and 3. This potential impact would be significant.

Without SAFCA's improvements to the levee system to provide 100-year flood protection, the significantly high risk of a levee failure would remain. A levee failure in

the Natomas Basin could result in minor to substantial flooding that could substantially interrupt utilities and public services. However, the potential for such an occurrence is uncertain, and the magnitude and duration of any related effect on these services cannot be predicted.

Alt. 1, Alt. 2, Alt. 3

Approximately 500 power poles carrying electrical distribution and telephone lines are present along the landside toe of the Sacramento River east levee, within the proposed footprint of the adjacent levee for all construction phases. These poles would need to be either relocated to the water side of the existing levee embankment (to the west side of Garden Highway) or placed on special footings outside of critical levee and berm slopes. Natural gas lines also extend underground in some areas on the land side of the levee in the vicinity of the Sacramento River east levee, and other pipelines and underground utilities could be located within areas along the Sacramento River east levee of proposed ground disturbance associated with project construction.

Construction activity could damage identified or unidentified public utility infrastructure, resulting in temporary interruptions of service in the western Natomas Basin area. Relocations of known electrical, gas, and telephone lines could also result in interruptions of service. Significant interruptions of irrigation supply could occur if irrigation infrastructure is damaged or otherwise rendered inoperable at a time when it is needed (e.g., reconnections to water supply sources are not completed by the time crop irrigation must begin). Given the extent and intensity of project construction activities, it is possible that these activities could impede a service provider's ability to repair damage or limit a service interruption in a manner that ensures the provision of existing levels of service that meet established standards for the project area. Therefore, Alternatives 1, 2, and 3 would result in a significant effect.

Mitigation Measure 4.17-b: Verify Utility Locations, Coordinate with Utility Providers, Prepare a Response Plan, and Conduct Worker Training with Respect to Accidental Utility Damage

No-Action Alt.

If SCAS were to construct an interior compartment levee for the Airport in the absence of improvements to the Natomas perimeter levee system, SCAS would need to implement mitigation similar to that described below for Alternatives 1, 2, and 3 to minimize impacts related to the disruption of utility service to a less-than-significant level.

Alt. 1, Alt. 2, Alt.3

Before the start of construction, SAFCA and its primary contractors shall coordinate with USACE, the State, and applicable utility providers to implement orderly relocation of utilities that need to be removed or relocated. No new utility poles shall be located on the water side of Garden Highway in the vicinity of existing waterside residences unless, as a result of regulatory requirement, there is no feasible alternative for providing service to these residences. Notification of any potential interruptions in service shall be provided to the appropriate agencies.

Before the start of construction, utility locations shall be verified through field surveys and the use of the Underground Service Alert services. Any buried utility lines shall be clearly marked in the area of construction in advance of any earthmoving activities.

Before the start of construction, a response plan shall be prepared to address potential accidental damage to a utility line. The plan shall identify chain of command rules for notification of authorities and appropriate actions and responsibilities to ensure the safety of the public and workers. Worker education training in response to such situations shall be conducted by the contractor.

Utility relocations shall be staged to minimize interruptions in service.

Implementing this mitigation would reduce the impact to a less-than-significant level.

Impact 4.17-c: Increases in Solid Waste Generation

No-Action Alt.

If SCAS were to pursue the construction of an interior compartment levee in the absence of the proposed improvements to the Natomas perimeter levee system, construction would generate waste materials requiring proper disposal, as described below for Alternatives 1, 2, and 3. As described for those alternatives, only those landfills determined to have the ability to accommodate the construction disposal needs of the alternatives would be used, and there would be no long-term generation of solid waste. This No-Action Alternative scenario would not result in a significant effect.

Without improvements to the perimeter levee system to provide 100-year flood protection, a significantly high risk of a levee failure in the perimeter levee system and flooding of the basin would remain. Cleanup operations following flooding are likely to generate very high levels of solid waste; the amount of waste would depend on the extent, depth, and duration of flooding and the types of property damaged. Waste materials could exceed the permitted capacity of local landfills or fail to comply with Federal, state, and local statutes and regulations related to solid waste, resulting in a significant impact.

Alt. 1, Alt. 2, Alt. 3

There would be no long-term generation of solid waste associated with Alternatives 1, 2, or 3. Project construction would generate approximately 110,000 cubic yards of excess spoil material during the 2008 construction phase and 205,000 cubic yards in the 2009 and 2010 phases. Some residences, agricultural structures, and appurtenances in or near the footprint of the proposed flood control facilities on the land side of the NCC south levee and the Sacramento River east levee would be relocated, if feasible and in accordance with landowner preferences, but others would be demolished. Other materials, such as asphalt, concrete, pipes, and gravel, would need to be removed from the footprint of the proposed flood control facilities.

Waste materials would be hauled off-site to a suitable disposal location. Hazardous materials (e.g., building materials containing lead paint or asbestos) encountered during the removal of residences and other structures would be disposed of in accordance with regulatory standards. The location of the landfill used for disposal of spoil material and other construction-related waste would be determined by the construction contractor at the time of construction activity based on capacity, type of waste, and other factors. Only those landfills determined to have the ability to accommodate the construction disposal needs of the alternatives would be used. It is likely that Kiefer Landfill, owned and operated by Sacramento County, would be used for all or a part of the construction waste. Kiefer Landfill is located about 15 miles southeast of the City of Sacramento (approximately 40 miles southeast of the NCC south levee). With a permitted capacity of more than 117 million cubic yards through 2035 and a remaining capacity of nearly

113 million cubic yards as of 2005 (California Integrated Waste Management Board 2007), Kiefer Landfill would be able to accommodate the project's construction disposal needs. Similarly, the Western Regional Landfill in Placer County, approximately 15 miles from the NCC, would be able to accommodate the project disposal requirements, with a maximum permitted capacity of more than 36 million cubic yards and a remaining capacity of more than 29 million cubic yards as of 2005. Because project construction and operation would not cause existing regional landfill capacity to be exceeded, Alternatives 1, 2, and 3 would not result in a significant effect.

Mitigation Measure: None

Except for substantial improvements to the Natomas perimeter levee system (i.e., implementation of one of the action alternatives), no mitigation is available for the effects of flooding related to solid waste under the No-Action Alternative.

4.17.3 Unavoidable Significant Adverse Effects

No unavoidable significant adverse effects of Alternatives 1, 2, or 3 were identified. The No-Action Alternative could result in unavoidable significant effects associated with the interruption of utilities and public services and with the generation of solid waste under flood conditions.

4.18 HAZARDS AND HAZARDOUS MATERIALS

4.18.1 Methodology

This section addresses potential sources of hazards and risks associated with hazardous materials that may be associated with implementation of the alternatives, and the relationship of the alternatives to hazards associated with airport operations. For this analysis, the project alternatives were determined to result in a significant effect related to hazards if project construction activities would:

- create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials or through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
- emit hazardous emissions or involve the handling of hazardous or acutely hazardous materials, substances, or waste within ¼ mile of an existing or proposed school;
- be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, create a significant hazard to the public or the environment;
- result in a safety hazard for people residing or working in a project area that is located within 2 miles of a public airport or public-use airport;
- impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or
- expose people or structures to a significant risk of loss, injury, or death from wildland fires.

There are no existing or proposed schools located within ¼ mile of the project sites. Therefore, the handling of hazardous materials or waste within ¼ mile of a school is not discussed.

4.18.2 Impacts and Mitigation Measures

Impact 4.18-a: Spills of Hazardous Materials

No-Action Alt.

If SCAS were to pursue the construction of an interior compartment levee in the absence of the proposed improvements to the Natomas perimeter levee system, it is assumed that construction would not cause any significant hazards associated with the transport and handling of hazardous materials because the applicable regulations would be followed, as described below for Alternatives 1, 2, and 3.

Without SAFCA's improvements to the Natomas perimeter levee system to provide 100-year flood protection, the significantly high risk of a levee failure would remain. A levee failure in the Natomas Basin could result in flooding that could upset hazardous material storage and spread agricultural pesticides, oil, gasoline, and other hazardous materials in flood waters, creating hazardous conditions for the public and the environment. However, the potential for such an occurrence is uncertain, and the magnitude and duration of any related risks cannot be predicted.

Alt. 1, Alt. 2, Alt. 3

Alternatives 1, 2, and 3 would not cause any significant hazards associated with the transport and handling of hazardous materials. Construction and maintenance activities in all construction phases (2008–2010) would involve the use of potentially hazardous materials, such as fuels (gasoline and diesel), oils and lubricants, and cleaners (which could include solvents and corrosives in addition to soaps and detergents), that are commonly used in construction projects. Bentonite (a non-hazardous material) and/or cement would be used where cutoff walls are being constructed to remediate levee seepage conditions. Construction contractors would be required to use, store, and transport hazardous materials in compliance with Federal, state, and local regulations during project construction. Risks to water quality associated with incidental releases of these materials on project sites are addressed in Section 4.5, "Water Quality."

Compliance with the applicable regulations would reduce the potential for accidental release of hazardous materials during their transport and during project construction activities. Consequently, the risk of significant hazards associated with the transport, use, and disposal of these materials is low. Alternatives 1, 2, and 3 would not result in a significant effect.

Mitigation Measure: None

No mitigation is available for the risk of hazardous materials upset under the No-Action Alternative. No mitigation is necessary for Alternatives 1, 2, and 3.

Impact 4.18-b: Exposure to Hazardous Materials Encountered at Project Sites

No-Action Alt.

If SCAS were to pursue the construction of an interior compartment levee in the absence of the proposed improvements to the Natomas perimeter levee system, previously unknown or undocumented hazardous materials could be present in construction areas (including borrow sites). Excavation at or near areas of currently unrecorded soil and/or groundwater contamination could result in the exposure of construction workers, the general public, and the environment to hazardous materials, as described below for Alternatives 1, 2, and 3. Because the potential exists for exposure to

previously unknown hazardous materials during construction activities, this potential impact would be significant.

As noted in the discussion of Impact 4.18-a, without SAFCA's improvements to the levee system to provide 100-year flood protection, the significantly high risk of a levee failure would remain. A levee failure in the Natomas Basin could result in flooding that could flood known sites of hazardous materials and potentially expose the public and the environment to hazardous conditions. However, the potential for such an occurrence is uncertain, and the magnitude and duration of any related risks cannot be predicted.

Alt. 1, Alt. 2, Alt. 3

The Environmental Data Resources, Inc. (EDR) government records database search (Environmental Data Resources 2007) listed one site with possible contamination issues that may be subject to project-related excavation. This is the Yuki Farms property located at 7800 Garden Highway, in Sacramento River east levee Reaches 5B and 6A. The site was listed on the State Water Resources Control Board's SLIC list (Central Valley RWQCB 2007) and on DTSC's HAZNET list.

Central Valley Regional Water Quality Control Board records (Vogelsang, pers. comm., 2007) indicate that approximately 2,000 gallons of gasoline were discharged into the soil on this property in October 1997 and that soil sampling conducted in January 1998 showed "detectable concentrations of petroleum hydrocarbons" in two samples and "significant concentrations of the oxygenates MtBE and TAME" in another sample. Water samples from a previously used supply well and excavation showed significant impacts. To date, contaminant remediation has not been conducted on the site (Rowe, pers. comm., 2007). The entry in the HAZNET list, which tracks waste generation information, waste categorization, and disposal method, relates to photochemicals. However, the HAZNET records contain no indication of any contamination issue with regard to photochemical waste.

Alternative 1 would include construction of the adjacent setback levee and seepage remediation, likely in the form of a cutoff wall, through this reach. The relocated Elkhorn Canal and the new GGS/Drainage Canal also would be constructed through this property. Construction activity conducted at or near the site of previous contamination from the gasoline spill could disturb contaminated soils and expose workers and the public to unacceptable levels of hazardous substances. Construction of either canal through or near the contaminated site could lead to the introduction of hazardous materials into irrigation water supply or drainage and could expose the public, irrigated crops, or wildlife to unacceptable levels of these materials.

Additionally, although the database searches did not list any other hazardous material release sites, previously unknown or undocumented hazardous materials could be present in project construction areas, including the identified potential borrow sites or properties in the Fisherman's Lake area that have not yet been specifically identified for use as borrow sources for construction in the 2010 phase. Excavation at or near areas of currently unrecorded soil and/or groundwater contamination could result in the exposure of construction workers, the general public, and the environment to hazardous materials such as petroleum hydrocarbons, pesticides, herbicides, fertilizers, contaminated debris, or elevated levels of other chemicals that could be hazardous. Because the potential exists for exposure to previously unknown hazardous materials during construction activities, Alternatives 1, 2, and 3 would result in a significant effect.

Mitigation Measure 4.18-b(1): Ensure that Contaminants Are Not Present at Unacceptable Levels on the Yuki Farms Site Near the Location of Project Construction Activities

No-Action Alt.

This mitigation does not apply to the No-Action Alternative.

Alt. 1, Alt. 2, Alt.3

Before the start of any construction activities on the Sacramento County–owned property known as "Yuki Farms," SAFCA shall ensure that (1) any issues of documented soil or groundwater contamination on the property have been resolved by Sacramento County in accordance with federal, state, and local requirements; or (2) a qualified hazardous materials specialist, through soil and groundwater testing, has determined that any previously documented contamination site on the property is sufficiently distant from areas of project-related disturbance to ensure that hazardous materials at the site will not be encountered during construction activity and would not migrate into water carried in the new canals and pose a threat to the safety of construction workers, the general public, or the environment.

Mitigation Measure 4.18-b(2): Prepare a Worker Health and Safety Plan, and Implement Appropriate Measures to Minimize Potential Exposure to Unknown Hazardous Materials

No-Action Alt.

If the construction of an interior compartment levee for the Airport were pursued in the absence of the proposed improvements to the Natomas perimeter levee system, SCAS should implement mitigation similar to that described below for Alternatives 1, 2, and 3 to minimize impacts related to the exposure of hazardous materials to a less-than-significant level.

Alt. 1, Alt. 2, Alt.3

If, during site preparation and construction activities, previous undiscovered or unknown evidence of hazardous materials contamination is observed or suspected through either obvious or implied site characteristics (e.g., stained or odorous soil), construction activities shall immediately cease in the area of the find. A qualified hazardous materials specialist shall assess the construction site and shall collect and analyze soil samples, if needed, from the site. If contaminants at unacceptable levels are identified in the samples, SAFCA or its primary construction contractor shall implement measures in accordance with federal and state regulations before beginning construction activities.

SAFCA shall require all contractors to prepare a worker health and safety plan before the start of construction activities. This plan shall identify, at a minimum, all contaminants that could be encountered during construction activity; all appropriate worker, public health, and environmental protection equipment and procedures to be used during project activities; emergency response procedures; the most direct route to the nearest hospitals; and a site safety officer. The plan shall describe actions to be taken should hazardous materials be encountered on-site, including protocols for handling hazardous materials and preventing their spread and emergency procedures to be taken.

Impact 4.18-c: Temporary Aircraft Safety Hazards Resulting from Project Construction Activities within or near the Airport Critical Zone

No-Action Alt.

If SCAS were to pursue the construction of an interior compartment levee in the absence of the proposed improvements to the Natomas perimeter levee system, extensive night lighting of construction work and security lighting of construction staging areas at night within the Airport Critical Zone could interfere with nighttime aircraft landing operations and create a safety hazard related to aircraft landings, as described below for Alternatives 1, 2, and 3. However, it is assumed that SCAS would implement appropriate procedures consistent with its own policies and Federal Aviation Administration (FAA) guidance that would preclude aircraft safety hazards associated with construction.

Alt. 1, Alt. 2, Alt. 3

Parts of the project areas for all construction phases of improvements to the Sacramento River east levee; all Elkhorn Canal relocation activities, GGS/Drainage Canal construction, West Drainage Canal improvements, and Airport West Ditch modifications; and most of the Airport north bufferlands borrow site are within the Airport Critical Zone (**Plate 20b**). Part of the NCC south levee construction areas and the Fisherman's Lake area are near the aircraft landing approaches for, or are directly north or south of, the Airport runways. Extensive night lighting of construction work and security lighting of construction staging areas at night within these areas could interfere with nighttime aircraft landing operations and create a safety hazard related to aircraft landings. Alternatives 1, 2, and 3 would result in a significant effect.

Mitigation Measure 4.18-c: Coordinate Work in the Critical Zone with Airport Operations and Restrict Night Lighting within and near the Runway Approaches

No-Action Alt.

No mitigation is necessary.

Alt. 1, Alt. 2, Alt.3

SAFCA and its primary construction contractors shall ensure that the following mitigation is implemented to avoid interference of construction activities with Airport operations.

- No borrow activities shall be conducted within the Airport Critical Zone during nighttime hours.
- All project-related nighttime lighting that is in, or is aligned with, the Airport runway approach zones (NCC south levee Reaches 1–4 and Sacramento River east levee Reaches 1–11B) shall be directed downward to avoid potential interference with nighttime aircraft operations.
- SAFCA shall ensure that SCAS is informed in advance of the timing and nature of all construction activities within the Airport Critical Zone, and shall coordinate with SCAS during final project design to ensure that all appropriate safety precautions within the Critical Zone are incorporated into the construction plans.

Impact 4.18-d: Potential to Result in Higher Frequency of Collisions between Aircraft and Wildlife at Sacramento International Airport

No-Action Alt.

None of the borrow site conversion, dewatering, filling, canal replacement, removal and replacement of trees, or creation of habitat described for the action alternatives would occur under the No-Action Alternative; therefore, this alternative would have no effect on the abundance of wildlife at the Airport. It is assumed that if SCAS were to construct flood protection improvements for the Airport, appropriate measures would be incorporated into the project to ensure that the potential for hazards associated with the presence of wildlife would not increase.

Without improvements to the perimeter levee system to provide 100-year flood protection, a significantly high risk of a levee failure in the perimeter system and flooding of the basin would remain. Flooding is likely to result in changes in land surface in some areas and in many land areas retaining water for long periods even after floodwaters have receded. These conditions could result in high numbers of birds being attracted to the lands around the Airport (which in a low-elevation area in the basin) in the months following flooding and the resumption of Airport operations, increasing the potential for collisions between aircraft and wildlife. This would be a significant impact.

Alt. 1, Alt. 2, Alt. 3

The Airport has the highest number of reported wildlife strikes with aircraft in California. Collisions between aircraft and wildlife compromise the safety of aircraft passengers and flight crews. In an attempt to reduce wildlife collisions with aircraft, SCAS has maintained and implemented a wildlife hazard management plan (WHMP) for more than 10 years at the Airport. The plan identifies routine maintenance, hazardous wildlife habitat manipulation, and other land management activities as the most effective long-term preemptive measures for reducing wildlife hazards.

SCAS and the FAA are most concerned about hazardous wildlife attractants within 10,000 feet of the Airport Operations Area. The FAA identifies this area as the Critical Zone. Wildlife attractants near the runways are of greatest concern because, nationally, 74% of bird-aircraft strikes occurred at or below 500 feet above ground level (Cleary, Dolbeer, and Wright 2004). The area within a 10,000-foot radius of the Airport Operations Area is where arriving and departing aircraft are typically operating at or below 2,000 feet, an altitude that also corresponds with most bird activity (SCAS 2007).

Implementation of the project would involve construction of habitat enhancement features that could serve as attractants to birds within 10,000 feet of the Airport Operations Area. The project entails relocating, creating, or redesigning a substantial length of canals. It also includes creating new managed habitat and for giant garter snake and Swainson's hawk. This additional habitat would include 250 acres of managed marsh and 45 acres of new drainage canal designed as giant garter snake habitat.

Although these habitat features could serve as wildlife attractants, the project could result in a reduction of potential for wildlife collisions with aircraft at the Airport because it has been designed to replace existing hazardous wildlife attractants in the Critical Zone with land uses considered more compatible by the FAA and SCAS.

Construction of the GGS/Drainage Canal would allow approximately 6.5 acres of the Airport's West Ditch to be dewatered during summer. A significant portion of the West

Ditch, which parallels the Airport's west runway, is located within the Airport Operations Area. The aquatic habitat associated with the West Ditch has been identified by SCAS and the FAA as a hazardous wildlife attractant. Removing irrigation water and most drainage from the West Ditch and grading the ditch into a swale would help SCAS to achieve two objectives specified in the Airport's WHMP: reducing aquatic habitat for hazardous wildlife and reducing hazardous wildlife use of ditches in the Airport Operations Area (SCAS 2007).

SAFCA would implement landscape changes on Airport bufferlands used as borrow sources, through subsequent land reclamation, that would result in a reduction in the attractiveness of those parcels to hazardous wildlife. Most importantly, land currently or recently in rice cultivation north of the Airport Operations Area would be converted through SAFCA's borrow and reclamation activities to managed grasslands nearer to the Airport Operations Area and managed marsh farther north of the operations area.

Managed grassland is expected to attract substantially less hazardous wildlife than the current land uses because they do not provide waste grain, in the case of cereal crops, or standing water, in the case of rice. Grassland management activities also are expected to attract less hazardous wildlife than agricultural crops that require disking or irrigation. North of Elverta Road, some borrow sites on Airport bufferlands historically cultivated as rice could be converted to managed marsh designed to provide maximum habitat value to giant garter snake while reducing the overall attractiveness to hazardous wildlife. These landscape changes could contribute to a reduction in wildlife collisions with wildlife by replacing land uses in the Critical Zone considered highly attractive to hazardous wildlife species with uses designed and managed to reduce use by these species. In addition, these landscape changes would likely result in an overall reduction of hazardous wildlife on Sacramento County–owned agricultural land within the 10,000-foot Critical Zone, which is a specific objective of the Airport's WHMP (SCAS 2007).

Additionally, SAFCA's excavation and grading activities could serve to improve existing irrigation and drainage infrastructure on Airport land beyond the dewatering of the West Ditch. These improvements could address floodplain storage issues that could arise in connection with the Airport's planned parking lot construction activities south of I-5. SAFCA would include the physical alteration of the land as part of its flood control program, obtaining all necessary permits and environmental clearances, thus giving the Airport more flexibility than it currently has to reduce the wildlife hazards associated with this land.

Although woodlands are known to support hazardous wildlife species, tree plantings that would result, eventually, in an increase in the acreage of woodlands within the Critical Zone could actually result in a net reduction in hazardous wildlife attractiveness of these areas because the woodlands would replace cropland. Agricultural crops, along with open water, are the primary wildlife attractants within the Airport's Critical Zone (SCAS 2007).

Most species of birds dependent on woodland habitats forage and nest within these habitats. This behavior trait is likely to put many woodland species at less risk of collisions with aircraft compared to birds that often fly long distances to forage in agricultural croplands (e.g., blackbirds, crows, pigeons). The potential for tree planting to result in a significant contribution to an increase in the frequency of wildlife

collisions with aircraft is also reduced by the selection of proposed planting locations; no tree plantings are proposed in the vicinity of the north and south runway approaches, and most plantings would occur outside the Critical Zone.

In combination, the project elements are expected to reduce the overall attractiveness of the project area to hazardous wildlife. As a result, wildlife collisions with aircraft arriving and departing from the Airport are not expected to increase, and could decrease. In addition, SAFCA would be responsible for securing all necessary permits and environmental clearances, which would provide SCAS with more flexibility than it currently has to reduce the wildlife hazards on its bufferlands. However, because the project design elements described in this document have yet to be finalized and land management practices have yet to be approved, Alternatives 1, 2, and 3 would result in a significant effect.

Mitigation Measure 4.18-d: Implement Measures to Avoid Substantial Increases in Hazardous Wildlife within the Critical Zone or Wildlife Collisions with Aircraft

No-Action Alt.

Except for substantial improvements to the Natomas perimeter levee system (i.e., implementation of one of the action alternatives), no mitigation is available to reduce the potential for increases in hazardous wildlife within the Airport Critical Zone or wildlife collisions with aircraft that may follow a period of flooding in the event of a Natomas levee failure.

Alt. 1, Alt. 2, Alt.3

A qualified biologist, retained by SAFCA, shall conduct a wildlife-aircraft strike analysis to determine to what extent the project could increase the potential for wildlife collisions with aircraft, and how the project could be modified to reduce any potential increase in wildlife collisions. The analysis, which shall be completed as part of project design of Airport borrow sites and of woodland plantings within the Critical Zone, shall include the following:

- A summary of existing information on wildlife-aircraft strikes at the Airport, relevant research conducted at the Airport and other airports in the United States, and a description of the sources of uncertainty resulting from insufficient data.
- A comparison of current land use and habitat types in the Natomas Basin with anticipated land use changes over the next 20 years (i.e., the period covered by the Airport's master plan). The purpose of this analysis will be to predict how anticipated land use changes will influence the diversity, abundance, and distribution of hazardous wildlife in the vicinity of the Airport. Particular attention will be given to analyzing potential effects of implementing the project on hazardous wildlife populations.
- An analysis of the anticipated effects of project implementation on the frequency and patterns of wildlife-aircraft strikes at the Airport.
- Mitigation options, including alternative designs for habitat compensation sites, on-site versus off-site mitigation opportunities, and monitoring and adaptive management options that could be implemented if it is determined that the overall project could result in a no net increase of risk to aircraft.

If the wildlife-aircraft strike analysis concludes that implementation of project elements would not result in an increase the potential for wildlife collisions with aircraft, no further mitigation is necessary.

If the wildlife-aircraft strike analysis concludes that project elements could increase the potential for wildlife collisions with aircraft, SAFCA shall implement the following mitigation:

- SAFCA, in consultation with SCAS and the FAA, shall design and implement mitigation and/or modify the project as needed until it is determined by SCAS and the FAA that the project would not substantially increase the risk of wildlife collisions with aircraft.

Impact 4.18-e: Interference with an Adopted Emergency Evacuation Plan

No-Action Alt.

There would be no construction of Natomas perimeter levee improvements associated with the No-Action Alternative; therefore, this alternative would have no effect on adopted emergency evacuation plans involving roadway closures for improvements to the perimeter levee system. If SCAS were to pursue the construction of an interior compartment levee in the absence of the proposed improvements to the Natomas perimeter levee system, construction activity is unlikely to require full or partial closure of major roadways, and this impact would likely be less than significant.

Without SAFCA's improvements to the levee system to provide 100-year flood protection, the significantly high risk of a levee failure would remain. A levee failure in the Natomas Basin could result in minor to substantial flooding that could affect implementation of emergency evacuation plans. However, the plans are developed to address such events; therefore, the potential for such an occurrence is considered low.

Alt. 1, Alt. 2, Alt. 3

Construction of a cutoff wall along the NCC south levee at the SR 99/70 levee crossing would require shutting down portions of SR 99/70 temporarily and constructing temporary detours in two stages, one for northbound traffic and one for southbound traffic. Temporary closure of the main roadway and the use of detours through the construction zone could cause traffic delays that would interfere with the use of SR 99/70 in this area as an emergency evacuation route should such use be required. Alternatives 1, 2, and 3 would result in a significant effect.

Mitigation Measure 4.18-e: Notify State and Local Emergency Management Agencies about Project Construction and Coordinate SR 99 Detours with These Agencies to Ensure That Any Need for Emergency Use Is Not Significantly Impaired

No-Action Alt.

No mitigation is necessary.

Alt. 1, Alt. 2, Alt.3

SAFCA and its primary contractors for engineering design and construction shall ensure that the following measures are implemented to avoid impairment of the use of SR 99/70 as an emergency evacuation route.

(a) SAFCA shall implement Mitigation Measures 4.12-a, 4.12-b, and 4.12-c.

(b) During project design, SAFCA shall coordinate with California Department of Transportation (Caltrans) to plan detours through the NCC south levee construction area at SR 99/70 that will ensure an acceptable flow of traffic through this area.

(c) Before the beginning of construction, SAFCA shall notify the California Highway Patrol and the Sutter County, Sacramento County, and City of Sacramento emergency management agencies of the timing and nature of detours and traffic controls required on SR 99/70 during project construction. SAFCA shall coordinate with these agencies and Caltrans to ensure that information on potential traffic delays and impairment of the use of this highway as an emergency evacuation route are appropriately publicized, as determined necessary by these agencies.

Impact 4.18-f: Exposure to Wildland Fires

No-Action Alt. Flooding of the basin in the absence of improvements to the perimeter levee system would be unlikely to alter exposure to wildland fires. If SCAS were to pursue the construction of an interior compartment levee in the absence of the proposed improvements to the Natomas perimeter levee system, physical and weather conditions may combine to lead to a high risk of fire hazard, and construction equipment or construction practices could ignite fires that may result in wildland fires and expose people or structures to a significant risk of loss, injury, or death under some circumstances. This potential impact would be significant.

Alt. 1, Alt. 2, Alt. 3 Although no Very High Fire Hazard Severity Zones are located in the project area, and the majority of Sutter and Sacramento Counties is located in either a “nonflammable” or “moderate” zone for wildland fires, the project components would take place in locations where physical and weather conditions may combine to lead to a high risk of fire hazard. Construction equipment or construction practices could ignite fires that may result in wildland fires and expose people or structures to a significant risk of loss, injury, or death under some circumstances. Alternatives 1, 2, and 3 would result in a significant effect.

Mitigation Measure 4.18-f: Prepare and Implement a Fire Management Plan to Minimize Potential for Wildland Fires

No-Action Alt. If the construction of an interior compartment levee for the Airport were pursued in the absence of improvements to the Natomas perimeter levee system, SCAS should implement mitigation similar to that described below for Alternatives 1, 2, and 3 to minimize impacts related to wildland fires to a less-than-significant level.

Alt. 1, Alt. 2, Alt.3 SAFCA and its primary contractors for engineering design and construction shall prepare and implement a fire management plan in coordination with the appropriate emergency service and/or fire-suppression agencies of the applicable local jurisdictions before beginning project construction. The plan shall describe fire prevention and response methods, including fire precaution, fire presuppression, and suppression measures that are consistent with the policies and standards of the affected jurisdictions. All materials and equipment required for implementation of the plan shall be maintained on-site. All construction personnel shall be made familiar with the contents of the plan before construction activities begin.

4.18.3 Unavoidable Significant Adverse Effects

No unavoidable significant adverse effects of Alternatives 1, 2, or 3 were identified. The No-Action Alternative could result in unavoidable significant effects associated with the release of hazardous materials into the environment under flood conditions and increases in the attraction of birds that pose a potential risk of wildlife collisions with aircraft.

5.0 CUMULATIVE AND GROWTH-INDUCING EFFECTS

5.1 CUMULATIVE EFFECTS

A cumulative impact is defined in the Council on Environmental Quality regulations at 40 CFR 1508.7 as follows:

> "Cumulative impact" is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative effects can result from individually minor but collectively significance actions taking place over a period of time.

This section identifies the resources that would be cumulatively affected by the project action alternatives in combination with other actions and assesses the extent of potential cumulative effects.

5.1.1 Geographic Scope of Effects of the Proposed Action and Alternatives

Table 5-1 defines the geographic scope of the effects of the proposed action and alternatives for each of the resource topics addressed in this EIS.

Table 5-1
Geographic Areas that Would Be Affected by the Proposed Action and Alternatives

Resource Area	Geographic Area
Agriculture	Natomas Basin, with regional implications
Land use	Not applicable, because the only potential effects on land use from the proposed project relate to possible inconsistency with land use plans and policies, and inconsistency with policies is not cumulative. Land use is not addressed further in this cumulative impact analysis.
Geology and soils	Individual construction sites and other ground disturbance sites
Hydrology	Drainage system on the west side of the Natomas Basin and individual grading sites
Hydraulics	Sacramento River system
Groundwater	Natomas Basin and local wells
Water quality	Ditches and canals on the west side of the Natomas Basin, with implications for the Sacramento River system
Fisheries and aquatic resources	Habitat at individual waterside improvement sites, with regional implications for species
Sensitive aquatic habitats	Natomas Basin
Terrestrial biological resources	Natomas Basin, with regional implications
Cultural resources	Individual ground disturbance sites, with regional implications
Paleontological resources	Individual ground disturbance sites
Transportation and circulation	Roadway network in the Natomas Basin, with regional implications
Air quality	Regional (FRAQMD and SMAQMD); global for greenhouse gas emissions
Noise	Immediate vicinity of the individual sites of construction activity
Recreation	Local (facilities near construction sites)
Visual resources	Individual levee improvement sites and landscape level
Utilities and service systems	Local service areas
Hazards and hazardous materials	Individual construction and other ground disturbance sites for hazardous materials, Airport for aircraft strike hazards

Notes: Airport = Sacramento International Airport; FRAQMD = Feather River Air Quality Management District; NA = not applicable; SMAQMD = Sacramento Metropolitan Air Quality Management District

5.1.2 Resource Topics for Which Effects of the Proposed Action and Alternatives Would Not Be Cumulatively Considerable

In several resource topics, as described in the subsections below, effects of the proposed action and alternatives would not be cumulatively considerable either because cumulative effects would be beneficial, or because the effects of the proposed action and alternatives would not be added to the effect of other projects (i.e., no cumulative impact would occur) or would be too minor or localized to be cumulatively considerable.

5.1.2.1 Hydraulic Effects. The action alternatives involve improving the Sacramento River east levee, the Natomas Cross Canal (NCC) south levee, and the Pleasant Grove Creek Canal (PGCC) west levee.

As discussed in Section 4.4, "Hydrology and Hydraulics," and in Appendix A, a hydraulic impact analysis was performed to analyze the cumulative effects of combining the proposed action with Federally authorized "early implementation" improvements to Folsom Dam and improvements to the SRFCP's urban levees aimed at providing urban areas outside the Natomas Basin with 200-year flood protection. The analysis was performed using a version of the Sacramento River UNET hydraulic simulation model that was developed by the USACE for the Sacramento and San Joaquin River Basins California Comprehensive Study. The results of this analysis are summarized in Section 4.4, "Hydrology and Hydraulics," and in Appendix A. In summary, the proposed project would not significantly alter water surface elevations in the project area or in the larger SRFCP or contribute cumulatively to any such alteration.

5.1.2.2 Project Effects that Would Not Be Cumulatively Considerable. For the following resource areas, the proposed action and alternatives would not be expected to make a cumulatively considerable contribution to an impact because it is expected that the project effects would not be added to the effects of other projects (i.e., no cumulative impact is expected to occur), or because the project's contribution to any potential cumulative impact would be very minor.

- *Geology and soils:* Grading and other earthmoving activities could result in temporary, localized soil erosion and topsoil loss. These effects would be site specific, particularly with implementation of construction best management practices (BMPs) (Mitigation Measure 4.3-a), and any residual effects are not expected to be additive with the effects of any other activities. Therefore, no cumulative impact would occur.

- *Local drainage:* The widening of levees along the Sacramento River east levee, associated modification of irrigation and drainage infrastructure, and borrow activities on large parcels could interfere with the functioning of drainage systems and alter surface drainage. Project design would incorporate measures to prevent a significant drainage disruption or alteration in runoff patterns (Mitigation Measure 4.4-b), and any temporary effects would be limited to the vicinity of the individual disturbance sites. Therefore, no cumulative impact would occur.

- *Paleontological resources:* Earthmoving activities could damage unknown unique paleontological resources, but potential damage would be limited by implementation of Mitigation Measure 4.11-a, and would be limited to individual resources in discrete locations. Therefore, there would be no cumulative impact.

- *Recreation:* Effects of the proposed action and alternatives on recreational uses would be limited to potential disturbance of access to facilities in the western part of the Natomas Basin during construction, potential temporary degradation in the quality of recreational experiences as a result of construction activity and noise, and potential removal of land at the

City of Sacramento's undeveloped Costa Park site from future recreational use. Because of the temporary nature of the construction effects and the likelihood that any access restrictions or degradation of the quality of recreational experiences would last for less than one construction season in any location, these effects are not considered substantial enough to make a cumulatively considerable contribution to a cumulative impact. The potential encroachment on the Costa Park site would be a localized effect that would likely be minor and that would be offset through compensation in the form of payment or land (Mitigation Measure 4.15-b). Therefore, there would be no cumulative impact on recreation.

- *Utilities and service systems:* Construction may damage irrigation systems and public utility infrastructure, resulting in temporary disruptions to service. Coordination with irrigation system users and consultation with service providers and implementation of appropriate protection measures (Mitigation Measures 4.17-a and 4.17-b) would minimize the possibility that any significant effect would occur. Furthermore, any such incidents would be isolated and would not contribute to a cumulative impact.

- *Hazardous materials:* Mitigation would be implemented to minimize the potential for exposure of people or the environment to hazardous materials encountered during construction activity or to fire hazards (Mitigation Measures 4.18-b and 4.18-f). If hazardous materials are encountered or a fire outbreak occurs, the effects would be localized and would not be expected to be additive with the effects of other projects. Therefore, there would be no cumulative impact related to hazardous materials.

- *Hazards related to Sacramento International Airport (Airport) operations:* The potential for night lighting of project areas to affect aircraft operations is a function of the location of construction areas in relation to the Airport Critical Zone and the runway approaches. Potential effects would be reduced through lighting restrictions and coordination with the Sacramento County Airport System (SCAS) (Mitigation Measure 4.18-c). The potential of the project to increase the possibility of collisions between aircraft and wildlife is a result of the project including broad changes to managed land cover types in or near the Airport Critical Zone. There are no other known projects that would affect lands within the Airport Critical Zone. Therefore, no cumulative impact related to hazards in the Airport vicinity would occur.

5.1.2.3 Resource Topics for Which Effects of the Proposed Action and Alternatives May Be Cumulatively Considerable. The remainder of this chapter focuses on analysis of the potential contributions of the proposed action and alternatives to cumulative effects with regard to the following resource topics that were not addressed in Section 5.1.2.2:

- Agricultural resources
- Groundwater
- Water quality/fisheries and aquatic resources
- Terrestrial biological resources
- Cultural resources
- Transportation and circulation
- Air quality
- Noise
- Visual resources

These are all resource areas in which effects may contribute to cumulative effects on a regional scale. While general trends for Sacramento are described in this section, the discussion of land use planning and projected changes in land use focuses on the Natomas Basin because this is the area of greatest projected urban growth and, therefore, the area with greatest potential for conversion of agricultural land to non-agricultural uses and loss of special-status species habitat.

5.1.3 Planning Context and Projects Considered in the Cumulative Impact Analysis

5.1.3.1 Relevant Land Use Plans and Projections

Population Trends in the Sacramento Area. According to the 2000 U.S. Census Bureau, Sacramento County had a resident population of 1,223,499 persons. Population projections for the county are 1,725,710 by 2025, representing a gain of approximately 502,211 new residents by 2025 and an increase of slightly more than 29%. (Sacramento Area Council of Governments [SACOG] 2005.)

Sutter County had a resident population of 78,930 in 2000. By 2025, the population of Sutter County is projected to reach approximately 137,108 persons. This would be approximately 58,178 new residents and an increase of 42%. (SACOG 2005.)

Sacramento and Sutter Counties and the cities within these counties are facing numerous regional growth issues pertaining to air quality degradation, traffic generation, biological habitat loss, loss of farmland, and other environmental changes related to urban development.

Trends in Agricultural Land Conversion. Information on agricultural land conversion in Sacramento and Sutter Counties was obtained from the Farmland Mapping and Monitoring Program (FMMP) of the California Department of Conservation. These data are the most complete available on this topic and encompass the land use conversions attributable to all development projects.

Table 5-2 shows the recent data compiled by the FMMP on land use conversions involving Prime Farmland, Farmland of Statewide Importance, Unique Farmland, and Farmland of Local Importance ("Important Farmland") in Sacramento and Sutter Counties.

As indicated by a comparison between the net totals for acreage changes and the total changes in acreage attributable to conversion to urban and built-up land, most of the reported conversions of Important Farmland are to FMMP land use categories other than "urban and built-up land." These other areas include "grazing land" and "other land." The majority of the acreage converted to "grazing land" was agricultural land being fallowed. "Other land" may include uses such as feedlots and other rural uses, low-density rural residential, government lands, and road systems. Gains in Important Farmland in this region are often the result of "grazing land" and "other land" being converted to vineyard use.

Land Use Plans. Most of the undeveloped lands in the Sacramento Metropolitan area, where future development would occur, are in the Natomas Basin. These lands have been identified in the City and County of Sacramento and Sutter County general plans and additional planning policy documents described below as the areas most suitable for urban growth.

- *North Natomas Community Plan*: The approximately 9,038-acre *North Natomas Community Plan* (NNCP) area is designated in the City of Sacramento's general plan as the city's major growth area for new housing and employment opportunities. The NNCP area is bounded by Elkhorn Boulevard to the north, Interstate 80 (I-80) to the south, the Natomas East Main Drainage Canal (NEMDC)/Steelhead Creek to the east, and the Natomas West Drainage

Table 5-2 Land Use Conversions Involving Important Farmland		
Changes in Important Farmland	**Sutter County (Acres)**	**Sacramento County (Acres)**
Total Acreage of Important Farmland Inventoried		
1992	308,518	239,536
1994	307,857–307,935[1]	238,983–239,064[1]
1996	306,865–306,864[1]	237,104–237,175[1]
1998	306,144–306,167[1]	236,940–236,943[1]
2000	301,291	234,120
2002	295,696	226,476
2004	293,429	221,480
2006	292,256	NA[2]
Total Losses and Gains of Important Farmland		
1992–1994	-1,293 + 632 = 661 net loss	-1,986 + 1,433 = 553 net loss
1994–1996	-1,341 + 271 = 1,070 net loss	- 4,535 + 2,575 = 1,960 net loss
1996–1998	-1,579 + 859 = 720 net loss	- 16,773 + 16,538 = 235 net loss
1998–2000	-7,491 + 2,615 = 4,876 net loss	- 15,163 + 12,340 = 2,823 net loss
2000–2002	-6,905 + 1,425 = 5,480 net loss	-9,338 + 7,883 = 1,455 net loss
2002–2004	-2,945 + 703 = 2,242 net loss	-10,046 + 5,005 = 5,041 net loss
2004–2006	-1,798 + 630 = 1,168 net loss	NA[2]
Amount of Important Farmland Converted to Urban and Built-Up Land		
1992–1994	338	772
1994–1996	166	1,478
1996–1998	54	1,766
1998–2000	547	3,473
2000–2002	649	1,335
2002–2004	388	3,645
2004–2006	205	NA[2]

[1] Total number of acres inventoried for these years differs between Farmland Mapping and Monitoring Program reports because of changes in mapping methods.

[2] The Sacramento County Important Farmland Mapping for 2004–2006 for Sacramento County is currently in progress.

Sources: California Department of Conservation 1996a, 1996b, 1998a, 1998b, 2000, 2002a, 2002b, 2004a, 2004b, 2006a, 2006b

Canal and State Route (SR) 99/70 to the west. Development within the NNCP area started in 1999. At buildout (year 2016), the NNCP estimates a population of 66,495 in the NNCP area occupying approximately 9,038 acres (City of Sacramento 1996). The environmental consequences of buildout of the NNCP were addressed in the 1986 NNCP environmental impact report (EIR) (certified by the Sacramento City Council in May 1986) and the 1993 Supplement to the 1986 NNCP EIR, which identified significant and unavoidable effects related to agriculture; traffic; air quality; species habitat, including Swainson's hawk foraging

habitat; noise; drainage, groundwater, and water quality; and flooding potential (City of Sacramento 1994).

- *Natomas Joint Vision Plan*: The *North Natomas Joint Vision Plan* (Joint Vision) (City of Sacramento 2006) is a long-term agreement between the City and County of Sacramento to collaboratively manage growth and preservation of open space and habitat in the 10,000-acre portion of unincorporated Natomas in Sacramento County. The area is north of the Sacramento city limits and generally bounded by Sutter County on the north, the Sacramento River on the west, and the NEMDC/Steelhead Creek on the east. Approximately 28% of this area is developed, and the Joint Vision anticipates that a substantial portion of the Natomas Basin will become urbanized. A specific land use plan has not been developed, but general concepts have been considered. In general, the preferred land use scenario for the Joint Vision area consists of a mixture of residential densities, an industrial park adjacent to the eastern edge of the Airport, and open spaces in the northern extent separating development from the Sutter County boundary. The Greenbriar project site (see below) is within the Joint Vision area.

- *Sacramento Area Council of Governments (SACOG) Sacramento Region Blueprint*: The "Blueprint" is a preferred scenario for regional growth in the Counties of El Dorado, Placer, Sacramento, Sutter, Yolo, and Yuba. The Blueprint is intended to serve as a framework to guide local government planning for orderly growth of population and transportation systems and integrates smart growth concepts such as higher-density developments. The Blueprint assumes extensive development in the Natomas Basin. For more details, see Section 5.2, "Growth Inducement."

- *South Sutter County Specific Plan and Measure M*: In 1996, the Sutter County Board of Supervisors identified a 10,500-acre South Sutter County Industrial/Commercial (SSCI/C) Reserve in the *Sutter County General Plan.* The SSCI/C Reserve is in Sutter County adjacent to the Sacramento County boundary. Sutter County began development in 2004 of a 3,500-acre specific plan area within the SSCI/C Reserve. In 2004, Sutter County voters also passed Measure M, an advisory measure providing guidance on the type of development preferred for a 7,500-acre portion of the SSCI/C Reserve area: at least 3,600 acres for commercial/ industrial uses, at least 1,000 acres for public and retail uses, and no more than 2,900 acres for residential development. The *Sutter Pointe Specific Plan* area (see below) is within the SSCI/C Reserve.

- *Natomas Basin Habitat Conservation Plan (NBHCP)*: The NBHCP (City of Sacramento, Sutter County, and The Natomas Basin Conservancy 2003) was developed to promote biological conservation in conjunction with expected economic and urban development in the Natomas Basin. The NBHCP establishes a multispecies conservation program 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 in the basin. The NBHCP currently authorizes take associated with 17,500 acres of urban development in southern Sutter County and within the City and County of Sacramento, with effects on habitat to be offset by the protection of 8,750 acres of habitat preserve land. As development is approved within the development areas covered under the NBHCP, developers pay mitigation fees to The Natomas Basin Conservancy (TNBC), the nonprofit "plan operator" of the NBHCP. TNBC uses the funds to acquire, establish, enhance, monitor, and manage mitigation lands in perpetuity. As of January 2006, nearly 4,000 acres of mitigation property had been acquired in the Natomas Basin (TNBC 2006).

5.1.3.2 Related Projects in the Natomas Basin. The major past projects in the project area (generally the northern and western boundaries of the Natomas Basin) are development of the Airport and Teal Bend Golf Club; residential development along Garden Highway and county roads; and numerous projects within the Sacramento city limits that make up the urbanized portion of the Natomas Basin south of Elkhorn Boulevard and west of Powerline Road. Other relevant completed projects are components of the plans described in the previous section (e.g., development within the NNCP area). These past projects have reduced the acreage of agricultural land and natural habitats in the basin.

Present and future projects are those projects that are currently under construction or are in various stages of planning but that have yet to break ground. Some of these projects are planned to be under construction during the period in which SAFCA's proposed action would be under construction (2008–2010), while others are expected to be developed after 2010. The following projects are organized into five categories:

- SAFCA Natomas Levee Improvement Program (NLIP) elements,
- other flood control system improvements,
- Sacramento International Airport Master Plan elements,
- development projects, and
- utility infrastructure projects.

SAFCA Natomas Levee Improvement Program (NLIP). In addition to the proposed Landside Improvements Project evaluated in this EIS, the NLIP includes NCC south levee improvements completed in 2007, post-2010 seepage remediation projects, and erosion control projects.

NLIP Natomas Cross Canal South Levee Phase 1 Improvements. In fall 2007, SAFCA completed improvements to correct seepage potential in the western portion of the NCC south levee and northernmost 500 feet of the Sacramento River east levee. The improvements consisted of the construction of a seepage cutoff wall through the levee and reconstruction of the levee. This work did not require the conversion of any agricultural land or habitat loss. Because of the movement of a large quantity of soil material and operation of heavy equipment, it did have substantial temporary air pollutant emissions in 2007 and temporary noise effects on the few nearby residences.

Post-2010 NLIP Seepage Remediation Projects. Completion of the "200-year" level of protection for the Natomas Basin flood control system will require constructing seepage remediation along some reaches of the Sacramento River east levee and the American River north levee that is in addition to the seepage remediation included in the proposed action and alternatives analyzed in this EIS. This work would be undertaken after completion of the improvements necessary to achieve the 100-year level of protection in 2010. The work is not currently proposed or designed but is a necessary part of the overall program to provide a "200-year" level of protection to the Sacramento area. It is anticipated that along the Sacramento River east levee, cutoff walls will be required in Reaches 5B, 11A, and 11B. Along the American River north levee, the anticipated through-seepage remediation is an internal layer of drain rock that would be built in the landside slope of the existing levee. This would require the excavation of the levee slope, followed by the installation of the drainage layer and the reconstruction of the levee. The American River north levee improvements would include a combination of internal drains and slope flattening along a total of 11,850 feet of levee. Construction activities would be similar to those described for the proposed action but would be on a much smaller scale.

Erosion Control Projects. In addition, improvements may be implemented at as many as nine erosion sites on the east (left) bank of the Sacramento River between River Mile (RM) 69 (upstream of the confluence with the American River) and RM 79 (the confluence with the NCC). Construction would take place between April 1 and October 15 during one or more construction seasons after 2010.

The improvements would stabilize the banks to ensure that the levees are not eroded during a large flood event. Toe stabilization would arrest retreat of the emergent upper bank and stop the reduction in berm width, thereby preventing loss of extensive mature riparian vegetation, destabilization of the levee foundation, and shortening of seepage pathways under the Sacramento River east levee. As described in Chapter 2, "Alternatives," if Alternative 2 were selected for implementation, erosion control improvements at three of the nine sites identified above (Sites G, J, and M) along the waterside toe of the Sacramento River east levee would likely be needed to ensure that 100-year protection would be achieved.

If trucks, rather than barges, are used to deliver construction materials to the bank protection sites, the bank protection project could result in a moderate level of increased truck traffic on some of the local roadways. Residents of waterside homes near bank protection construction sites would be exposed to audible noise from construction.

Other Flood Control System Improvements. Other relevant current and anticipated improvements to the flood control system include SAFCA's long-term levee integrity program and State/Federal repairs to critical erosion sites.

SAFCA Levee Integrity Program. As part of its long-term program to improve the Natomas Basin levee system, SAFCA expects to continue waterside and landside levee strengthening efforts, including increasing bank protection, levee armoring, levee toe stabilization, and flattening of landside levee slopes to a 5:1 horizontal-to-vertical (5H:1V) profile. The intention is to adapt the future flood control system as needed to changing hydrologic and floodplain conditions (e.g., changes in hydrology resulting from global climate change, increases in the amount of damageable property protected by the levee system).

Construction activities would be similar to those evaluated in this EIS for the proposed action and alternatives. However, specific construction activities are not yet planned, designed, or funded, and their timing is not known. The potential landside slope modifications would be within the boundaries of the maintenance access area that is included in the project described in this EIS. Where this land is currently in agricultural use, it would be converted to grassland in the near term, and building out the 5H:1V landside slope would not change the land cover type. However, where the 5:1 landside slope would overlap areas that contain woodland groves, the trees would be removed.

California Department of Water Resources/U.S. Army Corps of Engineers Repairs to Critical Erosion Sites. On February 24, 2006, Governor Arnold Schwarzenegger declared a state of emergency for California's levee system. Soon after, he signed Executive Order S-01-06, directing the California Department of Water Resources (DWR) to identify and repair eroded levee sites on the State/Federal levee system to prevent catastrophic flooding and loss of life. To date, nearly 250 levee repair sites have been identified, and more than 100 of the most critical sites have been completed. Two of these sites are along the bank of the Sacramento River east levee between the NCC and the American River. Rock toe protection has been installed at these sites. These improvements do not overlap temporally with construction for the proposed action and alternatives.

Sacramento International Airport Master Plan. The Sacramento International Airport Master Plan (SMF Master Plan) covers planned Airport improvements through 2020. The EIR for the SMF Master Plan was certified and the project approved in August 2007. The master plan includes three phases, as described below. The new facilities are planned to be constructed within the boundaries of existing Airport property, which totals approximately 5,670 acres, 2,300 acres of which are currently developed.

Development of the majority of the planned facilities will be within the existing Airport Operations Area, with some of the planned facilities to be developed on land historically in agricultural production. Most lands outside the current Airport Operations Area provide foraging habitat of varying quality for a variety of wildlife species and that the facility expansion would reduce the overall availability of such habitat in the western portion of the Natomas Basin. The SMF Master Plan EIR estimates that 190 acres of Swainson's hawk foraging habitat would be converted to developed uses in Phases 1 and 2 of master plan buildout. Construction of some of the planned facilities is likely to coincide with construction of the project analyzed in this EIS in 2008–2010; as a result, some temporary construction-related effects (particularly construction traffic and air quality effects) could combine with those of the proposed action or a project alternative.

SMF Master Plan Phase 1 (2007–2013). Phase 1 of the SMF Master Plan includes the following features:

- New landside passenger terminal (Terminal B)
- New airside concourse (Concourse B, accommodating a total of 23 aircraft gates) and aircraft apron
- Hotel/parking garage
- New parallel Taxiway Y
- New full-length parallel Taxiway A, hold pads, and high-speed taxiway exits for Runway 16R/34L (west runway)
- New airport traffic control tower north and west of Cy Homer Road and airport, airfield, and equipment maintenance buildings
- General aviation area including corporate hangars, fixed base operator facility, and apron
- Expanded surface rental car parking lot between Airport Boulevard and Earhart Drive
- Expanded rental car terminal facility east of Airport Boulevard and McNair Circle
- Extension of Elkhorn Boulevard from Metro Air Park to Airport Boulevard
- Surface employee parking lot north of Interstate 5 (I-5) and west of Airport Boulevard to accommodate 1,500 automobile parking spaces
- New remote economy parking and rental car overflow facility south of I-5 to accommodate 13,800 automobile parking spaces
- Extension of Airport Boulevard to the new parking facility
- New ground-service equipment maintenance building east of Aviation Drive
- New community fire station at the northwest corner of Lindbergh Drive and Crossfield Drive

- Acquisition of two areas (48 acres and 313 acres) north of I-5 for buffers

SMF Master Plan Phase 2 (2014–2020). Phase 2 of the SMF Master Plan includes the following features:

- Expansion of landside Terminal B to create a centralized landside terminal, with addition of four gates along Concourse B and a new Terminal B parking garage

- Extension of Terminal A concourse piers to accommodate four additional aircraft gates, and a 2,400-foot extension of Runway 16L/34R (east runway) to provide a total runway length of 11,000 feet

- Addition of a localizer, instrument landing system glide slope, and high-intensity approach lighting system with sequenced flashing lights for new instrument landing system approach to Runway 16L/34R perpendicular taxiway exits for parallel Taxiway A

- Addition of a full-length parallel Taxiway E, hold pads, and high-speed taxiway exits for Runway 16L/34R, new north crossfield Taxiway Z (north of Taxiway Y), terminal apron near Terminal A, air cargo building and air cargo apron with a taxiway connector to the end of Runway 16L/34R, Aircraft Rescue & Fire Fighting building north of Cy Homer Road and west of Earhart Drive

- Extension of Cy Homer Road to both existing runways

- Relocation of Elverta Road to avoid the Runway 16L/34R Runway Protection Zone

- Commercial development on approximately 79 acres south of I-5

- Placement of ditches within culverts and pipes in the Runway Protection Zone and road areas

- New 8,600-foot runway parallel to and 1,200 feet west of existing Runway 16R/34L

- New concourse to serve the third runway

- Light rail and/or bus rapid transit service to passenger terminals

- Commercial development on approximately 77 acres north of I-5 and east of Airport Boulevard, and approximately 135 acres north of existing Elverta Road

SMF Master Plan Phase 3 (After 2020). Phase 3 of the SMF Master Plan includes the following conceptual features:

- A new 8,600-foot-long runway parallel to and 1,200 feet west of the existing west runway (Runway 16R/34L)

- A new passenger concourse to support this new runway

- Commercial development on approximately 137 acres north of the existing alignment of Elverta Road between the existing parallel runways and on about 77 acres north of I-5 and east of Airport Boulevard

- Construction of a light rail line into the airport terminal complex

Development Projects. Described below are the four major Natomas Basin development projects that have been approved or are under study.

Camino Norte Project. The Camino Norte/Leona Circle project area—generally located east of El Centro Road south of Arena Boulevard—has been proposed by the City of Sacramento as Phase 1 of the more extensive Sphere of Influence amendment for the Joint Vision area. There is no development application for this project for this project. The concept is to develop the approximately 400-acre area for residential and commercial uses. Preparation of an EIR for the Camino Norte Sphere of Influence Amendment began in 2007 (Mende, pers. comm., 2007).

If developed, this project would convert land historically in row crops to nonagricultural uses.

Greenbriar. Greenbriar is a proposed 577-acre, mixed-use project proposed for the northwest corner of the intersection of I-5 and SR 99/70. The Greenbriar project site lies 1 mile east of the Airport and is bounded on the north by Elkhorn Boulevard and on the west by the Lone Tree Canal. The site, which is included in the Joint Vision area, is zoned agricultural and is located outside the Sacramento city limits and Sacramento County's Urban Services Boundary. The development would include nearly 3,500 residential units, about 50 acres of commercial development, a 10-acre elementary school, about 50 acres of neighborhood parks, and a 40-acre lake for stormwater retention. The project would include two connections with SR 99/70—the existing Elkhorn Boulevard and a new east/west thoroughfare, Meister Way, which would require creation of a new interchange just north of the I-5 exit. The final EIR for the Greenbriar project was issued in August 2007.

Implementation of the project would result in the conversion of 577 acres of Important Farmland historically rotated between rice, alfalfa, wheat, and row crops to nonagricultural uses. A project-specific habitat conservation plan (HCP) is being developed to address the mitigation requirements for effects of the project on special-status species and habitats, particularly Swainson's hawk foraging habitat and giant garter snake habitat (City of Sacramento and Sacramento Area Local Agency Formation Commission 2007).

Sutter Pointe Specific Plan. The *Sutter Pointe Specific Plan* area encompasses approximately 7,500 acres in southeastern Sutter County within the SSCI/C Reserve described above. The site is generally bounded by Natomas Road on the east, the Sacramento/Sutter County line on the south, and, at its westernmost point, Powerline Road; the northern boundary is approximately 4 miles north of the Sacramento-Sutter County line. SR 99/70 divides the southern portion of the specific plan area and serves as the western boundary of its northern portion. The *Sutter Pointe Specific Plan* is a mixed-use project that combines industry, commerce, housing, open space, and civic and associated uses. Buildout of the proposed project would be split into five residential/mixed-use development phases and five employment center development phases and is anticipated to occur over approximately 30 years.

Development of this specific plan area would convert land historically in a mixture of agricultural row crops to nonagricultural uses. An EIR for the *Sutter Pointe Specific Plan* is in preparation.

Metro Air Park Specific Plan. The *Metro Air Park Specific Plan* area encompasses 1,887 acres just east of the Airport on the north side of I-5. The specific plan area is bordered by Elverta Road to the

north, Lone Tree Road to the east, Bayou Way to the south, and Powerline Road to the west. The following land uses are proposed for Metro Air Park: light manufacturing (551 acres), airport related (277 acres), office (682 acres), and recreation/open space (275 acres). However, no development plans had been submitted at the time of preparation of this EIS. Metro Air Park cannot be redesignated for residential use because of its proximity to the Airport, and the HCP for Metro Air Park requires that the land be used in agriculture until developed.

Utility Infrastructure Projects. Anticipated major utility projects include water intake diversion consolidation and screening, transmission line construction, transportation system extensions, water supply improvements, and sewer system expansions.

American Basin Fish Screen Habitat Improvement Project. This project involves the consolidation of diversions and the addition of state-of-the-art fish screens to Natomas Central Mutual Water Company's (NMWC's) diversions on the Sacramento River between Verona and the American River, and on the NCC. The specific objectives of the project are to remove migration barriers; prevent straying and entrainment of winter-run chinook salmon, spring-run chinook salmon, fall-run chinook salmon, late fall–run chinook salmon, steelhead trout, splittail, green sturgeon, and other high-risk species; and to improve aquatic, riverine, and riparian habitat. As part of this project, NMWC would construct the Sankey diversion, a screened intake and pumping plant in Reach 1 of the Sacramento River east levee at the proposed realignment of the Sankey Road intersection with Garden Highway. Construction would take place on both sides of the levee.

The timing of the Sankey diversion project has not yet been established. The land use conversion that would be required at the intake site is already assumed in the proposed action and alternatives evaluated in this EIS as part of the land acquisition for the Sankey Road/Garden Highway intersection realignment, shown in **Plate 20a**.

Western Area Power Administration Transmission Line/Sacramento Area Voltage Support Project. The Western Area Power Administration of the U.S. Department of Energy, the Sacramento Municipal Utility District (SMUD), and the City of Roseville are proposing to construct and operate approximately 38 miles of 230-kilovolt (kV), new double-circuit transmission line in the Sacramento area. A joint supplemental environmental impact statement (SEIS) and EIR were prepared for this project in 2003. Segments of the line would run along established roadways in the Natomas Basin; alternative alignments have been identified for these segments.

The draft SEIS/EIR estimated that in the Natomas Basin, the project would permanently affect up to 17 acres of Prime and Unique Farmland, approximately 19 acres of rice, 1.4 acres of riverine/riparian habitat, up to 0.3 acre of riverine/riparian habitat, 1 acre of vernal pools, and up to 1.4 acres of emergent wetlands (WAPA 2007).

Placer Parkway Corridor Preservation Project. The Placer Parkway Corridor Preservation Project is a proposal to identify and preserve an approximate 15-mile-long, 500- to 1,000-foot-wide corridor between SR 65 and SR 99/70 for future development of a roadway that would connect State Route (SR) 65 in the Lincoln/Roseville/Rocklin area to SR 99/70 in Sutter County and the Airport (Placer Parkway Corridor Preservation 2007). The draft EIS/EIR for the Tier 1 corridor assessment is expected to be released in 2007. Design and construction have not been funded. Implementation is anticipated by 2020. (Placer Parkway Corridor Preservation 2007.)

The proposed corridor would occupy 90–180 acres, approximately ¼ of which (22–45 acres) would be in the Natomas Basin, on land currently in agricultural use.

Downtown Natomas Airport Light Rail Transportation Project. A 13-mile, 13-station light rail transit corridor would extend from downtown to the Airport, serving the future Railyards development and Regional Intermodal Facility, the Richards Boulevard Redevelopment Area, and the communities of South and North Natomas (Sacramento RT 2006). Extension of the light rail into Natomas is not anticipated to occur until after 2012.

Sacramento Municipal Utility District Power Line–Elkhorn Substation Capacity Expansion Project. SMUD plans to expand an existing distribution substation located on Powerline Road (approximately 1.25 miles north of I-5) along the east side of the Airport in northern Sacramento County. The proposed Power Line–Elkhorn Substation Capacity Expansion Project would increase the capacity of the substation from 16.25 MVA to 50 MVA, mainly to serve the Airport's terminal modernization and demand from Metro Air Park development (SMUD 2007).

The project would increase the footprint of the substation by approximately 0.5 acre.

Sacramento River Water Reliability Study. The U.S. Bureau of Reclamation and Placer County Water Agency in 2002 initiated the Sacramento River Water Reliability Study on behalf of cost-sharing partners—the City of Roseville, the City of Sacramento, and Sacramento Suburban Water District—to develop a water supply plan that would use a Sacramento River diversion to meet water supply needs of the Placer-Sacramento region. The plan would include water supply infrastructure components, water treatment and pumping facilities, storage facilities, and major transmission and distribution pipelines. The study will include a feasibility study and an EIS/EIR for identified water supply alternatives as the basis for seeking necessary biological opinions and permits from the responsible resource agencies to allow execution of necessary agreements and construction of the recommended water supply infrastructure.

The final version (March 2005) of the Initial Alternatives report for the study identified an Elverta Diversion Alternative and recommended it for further study. The alternative would pump water from the Sacramento River near Elverta Road and Garden Highway to a new treatment facility north of the Airport. After treatment, the water would be transported via pipeline to areas east of the Natomas Basin. It is anticipated that the intake and water treatment plant would be owned and operated by the City of Sacramento. No project-specific analysis has been prepared yet for any of the alternatives identified in the study.

Upper and Lower Northwest Interceptor Projects. These projects are managed by the Sacramento Regional County Sanitation District. The Upper Northwest Interceptor (UNWI) is an underground sewer interceptor—a large sewer pipeline—that extends approximately 20 miles from Orangevale to Natomas. When complete, the UNWI pipeline will carry wastewater flows from northeast Sacramento County to the new Natomas Pump Station located near the junction of I-5 and I-80. All segments of the UNWI are expected to be complete by 2010. The Lower Northwest Interceptor (LNWI) conveys flows from the Natomas Pump Station to the Sacramento Regional Wastewater Treatment Plant in Elk Grove. The LNWI alignment is approximately 20 miles long and begins at the existing Natomas Pump Station in northwestern Sacramento County and ends at the SRWTP in southern Sacramento County. The LNWI was completed in 2007.

5.1.4 Analysis of Cumulative Effects

Many of the projects described in Section 5.1.3.2 would permanently disturb undeveloped land that is currently in agricultural use or that has recently been in agricultural use. These projects would have cumulative significant effects on agricultural resources through the conversion of Important Farmland (Prime Farmland, Farmland of Statewide Importance, and Unique Farmland) to nonagricultural uses.

These land conversions also have the potential to cause permanent adverse cumulative effects on terrestrial special-status species for which these lands provide habitat. However, federal and state resource agency approvals of these projects would depend on their ability to offset effects on species through the provision of preserved or enhanced habitats. Given the abundance of prehistoric archaeological resources in the Natomas Basin, all projects with ground-disturbing components have the potential to damage or destroy known or previously unknown buried cultural materials and contribute to a significant cumulative loss of cultural resources. Construction projects conducted simultaneously could combine to have temporary cumulative air quality, noise, and/or traffic effects. The following subsections discuss the potential for the project action alternatives to make cumulatively considerable contributions to these cumulative effects.

5.1.4.1 Agricultural Resources

Alternative 1 – Adjacent Setback. Implementation of the project would involve the conversion of large acreages of Important Farmland (Prime Farmland and Farmland of Statewide Importance) to managed marsh and managed grassland at borrow sites, and would entail the conversion of portions of agricultural parcels to nonagricultural uses at levee toe widening, berm, and new canal alignment locations. Borrow operations would include retaining the top soil on the parcels used for borrow, such that the physical ability of these lands to support future agricultural uses would not be lost. Nevertheless, the intention is to convert some of these lands to managed habitat, much of which (managed marsh) would not be considered an agricultural use. Approximately 400–520 acres and 855 acres of agricultural land are expected to be converted to nonagricultural uses in the 2008 and 2009–2010 construction phases, respectively, as a result of implementation of Alternative 1. Of the 400–520 acres converted in 2008, approximately 225 acres would be converted in the Airport north bufferlands for borrow removal and conversion to managed habitats. Of the 855 acres converted in 2009–2010, approximately 405 acres in the Airport bufferlands and 120 acres in the Fisherman's Lake area would be converted for borrow removal and conversion to managed habitats.

The Natomas Basin has already experienced the conversion of a substantial area of agricultural land, much of it Prime Farmland and other categories of Important Farmland, to residential and commercial development. The Natomas Basin is the focus of much of the growth planning in the Sacramento area, in both Sutter County and Sacramento County, and significant losses of Important Farmland to urban development are expected to continue in this area. As noted in Section 3.3.1, "Agricultural Resources," Important Farmland in the Natomas Basin totaled approximately 42,000 acres in 2004, the last year for which California farmland mapping data are available, representing 8% of the total of approximately 515,000 acres of Important Farmland mapped by the Farmland Mapping and Monitoring Program in Sutter and Sacramento Counties in 2004. Of this amount, approximately half is expected to be converted to developed uses and half maintained in agriculture or in a condition compatible with future agricultural use (i.e., undeveloped) within TNBC parcels, Airport bufferlands, lands anticipated to be maintained in an undeveloped condition as part of the Joint Vision, and land managed by SAFCA. The loss of an additional approximately 21,000 acres in the Natomas Basin would continue an overall trend of net loss of Important Farmland that has been documented in Sutter and Sacramento Counties for each consecutive 2-year interval of mapping by the California Department of Conservation from 1992 through 2006 (see **Table 5-2**). As described elsewhere in this EIS, development of land in the Natomas Basin is consistent with the regional land use planning effort (the Sacramento Area Council of Governments Preferred Blueprint, discussed in Section 5.2.4) and the emerging State Plan of Flood Protection (described in Section 5.,2.5), which promote the concentration of urban growth within the borders of existing cities and their immediate adjacent areas, including the Natomas Basin specifically, and discourage both sprawling development and development expansion into existing non-urbanized floodplains that would result in greater regional conversion of agricultural land to nonagricultural uses. (See Sections 2.1.1.2, "Reduced Natomas Urban Levee Perimeter"; 5.2, "Growth Inducement;" 6.1.10, "Executive Order 11988,

Floodplain Management;" and 6.1.13, "Farmland Protection Policy Act" for more discussion of this issue.)

Nevertheless, Alternative 1 would result in the conversion of agricultural land to non-agricultural uses and, in combination with the conversions of Important Farmland in the Natomas Basin associated with past, current, and future projects, is considered to contribute to the significant cumulative conversion of Important Farmland to nonagricultural uses.

Alternative 2 – Raise in Place plus 1,000-Foot Setback. Construction of the 1,000-foot setback levee would convert a 150-acre area of Important Farmland to nonagricultural use in the levee setback area, however the narrower footprint of the raise in place method of addressing levee freeboard deficiencies would reduce the farmland conversion associated with Alternative 1 by a similar amount. Therefore, the contribution of both alternatives to the cumulative loss of Important Farmland would be similar.

Alternative 3 – Adjacent Setback plus 500-Foot Setback. Construction of the 500-foot setback levee would convert a 75-acre area of Important Farmland to nonagricultural use, compared to about 35 acres under Alternative 1. However, the setback levee area would account for a part of the woodland planting area required for the project, reducing the amount of land needed for woodland planting by about 40–50 acres. All other components of the footprint of this alternative (canal footprints and borrow acreage) would be substantially the same. Overall, the amount of farmland conversion would be approximately the same asunder Alternative 1. Therefore, the contribution of Alternative 3 to the cumulative loss of Important Farmland would be similar to both Alternative 1 and Alternative 2.

5.1.4.2 Groundwater

Alternative 1 – Adjacent Setback. Implementation of the project would involve the construction of cutoff walls along the NCC south levee and Reaches 2 and 3 of the Sacramento River east levee during the 2008 construction phase. As described in Section 4.4, "Hydrology and Hydraulics," the cutoff walls proposed for the 2008 phase of construction are not expected to have a significant adverse effect on groundwater recharge in the Natomas Basin or local wells; however, for the 2009 and 2010 construction phases, cutoff walls may be used for seepage remediation in as many as 12 additional reaches of the Sacramento River east levee south of Reach 4B, and it is possible that these cutoff walls may have a significant effect on groundwater recharge and local well yields. It is unlikely that other projects described above would substantially adversely affect groundwater recharge, although as lands are converted from agricultural use to developed uses, some reduction in groundwater recharge from deep percolation of irrigation water can be expected. Mitigation Measure 4.4-c requires SAFCA to conduct detailed evaluation of potential groundwater effects from using cutoff walls during the 2009 and 2010 construction phases, to consider the effects in conjunction with the existing and future basin water budget, and to remediate effects accordingly. This mitigation applies to the potentially significant cumulative impact as well as the direct impact described in Section 4.4.

Alternative 2 – Raise in Place plus 1,000-Foot Setback. The cumulative contribution of Alternative 2 to cumulative effects on groundwater would be similar to that of Alternative 1.

Alternative 3 – Adjacent Setback plus 500-Foot Setback. The cumulative contribution of Alternative 3 to cumulative effects on groundwater would be similar to that of Alternative 1.

5.1.4.3 Water Quality/Fisheries

Construction activities have the potential to temporarily degrade water quality and fish habitat through the direct release of soil and construction materials into water bodies or the indirect release of contaminants into water bodies through runoff. Other projects, including the extensive array of development projects anticipated in the Natomas Basin and SAFCA's bank protection project, would have a similar potential to release materials into watercourses that support fish. In addition, vegetation that may provide shaded riverine aquatic (SRA) habitat would be removed under all alternatives. As noted in Section 3.3.6.1, "Fish Species Found in the Channels Bordering the Natomas Basin," modifications of the channels bordering the Natomas Basin have resulted over time in homogenous, trapezoidal channels lacking in-stream structure with narrow and sparse bands of riparian vegetation that provide only limited SRA habitat functions and limited recruitment of large woody debris. Combined, these alterations have resulted in marginal habitat conditions that provide only limited habitat functions for most native fish species.

Alternative 1 – Adjacent Setback Levee. The implementation of BMPs and adherence to the conditions of a storm water pollution prevention plan (Mitigation Measure 4.5-a) would ensure that the requirements of the Clean Water Act and Porter-Cologne Water Quality Control Act are met. Given the temporary nature of any effects and the protections afforded by regulatory programs under the Clean Water Act and Porter-Cologne Water Quality Control Act, any degradation of surface waters by construction activities of Alternative 1 and other projects would be minimized. Consequently, the potential effects of project construction on water quality are not expected to contribute to a cumulative impact on water quality, fish habitat, or aquatic species.

The proposed improvements along the NCC south levee would include waterside slope stabilization activities (flattening of oversteepened areas of the waterside slope) that would require the removal of small amounts of vegetation, some of which may constitute a loss of SRA habitat. Given the small amount of habitat involved, adherence to Section 1602 (California Fish and Game Code) permit conditions (Mitigation Measure 4.6-b) would limit potential disturbance to fish habitat associated with levee improvements on the water side of the NCC and would ensure that restoration, rehabilitation, and/or replacement of any affected channel habitat would result in no net loss of SRA habitat. Other projects in the Natomas Basin would be required to implement similar measures to prevent adverse effects.
In addition, SAFCA's bank protection project would incorporate features that would compensate for temporary effects on SRA habitat and result in long-term increases in nearshore and SRA cover values relative to pre-project conditions. Consequently, Alternative 1 would not contribute to a cumulative impact on fish habitat.

Alternative 2 – Raise in Place plus 1,000-Foot Setback. Alternative 2 would include the same improvements as Alternative 1 along the NCC south levee and the PGCC west levee. Along the Sacramento River east levee, Alternative 2 would have a narrower landside levee improvement footprint than Alternative 1 except in the area where the setback levee would be located. The setback levee would be designed to enhance the shallow flooded habitat seasonally available to fish in the Sacramento River. Under this alternative, erosion control improvements would be implemented along approximately 3,710 feet of river bank at River Miles 73.5, 69.8 and 68.8 (Sites G, J, and M) along the Sacramento River east levee. Construction of these improvements would require tree removal and trimming of canopies of other trees growing on the eroding bank, resulting in a short-term reduction in riparian canopy providing overhead SRA cover of approximately 0.5 acre. However, approximately 3.44 acres of riparian habitat would be installed at the erosion sites under this alternative, resulting in an expected net change in riparian habitat at those sites of +2.94 acres over a 5-year period. Direct and cumulative impacts resulting from construction of the setback levee and the erosion control improvements would be avoided through the design of the improvements and through implementation of BMPs and adherence to the conditions of a storm water pollution prevention plan (Mitigation Measure 4.5-a) would ensure that the requirements of

the Clean Water Act and Porter-Cologne Water Quality Control Act are met. Adherence to Section 1602 (California Fish and Game Code) permit conditions (Mitigation Measure 4.6-b) would limit potential disturbance to fish habitat associated with the project improvements and would ensure that restoration, rehabilitation, and/or replacement of any affected channel habitat would result in no net loss of SRA habitat.

However, removal of approximately 35 acres of woody vegetation from the water side of the Sacramento River east levee to conform with USACE guidance regarding levee encroachments could have a substantial effect on SRA habitat along this levee. The loss of SRA habitat and reduction in input of woody debris associated with this removal could be a significant contribution to historical loss; it is unknown whether adequate mitigation could be provided to compensate for this impact.

Alternative 3 – Adjacent Setback plus 500-Foot Setback. Alternative 3 would involve substantially the same improvements as Alternative 1 except in the area where the setback levee would be located. As in Alternative 2, the setback levee would be designed to enhance the shallow flooded habitat seasonally available to fish in the Sacramento River. Direct and cumulative impacts resulting from construction of the setback levee would be avoided through the design of the improvements and through implementation of BMPs and adherence to the conditions of a storm water pollution prevention plan (Mitigation Measure 4.5-a) would ensure that the requirements of the Clean Water Act and Porter-Cologne Water Quality Control Act are met. Effects on SRA habitat, and applicable mitigation, would be as described for Alternative 1.

5.1.4.4 Sensitive Aquatic Habitats

The project would include excavation and the placement of fill in sensitive aquatic habitats, resulting in both temporary and permanent effects. With the exception of TNBC-managed lands and Airport mitigation sites that have been developed in the last decade, the overall trend in wetlands and other aquatic habitats within the Natomas Basin is a reduction in acreage and habitat values.

As described in the NBHCP, approximately one-fourth to one-fifth of the 53,000-acre basin contained areas of seasonal open water or riparian scrub historically, as indicated by 1908 mapping. Since 1914, land reclamation and reclamation facilities, canals, levees, and pumping stations have allowed over 80% of the basin to be converted to agricultural production, with irregular small-scale topographic features of the earlier landscape having largely been eliminated by agriculture. As part of this conversion, the drainage pattern of the basin was altered to collect runoff into canals, from which it is pumped into the surrounding canals and Sacramento River. Except on TNBC parcels and other mitigation lands, natural vegetation in the basin is now primarily found along irrigation canals, drainage ditches, pastures, and uncultivated fields. Borders of canals and ditches often have narrow strips of emergent vegetation or wooded riparian areas that provide important nesting, feeding, and migration corridor habitat for a variety of wildlife species. The following acreages of wetlands and other aquatic habitats are estimated as having been present in the basin in 1997, the baseline for the NBHCP: 96 acres of ponds and seasonally wet areas, 503 acres of large canals and drains and 1,276 acres of smaller canals and drains (including adjacent upland areas such as maintenance roads), and 124 acres of riparian habitat. The NBHCP in 2003 noted a particular limitation in the remaining acreage of marshlands, which are important habitat for giant garter snake. (City of Sacramento, Sutter County, and TNBC 2003.) Replacement of irrigated field crops and rice with urbanization and dryland farming on the Airport bufferlands and in the eastern part of the basin has diminished the water supply and extent of the functional canal system within the basin in recent years.

Alternative 1 – Adjacent Setback Levee. The 2008 construction phase would include permanent effects on approximately 15 acres and temporary effects on more than 64 acres of wetlands

and other waters of the United States, and the 2009 and 2010 construction phases would result in permanent effects on approximately 23 acres and temporary effects on approximately 23 acres of wetlands and other waters of the United States. Proposed mitigation for the above impacts includes the creation of at least 1 acre of irrigation/drainage canal or 1 acre of seasonal wetland for every acre that is lost (Mitigation Measure 4.7-a). The project includes the following compensation well beyond this amount, with features that would ensure that all aquatic functions of the lost habitats are replaced or improved: the creation of approximately 45 acres of jurisdictional habitat resulting from construction of the new GGS/Drainage Canal and expansion of the existing West Drainage Canal, creation of approximately 60 acres of new irrigation canal, and managed marsh habitat created on an anticipated 230 acres after borrow extraction from the Airport north bufferlands borrow area and potential borrow areas in the vicinity of Fisherman's Lake. Seasonal wetland habitat is expected to be incorporated into the marsh creation to offset the potential loss of seasonal wetland.

The proposed new GGS/Drainage Canal included in the project would improve overall aquatic habitat functions in the basin because it would have (1) a reliable water supply; (2) more gradual and consistent side slopes than are found typically in existing RD 1000 canals, which would result in reduced erosion and sedimentation and the associated need for frequent disturbance by heavy equipment of vegetation and soil on canal banks; and (3) maintenance access that will allow for easy mowing, precluding the need for the typical high-disturbance practice of flail mowing or scraping vegetation from the banks and canal with a drag bucket.

Because Alternative 1 would include the creation of acreages of waters of the United States that are expected to more than offset the filling and dewatering of waters of the United States included in the project, and because new jurisdictional habitats would be created and managed in a manner that minimizes maintenance disturbance and provides the essential functions of the habitats that would be lost (Mitigation Measure 4.7-a), overall effects of Alternative 1 on jurisdictional habitats in the Natomas Basin would be beneficial.

Alternative 2 – Raise in Place plus 1,000-Foot Setback. Alternative 2 would include the creation of the same types and acreages of waters of the United States described for Alternative 1. Because these acreages are expected to more than offset the filling and dewatering of waters of the United States included in this alternative, and because new sensitive aquatic habitats would be created and managed in a manner that minimizes maintenance disturbance and provides the essential functions of the habitats that would be lost (Mitigation Measure 4.7-a), overall effects of Alternative 2 on sensitive aquatic habitats in the Natomas Basin would be beneficial.

Alternative 3 – Adjacent Setback plus 500-Foot Setback. Alternative 3 would include the creation of the same types and acreages of waters of the United States described for Alternative 1. Because these acreages are expected to more than offset the filling and dewatering of waters of the United States included in this alternative, and because new sensitive aquatic habitats would be created and managed in a manner that minimizes maintenance disturbance and provides the essential functions of the habitats that would be lost (Mitigation Measure 4.7-a), overall effects of Alternative 3 on sensitive aquatic habitats in the Natomas Basin would be beneficial.

5.1.4.5 Terrestrial Biological Resources

Implementation of the project has the potential to contribute to the loss or degradation of sensitive habitats and to adversely affect special-status terrestrial species (special-status plants, valley elderberry longhorn beetle, giant garter snake, Swainson's hawk, burrowing owl, and others). Potential effects of the project alternatives related to wildlife would be associated with construction disturbances of wildlife and their habitats, as well as permanent loss of habitat for the affected species. These effects could contribute

to species declines and losses of habitat that have led to the need to protect these species under the federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA).

Alternative 1 – Adjacent Setback Levee. Proposed NMWC projects, including the Sankey Diversion and Fish Screen Project, would also result in habitat and wildlife disturbances during construction. The Sankey Diversion would include permanent loss of habitat for some special-status species, including giant garter snake, but an appropriate habitat replacement and management plan is being developed in consultation with the U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Game (DFG) to provide adequate compensation for the loss. Despite construction-related adverse effects from the fish screen project, the overall effect would be beneficial and habitat quality would improve.

The SMF Master Plan includes a number of components that are anticipated to result in adverse effects on sensitive habitats and special-status species. The majority of these effects would be associated with Phases 2 and 3, which would not commence until 2014. Adverse effects in all phases could include a combination of permanent habitat loss and construction-related effects. There could also be effects from expanded long-term operation of the Airport. SCAS has identified some habitat enhancement and protection measures that would be implemented to compensate for adverse effects, and additional measures are anticipated to be identified as subsequent California Environmental Quality Act (CEQA) evaluation and regulatory permitting is completed.

Significant adverse effects on special-status species and sensitive habitats will be associated with the extensive future urban growth expected to occur in the Natomas Basin. This growth will continue to reduce the amount of habitat available to support populations of special-status species. Potential adverse effects from future approved expansion within the basin have been addressed through the development of the NBHCP, and successful implementation of the NBHCP would ensure that there is no overall adverse effect on special-status species from implementation of these projects. Similarly, an HCP is being implemented for the Metro Air Park Specific Plan. Additional urban expansion is being promoted through the Joint Vision, which would result in development and open space conservation within the Sacramento County portion of the Natomas Basin that was not covered in the NBHCP. Potential effects on biological resources from implementation of this potential future development are at various stages of evaluation. Projects will be required to incorporate adequate impact avoidance and minimization measures and permanent habitat conservation to mitigate and compensate for the anticipated adverse effects.

Implementation of Alternative 1 and mitigation measures in Sections 4.8 and 4.9 would ensure that the effects of the project are reduced or avoided in accordance with the requirements of the ESA and CESA and other regulatory programs that protect habitats, such as Section 404 of the Clean Water Act and Section 1602 of the California Fish and Game Code. As discussed in Chapter 3, the project incorporates habitat creation, modification, and preservation components designed to offset adverse effects of the project. In addition, mitigation measures require further development of these habitat improvement components, including preparation and approval of management plans. Successful implementation of these mitigation measures would result in permanent protection and management of habitat for giant garter snake, including creation and enhancement of connectivity between giant garter snake populations in the Natomas Basin, expected to result in an overall improvement of conditions for giant garter snakes in the basin. An increase in permanently protected foraging habitat for Swainson’s hawk, eventual increase in potential nesting habitat, and preservation of existing nest sites would also maintain or improve current conditions for this species in the Natomas Basin. Implementation of project components and mitigation measure would similarly ensure that potential adverse effects on other special-status species and on sensitive habitats are reduced to a less-than-significant level and would not be cumulatively considerable.

Successful implementation of the NBHCP depends on a number of assumptions that could be jeopardized by implementation of other projects and activities in the basin, including Alternative 1and the various cumulative projects. Alternative 1 has been designed to support achievement of the goals and objectives of the NBHCP, and implementation of Mitigation Measure 4.9-f would ensure that Alternative 1 does not jeopardize successful implementation of the NBHCP.

Alternative 1 would include minimization, avoidance, and compensation measures in accordance with the requirements of ESA, CESA, and other relevant regulatory requirements as well as additional habitat protection and enhancement components. As a result of these measures, Alternative 1 would not contribute to a cumulative impact on terrestrial biological resources, including special-status species.

Alternative 2 – Raise in Place plus 1,000-Foot Setback. Because of its inclusion of a setback levee and waterside erosion control improvements at three sites along the Sacramento River east levee, Alternative 2 would involve a slightly different set of impacts to terrestrial biological resources than Alternative 1. The narrower landside levee footprint of Alternative 2 would avoid some losses of woodland and grassland habitat that would be unavoidable under Alternative 1. However, the 1,000-foot levee setback would convert approximately 10 additional acres of rice (giant garter snake habitat) and 100 acres of generally high-quality agricultural foraging habitat for Swainson's hawk to nonagricultural uses. These losses would be offset by marsh, canal, and grassland habitats created under the project. Additionally, under Alternative 2, as much as 35 acres of riparian woodland on the water side of the levee in Reaches 3–19 could be removed to conform with USACE guidance. 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 effects on these resources on the water side of the levee would be more difficult to mitigate than the adverse effects from the adjacent setback levee footprint on the land side of the levee under Alternative 1, 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 the requirements of ESA, CESA, 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. Therefore, it is possible that Alternative 2 could contribute to a cumulative impact on terrestrial biological resources, including special-status bird species for which the waterside trees provide important nesting habitat.

Alternative 3 – Adjacent Setback plus 500-Foot Setback. Alternative 3 is similar to Alternative 1 in terms of terrestrial biological effects. However, the 500-foot levee setback would convert approximately 5 additional acres of rice (giant garter snake habitat) and 70 acres of generally high-quality agricultural foraging habitat for Swainson's hawk to nonagricultural uses. Nevertheless, because the project would include offsets of these habitat losses and would include minimization, avoidance, and compensation measures in accordance with the requirements of ESA, CESA, and other relevant regulatory requirements, Alternative 3 would not contribute to a cumulative effect on terrestrial biological resources, including special-status species.

5.1.4.6 Cultural Resources

Alternative 1 – Adjacent Setback Levee. Prehistoric human habitation sites are common in riverbank and floodplain areas, and burial sites are often encountered in the course of ground-disturbing activities. It is likely that known or unknown archaeological resources could be disturbed and cultural resources damaged or destroyed during construction activities for Alternative 1. Losses of a unique archaeological resource could occur where excavations encounter archaeological deposits that cannot be removed or recovered (e.g., under levees), or where recovery would not be sufficient to prevent the loss of significance of the cultural materials. Historic resources could also be damaged or require removal from areas near flood control facilities under Alternative 1. If these resources would be eligible for

National Register of Historic Places (NRHP) listing, their modification or destruction would be considered significant. Although mitigation would be implemented to reduce effects on potentially significant cultural resources, adverse effects, particularly on archaeological resources, may still occur. Losses of archaeological resources would add to a historical trend in the loss of these resources as artifacts of cultural significance and as objects of research importance. For these reasons, despite the implementation of Mitigation Measures 4.10-c, -d, -e, Alternative 1 has the potential to make a cumulatively considerable impact on cultural resources. The contribution of the project to cumulative effects on cultural resources would be significant and unavoidable.

Alternative 2 – Raise in Place plus 1,000-Foot Setback. The cumulative contribution of Alternative 2 to cumulative effects on cultural resources would be similar to that of Alternative 1.

Alternative 3 – Adjacent Setback plus 500-Foot Setback. The cumulative contribution of Alternative 3 to cumulative effects on cultural resources would be similar to that of Alternative 1.

5.1.4.7 Transportation and Circulation

Alternative 1 – Adjacent Setback Levee. Effects of construction activities on emergency access would be site specific, intermittent, and temporary, and are not expected to be cumulatively considerable. The proposed construction activities would temporarily increase traffic levels on some local and regional roadways, but the majority of truck trips would take place off of public roads. In general, the temporary traffic increases associated with Alternative 1 would be limited to the roadways between the Brookfield and Reclamation District (RD) 1001 borrow sites and the NCC south levee and PGCC west levee. There are no other anticipated projects in the vicinity of the project that are likely to compound the significant temporary traffic effects of the project. Because of the limited potential for the traffic associated with the project to combine with increased traffic from other future projects, and because of the short-term, intermittent nature of any effects, no cumulative traffic effects are expected to occur.

Alternative 2 – Raise in Place plus 1,000-Foot Setback. For the same reasons as Alternative 1, Alternative 2 would not result in cumulative effects on traffic.

Alternative 3 – Adjacent Setback plus 500-Foot Setback. For the same reasons as Alternative 1, Alternative 2 would not result in cumulative effects on traffic.

5.1.4.8 Air Quality

Alternative 1 – Adjacent Setback Levee. Future projects will 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 respirable particulate matter 10 micrometers or less (PM_{10}). Alternative 1 would cause an impact to air quality through construction emissions. When taken in total with other projects in the region, this impact would contribute to a cumulative effect on air quality.

No air district in California, including FRAQMD or SMAQMD, has identified a significance threshold for analyzing greenhouse gas (GHG) emissions generated by a proposed project or a methodology for analyzing cumulative effects related to global warming. Although the state of California has identified GHG reduction goals through adoption of Assembly Bill 32, the California Global Warming Solutions Act of 2006, the effect of GHG emissions as they relate to global climate change is inherently a cumulative impact issue. While the emissions of one single project will not cause global climate change, GHG emissions from multiple projects throughout the world could result in a cumulative impact with respect to global climate change.

In comparison to criteria air pollutants, such as ozone and PM_{10}, carbon dioxide (CO_2) emissions persist in the atmosphere for a much longer period of time. GHG emissions generated by the proposed action would predominantly be in the form of CO_2. Project construction would result in a net increase in emissions to occur over a period of 3 years (2008–2010), despite the implementation of Mitigation Measure 4.13-a. While any increase in GHG emissions would add to the quantity of emissions that would contribute to global climate change, it is noteworthy that emissions associated with the proposed action occur over a finite period of time (3 years), as opposed to operational emissions, which would occur over the lifetime of a project. The project would have no net increase in operational GHG emissions. Nonetheless, because of the intensity and duration of construction activities, and the lack of available mitigation measures to abate GHG emissions from heavy-duty construction equipment exhaust and on-road hauling emissions, the project's construction emissions would make an incremental contribution to climate change.

Alternative 2 – Raise in Place plus 1,000-Foot Setback. Alternative 2 would require approximately fewer trips for hauling borrow material than Alternative 1. Therefore, it would make a smaller but nevertheless considerable contribution to cumulative air quality effects.

Alternative 3 – Adjacent Setback plus 500-Foot Setback. Alternative 3 would require approximately the same number of trips for hauling borrow material as Alternative 1. Therefore, it would make approximately the same considerable contribution to cumulative air quality effects.

5.1.4.9 Noise

Alternative 1 – Adjacent Setback Levee. This alternative would have a significant effect on noise levels experienced by the occupants of residences that are near sites of construction activity or haul routes for construction traffic. However, there are no other known projects in the vicinity of proposed project activity (borrow sites, rural roadways, levee and canal construction areas) that would generate noise levels noticeably above ambient noise levels, which are generated by sources that include aircraft operations, truck traffic on area roadways, and agricultural activity. Therefore, Alternative 1 is not expected to contribute to any significant cumulative noise effect.

Alternative 2 – Raise in Place plus 1,000-Foot Setback. Under Alternative 2, levee improvement activity would occur directly along the Sacramento River east levee at many locations adjacent to residences on the water side of Garden Highway, and to a lesser extent, the land side of the levee. In addition, Alternative 2 would require the implementation of erosion control improvements at three sites along the water side of the Sacramento River east levee. The combined effect of noise from simultaneous construction of erosion control improvements on the water side and levee improvements on the land side would be amplified and would affect a small number of residences on the Garden Highway in the vicinity of the erosion control sites. However, this additional cumulative impact could be avoided by scheduling construction of the erosion control improvements to occur before or after the nearby levee improvement work.

Alternative 3 – Adjacent Setback plus 500-Foot Setback. For the same reasons described above for Alternative 1, Alternative 3 is not expected to make a considerable contribution to a cumulative noise effect.

5.1.4.10 Visual Resources

Alternative 1 – Adjacent Setback Levee. The project would include the removal of trees, other vegetation, and structures from the land side of the Sacramento River east levee within the footprint of the adjacent setback levee and berms, may include the removal of some vegetation and structural

encroachments from the water side of the Sacramento River east levee as part of encroachment removal actions, and would include the removal of trees from areas along the water side of the NCC south levee. The additional levee and bank protection improvements needed to achieve a "200-year" level of flood protection in the Natomas Basin along with SAFCA's proposed levee integrity program would also require the removal of vegetation and other features that currently add to the rural and riverine character of views in the area. These changes would contribute to the substantial degradation of scenic resources in Natomas 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 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 will require several years to become well established. Therefore, Alternative 1 would make a cumulative contribution to changes in the visual character and scenic resources of Natomas in the near term.

Alternative 2 – Raise in Place plus 1,000-Foot Setback. The cumulative contribution of Alternative 2 would be slightly less than that of Alternative 1 on the land side of the Sacramento River east levee where trees would need to be removed to accommodate raising the levee in place, and significantly greater on the water side of this levee where trees would need to be removed to meet USACE encroachment guidelines. This alternative would result in a cumulatively considerable near-term and long-term contribution to changes in the visual character and scenic resources of the Natomas Basin, which would be greater than the cumulative impact under Alternative 1.

Alternative 3 – Adjacent Setback plus 500-Foot Setback. The temporary impacts of Alternative 3 on scenic vistas would be similar to those of Alternative 1 and would therefore make a similar cumulative contribution to changes in the visual character and scenic resources of Natomas in the near term.

5.2 GROWTH INDUCEMENT

5.2.1 Introduction

NEPA requires an examination of the direct and indirect effects of the proposed project, including the potential of the project to induce growth leading to changes in land use patterns and population densities and related impacts on environmental resources. Within the project area, population growth and urban development are driven by local, regional, and national economic conditions. The impact of this growth on local land use patterns is managed by the local governments with jurisdiction over the land in the project area: the City of Sacramento and the Counties of Sacramento and Sutter. Each of these agencies has adopted a general plan consistent with state law. These general plans provide an overall framework for growth and development within the jurisdiction of each agency, including the project area. Although each of these agencies is a member of SAFCA, as a joint powers agency, SAFCA is limited to exercising powers common to all of its constituent members, including RD 1000 and American River Flood Control District, neither of which has any land use planning authority. Accordingly, SAFCA has no authority to permit development and has only limited authority to impose conditions on the development that is permitted.

5.2.2 Local General Plans

In general, by providing at least a 100-year level of flood protection to the project area, the project would accommodate growth currently anticipated in the general plans of the City of Sacramento and Sacramento and Sutter Counties as discussed below. The approximately 9,038-acre North Natomas Community Plan (NNCP) area is designated in the City of Sacramento's general plan as the city's major growth area for

new housing and employment opportunities (City of Sacramento 1996). In 2000, the estimated population of the North Natomas area of Sacramento County was 1,082 people occupying 416 housing units (SACOG 2002). At buildout (year 2016), the NNCP estimates a population of 66,495 in the NNCP area occupying approximately 9,038 acres (City of Sacramento 1996). As of September 14, 2005, the City of Sacramento had approved 12,162 lots for development of residential, commercial, and industrial land uses; 10,801 building permits; 11,599 single-family residential special permits; and 6,003 multifamily residential special permits for this area (City of Sacramento 2005). SACOG estimates there were 14,865 persons living in the NNCP area and 5,368 housing units in the area in 2005, and projects that 45,040 persons will occupy 17,230 housing units in the NCCP area in 2025 (SACOG 2005).

The environmental consequences of buildout of the NNCP were addressed in the 1986 NNCP environmental impact report (EIR) (certified by the Sacramento City Council in May 1986) as well as the 1993 supplement to the 1986 NNCP EIR. Development within the NNCP started in 1999. The more than 9,000 acres of the NNCP area were historically used for agriculture. While other long-term consequences of NNCP buildout would be mitigated by measures incorporated into the individual NCCP area projects, including measures to ensure consistency of development with the Natomas Basin Habitat Conservation Plan (NBHCP), loss of important farmland will remain a significant and unavoidable environmental impact of this growth. In addition, the 1986 NNCP EIR and the 1993 NNCP EIR supplement found that the development of the NNCP area would itself have growth-inducing effects on the adjacent areas surrounding the NNCP area, likely leading to the conversion of additional agricultural land to urban uses (City of Sacramento 1994). There is existing, substantial pressure to develop the northern portion of the Natomas Basin. Recent proposals have included developing the area and using revenues from development to help fund a new sports arena. This proposal did not result in formal application to the City or County of Sacramento but suggests that interest in the area is high.

Another indicator of anticipated future growth of the Natomas Basin is the City/County North Natomas Joint Vision Plan (Joint Vision). The Joint Vision is a long-term agreement between the City and County of Sacramento to collaboratively manage growth and preservation of open space and habitat in the 10,000-acre portion of unincorporated Natomas in Sacramento County. The Joint Vision anticipates that a substantial portion of the Natomas Basin will become urbanized. Both jurisdictions determined that it would be mutually beneficial to cooperatively plan for the urbanization of the area in accordance with smart growth principles. Concepts for development include a mixture of residential densities, an industrial park, and open spaces throughout, particularly in the northern part of the Natomas Basin in order to separate development from the Sutter County boundary. To date, no land use plans have been adopted.

Finally, in addition to the NNCP and the Joint Vision, Sutter County voters in 2004 passed Measure M, an advisory measure intended to provide the Sutter County Board of Supervisors with an indication of public sentiment regarding the types and level of development in the 7,500-acre area of the South Sutter County Industrial/Commercial Reserve in the northern part of Natomas. The southern boundary of the Measure M area forms the Sutter/Sacramento county line. Measure M did not approve any specific development proposals, but provides guidance for future development in the form of the following parameters for the South Sutter area:

- at least 3,600 acres for commercial/industrial development;
- at least 1,000 acres for schools, parks, other public uses, and retail; and
- no more than 2,900 acres for residential development, with a population cap of 39,000.

5.2.3 Prior Analysis of Growth

Recognizing that improving the Natomas Basin perimeter levee system would indirectly support population development within the basin, USACE, in its engineering feasibility and environmental

analyses prepared for the American River Watershed Investigation in 1991, studied the feasibility of constructing a cross levee spanning the basin from east to west to limit the extent of flood protection improvements and associated floodplain development to the southern one-half to two-thirds of the basin. The present study reconsidered a cross-levee measure. For the reasons described in Section 2.1.1.2, "Reduced Natomas Urban Levee Perimeter," this flood protection option has been determined to be impracticable and unlikely to prevent the urbanization of the northern portion of the basin without a very costly program for acquiring flowage easements and retiring development rights on the lands north of the cross levee (see Section 2.1.1.2 for additional reasons why this measure was rejected from further analysis). Consequently, improvements to the Natomas Basin perimeter levee system have been determined by USACE, the State, and SAFCA to be the feasible method of providing adequate flood protection to the basin. The 1991 analyses identified the potential for such growth to convert substantial amounts of irrigated agricultural land to urban development and thus eliminate habitat for a multitude of species that have adapted to this agricultural regime, including giant garter snake and Swainson's hawk, each of which is recognized as a threatened species at either the Federal level (giant garter snake) or the state level (Swainson's hawk). These analyses helped to lay the groundwork for a basinwide HCP, the NBHCP, focused on these threatened species. Pursuant to its authority under Section 404 of the Federal Clean Water Act, USACE made development of the NBHCP a condition of SAFCA's permit to proceed with levee improvements to the Natomas Basin perimeter levee system that had the effect of providing the basin with a 100-year level of flood protection in the 1990s. The objective of the NBHCP is to ensure that as new development occurs in the Natomas Basin, adequate amounts of well-connected and -managed habitat lands are preserved and created to ensure that viable populations of giant garter snake, Swainson's hawk, and other covered species can continue to exist in the basin. Most of these preserved and created habitat lands consist of parcels that are maintained in agricultural uses that provide desired habitat values for the species covered under the NBHCP.

The NBHCP is administered by TNBC and has been in effect for more than a decade. During this period, through a combination of land exchanges and in-lieu fees charged to new development, TNBC has assembled three contiguous blocks of land exceeding a total of 4,000 acres in the northern central and southern portions of the Natomas Basin and is managing these lands in accordance with the terms and conditions of the NBHCP. This land mass will expand as planned development occurs in the basin over the next three decades. The theory of the NBHCP is that conversion of portions of the agricultural landscape to a managed wetland condition, combined with protection and intensive management of contiguous corridors of agricultural land, can significantly enhance the wildlife habitat value of these lands and offset a reduction of the total amount of agricultural land in the Natomas Basin due to the effects of urban development over time.

As discussed in prior chapters of the EIS, the action alternatives would contribute to this conservation effort through the location and design of the irrigation and drainage and soil borrow features included in the project. These features include:

- Construction of a new drainage canal (the "GGS/Drainage Canal") to provide connectivity of aquatic habitat between Fisherman's Lake south of I-5 and the North Drainage Canal in the northern Natomas Basin to enhance opportunities for giant garter snake movement within the basin. The length of the entire GGS/Drainage Canal, including a portion of the West Drainage Canal that is proposed for modifications, is approximately 44,000 linear feet (8.3 miles) connecting the block of habitat land being assembled by TNBC in the Fisherman's Lake area to the block of TNBC land that has been assembled north of the Airport.

- Creation of three major soil borrow sites at strategic locations in the Natomas Basin: the Brookfield site in the northeastern corner of the basin that will be graded and preserved in

rice production with improved irrigation and drainage infrastructure to facilitate giant garter snake access to the property; the Airport northern bufferlands that will be converted in part to managed marshlands and in part to native grasslands; and the Fisherman's Lake area that will be improved through the expansion of existing marshland habitat.

- Creation of a more than 125-acre woodland corridor along the landside of the Sacramento River east levee to enhance the existing riparian forest along the western perimeter of the Natomas Basin and offset the woodland losses within the footprint of the levee improvements in this reach.

These habitat improvements would also serve to reduce wildlife hazards in the vicinity of the Airport where the risk of bird strikes has been deemed unacceptably high by the Federal Aviation Administration. Conversion of land cover types on the Airport's northern bufferlands as part of borrow and reclamation operations is expected to reduce the level of bird attraction to these lands, lower the risk of bird strikes, and thus promote aviation safety. This would be accomplished primarily by replacement of rice and fallowed rice fields with managed grassland and managed marsh that would reduce the expanses of open water with good visibility preferred by large water birds.

5.2.4 Blueprint for Regional Growth

In December 2004, SACOG, representing the Counties of El Dorado, Placer, Sacramento, Sutter, Yolo, and Yuba and their 22 constituent cities, adopted the "Preferred Blueprint Scenario" to guide land use and transportation choices over the next 50 years as the region's population grows from its current population of 2 million to include more than 3.8 million people. The Blueprint project was initiated in 2002 to study future land use patterns and their potential effects on the region's transportation system, air quality, housing, open space, and other resources.

The study found that continuing the recent practice of building large-lot, low-density housing would consume another 660 square miles of undeveloped land. Residents would face longer commutes, more vehicle trips, dirtier air, and a growing disconnect between where they live and where they work.

Through a series of Blueprint workshops at the neighborhood, city, county, and regional level, more than 5,000 residents, elected officials, business leaders, and environmental interests helped craft an alternative vision that integrates smart growth concepts such as higher-density, mixed-use developments and reinvestment in existing developed areas. The Blueprint study identified a need to funnel significant growth within the borders of existing cities and their immediate adjacent areas, rather than continuing sprawl outward into agricultural lands and open spaces in the six-county region. The Preferred Blueprint Scenario assumes certain levels and locations of both "reinvestment" (i.e., additional development on already-built parcels) and greenfield development (i.e., large-scale development on vacant land), including development in the project area substantially in accordance with the local general plans for the area discussed above (**Plate 17**). An analysis of this scenario showed that following smart growth principles would consume less undeveloped land, including Important Farmland; shorten future commute times; reduce traffic congestion; lessen dependence on automobiles; and provide for housing choices that more closely align with the needs of an aging population.

The Preferred Blueprint Scenario will become part of SACOG's long-range transportation plan for the six-county region. It also will serve as a framework to guide local government in growth and transportation planning through 2050.

5.2.5 State Plan of Flood Protection

In November 2006, the voters of California approved two major bonds that provide an unprecedented amount of non-Federal funding for flood control system improvements: Proposition 1E ($4.09 billion), and Proposition 84 ($800 million). Of these sums, $3 billion is specifically allocated for improvements to State-Federal levees in the Central Valley that protect urban areas that contain more than 10,000 residents.

A year later in October 2007, the California Legislature approved six major bills that together constitute the most significant reforms in the State's approach to flood risk management in the Central Valley in more than fifty years. The Central Valley Flood Control Act of 2008 (Act) recognizes that the Central Valley of California is experiencing unprecedented development, resulting in the conversion of historically agricultural lands and communities to densely populated residential and urban centers. The Act notes that many of these areas are protected by levees that were originally built to reclaim and protect agricultural land; some of these levees have been improved to reflect the impact of urbanization, but most have not. Thus, the Act concludes, through many years of practice, a dichotomous system of flood protection for urban and rural lands has developed.

Because of the potentially catastrophic consequences of flooding, the Act recognizes that the Federal government's current 100-year flood protection standard is not sufficient to protect urban and urbanizing areas within flood-prone areas throughout the Central Valley and declares that the minimum standard for these areas is a 200-year level of flood protection. To continue with urban development, cities and counties must develop and implement plans for achieving this new standard by 2025,

At the same time, the Act recognizes that improvements to earthen levees reduce but do not eliminate the risk of flooding. Hence, linking land use decisions to flood risk and flood protection estimates is only one element of improving lives and property in the Central Valley. Making those flood risks more apparent is equally important in helping to ensure that Californians make careful choices when deciding whether to build homes or live in Central Valley flood plains, and if so, whether to prepare for flooding or maintain flood insurance.

With respect to flood risk reduction, the Act calls upon the DWR to develop by the end of 2012 a comprehensive Central Valley Flood Protection Plan for protecting the lands currently within the Sacramento-San Joaquin River Flood Management System. The planning process is to be systemwide in nature, unfolding in three phases: (1) mapping of the 100-year and 200-year floodplains based on information from the Sacramento-San Joaquin River Basins Comprehensive Study, (2) identification of the existing and proposed performance standards for all facilities within the flood management system, and (3) proposals for additional structural and nonstructural facilities that may become part of the flood management system, including bypasses, floodway corridors, floodplain storage, or other projects that expand the capacity of the system; increase and improve the quantity, diversity, and connectivity of riparian, wetland, floodplain, and shaded riverine aquatic habitats, including the agricultural and ecological values of these lands; minimize the flood management system operation and maintenance requirements; and promote the recovery and stability of native species populations and overall biotic community diversity.

Recognizing the urgency of reducing the risk of flooding in the urban areas currently protected by the Sacramento-San Joaquin River Flood Management System, the Act recognizes that DWR may undertake early implementation of flood protection improvements for these urban areas under the following circumstances:

- The improvements are necessary and require state funding before the completion of the comprehensive Central Valley Flood Protection Plan.

- The improvements will reduce or avoid risk to human life in one or more urban areas.

- The improvements will not impair or impede future changes to regional flood protection or the comprehensive Central Valley Flood Protection Plan.

- The improvements will be maintained by a local agency that has committed sufficient funding to maintain both the existing and improved facilities of the State Plan of Flood Control.

- The affected cities, counties, and other public agencies will have sufficient revenue resources for the operation and maintenance of the facility.

- Upon the allocation of funds for a project, the proposed project is ready for implementation.

Finally, in separate legislation addressing SAFCA's plan for achieving 200-year flood protection for the Sacramento area, the California Legislature specifically considered the issue of how local agencies could discharge their obligations under the CEQA to analyze the potential for early implementation projects to cause adverse hydraulic impacts (or transfer of risk) elsewhere in the Sacramento-San Joaquin River Flood Management System.

SAFCA's evaluation focused on the potential of its proposed project improvements to alter water surface elevations in the channels in the flood management system. This impact analysis relied on a UNET hydraulic model reviewed and approved by the Chief of the Hydraulics Branch of the Sacramento District of the USACE. The model compared water surface elevations upstream and downstream of the Sacramento area with and without the project improvements in place under three different flow conditions, the SRFCP minimum design condition ("1957 profile"), the 100-year flood condition, and the new 200-year flood condition. This evaluation indicated that the project improvements proposed for the Sacramento area would not cause any increase in water surface elevations outside this area. Rather, as a result of planned physical and operational improvements to Folsom Dam, water surface elevations would be lowered in several reaches of the system. On this basis, the California Legislature found that SAFCA's projects would increase the ability of the existing SRFCP to protect heavily urbanized areas within the City of Sacramento and the Counties of Sacramento and Sutter against very rare floods without altering the design flows and water surface elevations prescribed as part of the SRFCP or impairing the capacity of other segments of the system to contain these design flows and to maintain water surface elevations. Accordingly, the legislature found that SAFCA's projects will not result in significant adverse hydraulic impacts to the lands protected by the SRFCP and neither the Central Valley Flood Protection Board nor any other state agency should require these projects to include hydraulic mitigation. See Section 4.4, "Hydrology and Hydraulics," and appendix A for details of this analysis.

5.2.6 Residual Risk

Achievement of a 200-year level of flood protection for the Natomas Basin would substantially lessen the probability of an uncontrolled flood in the Basin due to levee failure. However, the Natomas Basin would remain subject to a residual risk of flooding. In recognition of the need to incorporate management of this residual risk should 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 state or federal 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

- A requirement, to the extent reasonable, that new buildings in which the inhabitants are expected to be essential service providers is either located outside an area that may be flooded or is designed to be operable shortly after the floodwater is removed

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 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 intends to implement a development fee program that would apply to all new structures placed anywhere in the 200-year floodplain of SAFCA's capital assessment district, including the Natomas Basin. The objective of this program will be to avoid any substantial increase in the expected damage of an uncontrolled flood as new development proceeds in the floodplain. The revenue generated by the fee program will be used to finance a continuing flood risk reduction program for the Natomas Basin and the lower American and Sacramento Rivers that will consist of the following measures:

- 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 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 and the Sacramento River east levee to a 1H:5V dimension. Along the lower American River, 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 Conservation Easements. This measure would focus on acquiring agricultural conservation easements from willing landowners occupying the levee-protected floodplains upstream and immediately downstream of the Fremont Weir. 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 SRFCP and would thus ensure that these levees are not raised above the "1957 profile" that governs the design of the SRFCP. This would reinforce the 200-year design of the early implementation project and the NLIP as a whole, which assumes that upstream levees are improved to the 1957 profile and overtop without failing when water surface elevations exceed this profile. It is assumed that SAFCA's development fee revenue would constitute only a portion of the revenue devoted to this measure, with the balance coming from the state and Federal governments as part of a comprehensive update of the plan of flood protection for the Sacramento Valley.

- 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 fee revenue would constitute only a portion of the revenue devoted to this measure, with the balance coming from the state and Federal governments as part of a comprehensive update of the plan of flood protection for the Sacramento Valley.

5.2.7 Growth-Inducement Analysis for the Natomas Levee Improvement Program

Based on the information presented above and in the previous sections of this EIS, there is substantial evidence that the project evaluated in this EIS and the NLIP as a whole would accommodate anticipated growth in the project area in a manner that would be consistent with adopted local and regional growth management plans and with an emerging State Plan of Flood Protection. Local plans embrace an HCP that is designed to preserve and facilitate intensive management of a contiguous land mass large enough to sustain viable populations of giant garter snake, Swainson's hawk, and other species within the Natomas Basin. The proposed action and the action alternatives are designed to strengthen the NBHCP by expanding and integrating the land mass under management by TNBC and improving the irrigation and drainage infrastructure serving this land mass.

The SACOG Preferred Blueprint seeks to concentrate new development in the region in areas like the Natomas Basin that can be served by existing transportation infrastructure; that can create opportunities for balancing industrial, commercial and residential uses and supporting a greater diversity of home to work transportation alternatives; and that can preserve open space by increasing the density of the new development. The proposed action and action alternatives would provide the flood risk management infrastructure necessary to achieve these objectives.

Development in the Natomas Basin would be substantially in accordance with the previously described local general plans for the area (see Sections 3.3.2 and 5.2.2 and **Plate 17**). Implementation of the proposed perimeter levee improvements would facilitate the type of higher-density development in the Natomas Basin envisioned by the Blueprint by providing a higher level of flood protection. This type of

development would reduce the amount of non-urbanized land, including Important Farmland, that would need to be converted to urban uses in the greater SACOG region. If development proceeds according to the growth principles of the Preferred Blueprint Scenario, including a concentration of development in the Natomas Basin, the regional conversion of Important Farmland is expected to total approximately 102 square miles, compared to 166 square miles under the "Base Case Scenario." Approximately 20,000 acres of this conversion would be within the Natomas Basin (see Section 5.1.4.1, "Agricultural Resources").

The emerging State Plan of Flood Protection recognizes that urbanizing areas like the Natomas Basin should be provided with a high level of flood protection while the surrounding agricultural basins should be well enough protected to support crop production without encouraging new development.
The proposed action and alternatives are fully consistent with the principles guiding the State Plan of Flood Protection and has been approved by the California Legislature as an early implementation project. Thus, the project is likely to avoid impacts on environmental resources that could occur if the growth currently projected to occur in the Natomas Basin is forced to go elsewhere in the region due to inadequate flood protection. Further, although improving the perimeter levee system would fail to discourage further development within the basin, this action is consistent with the State's efforts to comprehensively address floodplain development and flood risk on a regional scale, which direct urban development away from those floodplains where an urban, "200-year" level of flood protection cannot be achieved while ensuring that this level of protection is provided for already heavily populated areas such as the Natomas Basin.

6.0 COMPLIANCE WITH OTHER ENVIRONMENTAL LAWS AND REGULATIONS

Sections 6.1 and 6.2 summarize Federal laws and regulations, aside from the National Environmental Policy Act (NEPA), and state laws and regulations that apply to the project and describe the project's compliance with them. The approach for compliance with the regulations described in this chapter is essentially the same for all action alternatives, since these alternatives would affect the same regulated resources to a similar degree.

The remainder of this chapter includes the following requirements of NEPA that are not addressed elsewhere in this Environmental Impact Statement (EIS): relationship between short-term uses of the environment and long-term productivity (Section 6.3), and irreversible and irretrievable commitments of resources (Section 6.4).

6.1 FEDERAL

6.1.1 Federal Clean Water Act and Section 404

The U.S. Environmental Protection Agency (EPA) is the lead Federal agency responsible for water quality management. The Clean Water Act of 1972 (CWA) is the primary Federal law that governs and authorizes water-quality control activities by EPA as well as the states. Various elements of the CWA address water quality, as discussed below.

Under federal law, EPA has published water quality regulations under Volume 40 of the Code of Federal Regulations (40 CFR). Section 303 of the CWA requires states to adopt water quality standards for all surface waters of the United States. As defined by the CWA, water quality standards consist of two elements: (1) designated beneficial uses of the water body in question, and (2) criteria that protect the designated uses. Section 304(a) requires EPA to publish advisory water quality criteria that accurately reflect the latest scientific knowledge on the kind and extent of all effects on health and welfare that may be expected from the presence of pollutants in water. Where multiple uses exist, water quality standards must protect the most sensitive use. In California, EPA has delegated responsibility to the State Water Resources Control Board (SWRCB) and its nine regional water quality control boards (RWQCBs) for identifying beneficial uses and adopting applicable water quality objectives.

CWA Section 404 establishes a requirement for a project applicant to obtain a permit from the U.S. Army Corps of Engineers (USACE) before engaging in any activity that involves discharge of dredged or fill material into "waters of the United States," including wetlands. Fill material means material placed in waters of the United States where the material has the effect of replacing any portion of a water of the United States with dry land, or changing the bottom elevation of any portion of a water of the United States. Examples of fill material include but are not limited to rock, sand, soil, clay, plastics, construction debris, wood chips, overburden from mining or other excavation activities, and material used to create any structure or infrastructure in waters of the United States. Waters of the United States include navigable waters of the United States; all other waters where the use, degradation, or destruction of the waters could affect interstate or foreign commerce; tributaries to these waters; and wetlands that are adjacent to these waters. Wetlands are defined as those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Jurisdictional wetlands must meet three wetland delineation criteria: hydrophytic vegetation, hydric soil, and wetland hydrology. Many surface waters and wetlands in California meet the criteria for waters of the United States, including intermittent streams and seasonal wetlands.

Under Section 404 of the CWA, USACE regulates and issues permits for activities that involve the discharge of dredged or fill materials into waters of the United States. Fill of less than one-half acre of nontidal waters of the United States for a variety of projects can generally be authorized under USACE's nationwide general permit (NWP) program, provided that the project satisfies the terms and conditions of the particular NWP. Fills that do not qualify for a NWP or regional general permit require an individual permit.

Before USACE can issue a permit under CWA Section 404, it must determine that the project is in compliance with the CWA Section 404(b)(1) guidelines. The Section 404(b)(1) guidelines specifically require that "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences" (CFR Title 40, Section 230.10[a] [40 CFR 230.10(a)]). Based on this provision, the applicant is required to evaluate opportunities that would result in less adverse impact on the aquatic ecosystem. A permit cannot be issued, therefore, in circumstances where a less environmentally damaging practicable alternative exists that would fulfill the project purpose. An alternative is practicable if it is available and capable of being done after cost, existing technology, and logistics are taken into consideration in light of the overall project purpose as determined by USACE. If it is otherwise a practicable alternative, an area not presently owned by the project applicant(s) that could reasonably be obtained, used, expanded, or managed to fulfill the purpose of the proposed activity may be considered.

As described in Section 4.7, "Sensitive Aquatic Habitats," Alternative 1, 2, or 3 would require individual permitting from USACE under Section 404 of the CWA for the discharge of fill into waters of the United States, including wetlands. This EIS will be used to support the decision whether to grant SAFCA an individual permit for the proposed action or a project alternative pursuant to Section 404.

6.1.2 Rivers and Harbors Act of 1899

Under Section 10 of the Rivers and Harbors Act of 1899, work in, over, or under "navigable waters" is regulated by USACE. Navigable waters of the United States are defined as those waters subject to the ebb and flow of the tide shoreward to the mean high-water mark or those that are currently used, have been used in the past, or may be susceptible to use to transport interstate or foreign commerce. A permit from USACE is required prior to any work in, over, or under navigable waters.

The proposed action would not place any dikes, dams, or other obstructions in navigable waters of the United States. However, the reconstruction of Pump Station No. 2 in the 2009 construction phase would include extending replacement discharge pipes to a replacement outfall structure in the Sacramento River, and small outfall pipes would be placed in the bank of the Sacramento River east levee to direct filtered stormwater from the east levee to the river. This project element would be subject to permission from USACE under Section 10.

Under Section 14 of the Rivers and Harbors Act of 1899 (33 USC 408), referred to as "Section 408," the Secretary of the Army, on the recommendation of the Chief of Engineers, may grant permission for the alteration of the Federal levee system by a non-Federal entity if the alteration would not be injurious to the public. The proposed action is subject to Section 408 permission. This EIS will be used to support the decision whether to grant permission for the proposed action or a project alternative pursuant to Section 408.

6.1.3 Fish and Wildlife Coordination Act of 1934, as Amended

The Fish and Wildlife Coordination Act (FWCA) ensures that fish and wildlife receive consideration equal to that of other project features for projects that are constructed, licensed, or permitted by Federal agencies. The FWCA requires that the views of the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and the applicable state fish and wildlife agency be considered when impacts are evaluated and mitigation needs determined.

The USACE is coordinating with USFWS, NMFS, and the California Department of Fish and Game (DFG) to determine the effects of the proposed action on fish and wildlife in the project area. A coordination act report will not be required as part of the environmental compliance process because the entire Natomas Basin is considered habitat for the Federally listed giant garter snake, which will be addressed in the Biological Opinion issued in compliance with Section 7 of the Federal Endangered Species Act (ESA) (see Section 6.14).

6.1.4 Endangered Species Act of 1973, as Amended

Pursuant to the ESA, USFWS and NMFS have regulatory authority over Federally listed species. Under ESA, a permit to "take" a listed species is required for any Federal action that may harm an individual of that species. Take is defined under ESA Section 9 as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Under Federal regulation, take is further defined to include habitat modification or degradation where it would be expected to result in death or injury to listed wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. ESA Section 7 outlines procedures for Federal interagency cooperation to conserve Federally listed species and designated critical habitat. Section 7(a)(2) requires Federal agencies to consult with USFWS and NMFS to ensure that they are not undertaking, funding, permitting, or authorizing actions likely to jeopardize the continued existence of listed species.

SAFCA held meetings to discuss project features with USFWS during the alternatives formulation and California Environmental Quality Act (CEQA) compliance process (see Section 7.4, "Coordination with Other Federal Agencies"). USACE and SAFCA subsequently held informal consultation meetings in January 2008 to clarify project details and discuss information needs for ESA permitting.

A Draft Biological Assessment (BA) for the proposed action was prepared in accordance with requirements set forth under Section 7 of the ESA concurrent with preparation of this EIS. The informal inter-agency meetings noted above took place during the preparation of the BA. Coordination meetings involving USACE, USFWS, SAFCA, and DFG were conducted on January 11 and 24 to discuss presentation of information on project effects and habitat creation elements in the BA.

The BA identifies the potential for the project to adversely affect Federally listed species and their habitats, including habitat for giant garter snake and possible take of individuals of the species; habitat for valley elderberry longhorn beetle and possible take of individuals of the species; and Federally listed fish species within the NCC, the lower Sacramento River, and the PGCC. It also considers potential effects of the proposed action on successful implementation of the Natomas Basin Habitat Conservation Plan (NBHCP). Based on implementation of avoidance and minimization measures and the inclusion of extensive habitat creation components in the project design that would compensate for temporary and permanent habitat effects, the BA concludes that the proposed action would not jeopardize the continued existence of the identified species or the implementation and efficacy of the NBHCP.

The BA quantifies habitat effects of the project and proposed mitigation for those impacts in the form of created habitats that are incorporated into the project design; it also describes non-quantifiable aspects of

the mitigation. These include furthering the goals of the NBHCP by providing for connectivity between giant garter snake populations in the north and south portions of the Natomas Basin through creation of the proposed GGS/Drainage Canal, maximizing the habitat value of the marsh and canal habitats included in the project design by locating them adjacent to existing TNBC parcels managed for giant garter snake, and providing for more enlargement of and greater continuity of existing woodland areas to provide habitat value for special-status bird species and other wildlife.

Through coordination meetings and other informal discussions with USACE and SAFCA, USFWS has requested clarification of impact acreages and offsets and of the qualitative benefits of the habitat creation strategy, asked for additional information on long-term management of habitats and provision of water supply to giant garter snake habitat, and asked that SAFCA plan construction elements and new habitat creation to reduce temporal losses of habitat during the 3-year construction period. Revisions and clarifications requested by USFWS have been incorporated into the project description and the descriptions of project effects on special-status terrestrial species included in this EIS, as appropriate. Informal coordination with NMFS regarding the BA has not resulted in any requests for additional information or project changes. Formal consultation with USFWS is proceeding concurrent with EIS public and agency review.

6.1.5 Migratory Bird Treaty Act of 1918

The Migratory Bird Treaty Act (MBTA) implements domestically a series of international treaties that provide for migratory bird protection. The MBTA authorizes the Secretary of the Interior to regulate the taking of migratory birds; the act provides that it shall be unlawful, except as permitted by regulations, “to pursue, take, or kill any migratory bird, or any part, nest or egg of any such bird …” (U.S. Code Title 16, Section 703). This prohibition includes both direct and indirect acts, although harassment and habitat modification are not included unless they result in direct loss of birds, nests, or eggs. The current list of species protected by the MBTA includes several hundred species and essentially includes all native birds. Permits for take of nongame migratory birds can be issued only for specific activities, such as scientific collecting, rehabilitation, propagation, education, taxidermy, and protection of human health and safety and personal property.

Compliance with the MBTA is being addressed through compliance with the ESA and the California Endangered Species Act (CESA). The project incorporates mitigation measures that would ensure that construction activities do not result in the take of any migratory birds, as discussed in Section 4.9.

6.1.6 Bald Eagle Protection Act of 1940

The Bald Eagle Protection Act provides for the protection of the bald eagle (the national emblem) and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession, and commerce of such birds.

The project area does not contain bald eagle or golden eagle nesting habitat, and the proposed action would not result in the take of bald eagles. The project incorporates mitigation measures that would ensure that construction activities do not result in the take of any raptors, as discussed in Section 4.9.

6.1.7 Clean Air Act of 1963, as Amended

The Federal Clean Air Act (CAA) required EPA to establish national ambient air quality standards (NAAQS). EPA has established primary and secondary NAAQS for the following criteria air pollutants: ozone, respirable particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead. The primary standards protect the public health

and the secondary standards protect public welfare. The CAA also required each state to prepare an air quality control plan referred to as a State Implementation Plan (SIP).

Under the CAA, the primary responsibility for planning for attainment and maintenance of the NAAQS rests with the state and local agencies. Accordingly, state and local air quality agencies are also designated as the primary permitting and enforcement authorities for most CAA requirements. During SAFCA's preparation of the Environmental Impact Report (EIR) for the NLIP Landside Improvements Project, the air management districts with jurisdiction over the project area, the Feather River Air Quality Management District (FRAQMD) and the Sacramento Metropolitan Air Quality Management District (SMAQMD), were given the opportunity to comment on the project with regard to the scope and content of the EIR in relation to each agency's statutory responsibilities and regulatory oversight of the project. In addition, FRAQMD was also consulted through several written and verbal exchanges regarding its air emissions regulations. SMAQMD provided written comments on the Draft EIR, and revisions to the air quality information were incorporated into the Final EIR based on this input. The air quality effects analysis and associated mitigation measures in this EIS are consistent with the approach that was used in the EIR.

As described in Section 4.13, the proposed action will not exceed the EPA's general conformity *de minimis* thresholds or hinder the attainment of air quality objectives in the local air basin.

6.1.8 National Historic Preservation Act of 1966, as Amended

Section 106 of the National Historic Preservation Act (NHPA) and its implementing regulations (36 Code of Federal Regulations [CFR] 800, as amended in 2004) require Federal agencies to consider the potential effects of their proposed undertakings on historic properties. Historic properties are cultural resources that are listed on, or are eligible for listing on, the National Register of Historic Places (NRHP) (36 CFR 800.16[l]). Undertakings include activities directly carried out, funded, or permitted by Federal agencies. Federal agencies must also allow the Advisory Council on Historic Preservation (ACHP) to comment on the proposed undertaking and its potential effects on historic properties.

The project incorporates treatment measures to protect resources listed on or eligible for listing on the NRHP, as discussed in Section 4.10, "Cultural Resources." Determinations of the specific mitigation measures to be implemented will be made by USACE and SAFCA in consultation with the State Historic Preservation Officer (SHPO) as part of the determination and eligibility and effect process, as required by NHPA Section 106. Implementation of the selected mitigation measures will be ensured through the execution of a Programmatic Agreement (PA). Signatories to the PA are SAFCA, USACE, and the SHPO. The ACHP has been consulted and waived participation as a signatory to the PA.

The PA addresses the scope of the Area of Potential Effect (APE) and provides that the APE will be defined for each project phase. The APE for each phase will be submitted with the cultural resources inventory reports, and will be consulted upon by SHPO with each document. If areas are added to the project development activities subsequent to the SHPO concurrence on the map of the APE for a specific phase, SAFCA will complete an inventory of historic properties within the expanded APE. If historic properties that would be adversely affected by the project are identified in cultural resources inventories, SAFCA will prepare a Historic Properties Treatment Plan (HPTP) for review and written approval by USACE and the SHPO for those specific properties. Areas of archaeological sensitivity will be monitored in accordance with the HPTPs. A final report documenting the results of work prepared under the HPTPs will be submitted to the Corps and SHPO. The PA provides for public notice and consultation with Native Americans and the public. The PA is included in Appendix D.

6.1.9 Wild and Scenic Rivers Act (16 U.S.C. 1271 et seq.)

The Wild and Scenic Rivers Act establishes a National Wild and Scenic Rivers System for the protection of rivers with important scenic, recreational, fish and wildlife, and other values. Rivers are classified as wild, scenic, or recreational. The act designates specific rivers for inclusion in the system and prescribes the methods and standards by which additional rivers may be added. The act contains procedures and limitations for control of lands in Federally administered components of the system and for disposition of lands and minerals under Federal ownership. Hunting and fishing are permitted in components of the System under applicable Federal and State laws.

None of the internal water features of the project are tributary to a designated Wild and Scenic River; therefore, the project would have no effect on any Wild and Scenic River.

6.1.10 Executive Order 11988, Floodplain Management

Executive Order (EO) 11988, Floodplain Management (May 24, 1977), directs Federal agencies to issue or amend existing regulations and procedures to ensure that the potential effects of any action it may take in a floodplain are evaluated and that its planning programs and budget requests reflect consideration of flood hazards and floodplain management. The purpose of this directive is "to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative." Guidance for implementation of EO 11988 is provided in the floodplain management guidelines of the U.S. Water Resources Council (40 CFR 6030; February 10, 1978) and in *A Unified National Program for Floodplain Management*, prepared by the Federal Interagency Floodplain Management Taskforce.

Recognizing that improving the Natomas Basin perimeter levee system would indirectly support population development within the basin, USACE in 1991 conducted extensive studies of the feasibility of constructing a cross levee spanning the basin from east to west to limit the extent of flood protection improvements and associated floodplain development to the southern one-half to two-thirds of the basin. The present study reconsidered a cross-levee measure. For the reasons described in Section 2.1.1.2, "Reduced Natomas Urban Levee Perimeter," this flood protection option has been determined to be impracticable and unlikely to prevent the urbanization of the northern portion of the basin without a very costly program for acquiring flowage easements and retiring development rights on the lands north of the cross levee. Consequently, improvements to the Natomas Basin perimeter levee system have been determined by USACE, the State, and SAFCA to be the feasible method of providing adequate flood protection to existing development within the basin and to the planned development described in Sections 5.2.2, "Local General Plans, and 5.2.4, "Blueprint for Regional Growth." Although improving the perimeter levee system would fail to discourage further development within the basin, this action is consistent with efforts by the State of California to comprehensively address floodplain development and flood risk on a regional scale. This comprehensive approach differentiates between flood protection requirements for urbanized and non-urbanized floodplain areas and will direct urban development away from those floodplains where a "200-year" level of flood protection cannot be achieved while ensuring that this level of protection is provided for already heavily populated areas such as the Natomas Basin.

The project will reduce the risk of flood loss and minimize the impact of floods on human health, safety, and welfare by strengthening existing flood control infrastructure. The project will also create natural habitat that will serve ecological functions associated with natural floodplains, as described in Section 5.2.3, "Prior Analysis of Growth." Because there is no practicable alternative to the urban floodplain development indirectly associated with the project, and because the project will improve flood control capacity and provide habitat values, it satisfies EO 11988.

6.1.11 Executive Order 11990, Protection of Wetlands

The purpose of EO 11990 is to "minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands." To meet these objectives, EO 11990 requires Federal agencies, in planning their actions, to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided. EO 11990 applies to:

- acquisition, management, and disposition of Federal lands and facilities construction and improvement projects which are undertaken, financed or assisted by Federal agencies; and

- Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing activities.

SAFCA has taken actions to minimize project effects on wetlands where possible and to create new wetlands as part of the project, and has applied for a CWA Section 404 permit from USACE. The replacement of Elkhorn Reservoir with a new sediment basin is being designed to incorporate setbacks from the adjacent slough to minimize disturbance of wetlands there. Wetlands and other waters of the United States that would be created as part of the project are described in Section 2.2.2.3, "Habitat Conservation Components." These features would all be considered giant garter snake habitat and are quantified under Impact 4.9-c in Section 4.9, "Special-Status Terrestrial Species." Wetlands that would be created as part of the project include marsh habitat in a portion of the Airport north bufferlands borrow area, for which SAFCA has developed a preliminary design. Additional wetlands in the form of marsh are expected to be created on land used as a borrow source in the Fisherman's Lake area. Small wetland areas may also be created in nodes as part of the GGS/Drainage Canal system.

6.1.12 Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

The purpose of EO 12898 is to identify and address the disproportionate placement of adverse environmental, economic, social, or health impacts from Federal actions and policies on minority and/or low-income communities. EO 12898 requires that impacts on minority or low-income populations be taken into account during preparation of environmental and socioeconomic analyses of projects or programs that are proposed, funded, or licensed by Federal agencies.

Section 2-2 of EO 12898 requires all Federal agencies to conduct programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons (including populations) from participation in, denying persons the benefits of, or subjecting persons to discrimination because of their race, color or national origin. Section 1-101 of EO 12898 requires Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of programs on minority and low-income populations.

The proposed action would reduce the risk of flooding to existing residential, commercial, and industrial development in the Natomas Basin. This benefit would accrue to all segments of the population in the Natomas Basin and would have no disproportionately high adverse environmental effect on any minority or low-income population. Moreover, no concentrations of minority groups or low-income populations have been identified in the project area. The U.S. Department of Housing and Urban Development (HUD) defines "low income" and "very low income" for its many housing assistance programs. Generally, low income is considered to be 80% of the median income for the Metropolitan Statistical Area and adjusted for household size and the specific housing program (HUD 2003).

The California Association of Realtors (CAR) reported that the Housing Affordability Housing Index for the Sacramento metropolitan area, based on Sacramento Association of Realtors Multiple Listing Service Data, was 46% for the third quarter of 2007 (CAR 2007a). This means that 46% of first-time buyers in the City of Sacramento could afford the area's median priced home. The median home price for that same period, including single-family detached and single-family attached housing products, was $299,240. Among the regions tracked by CAR, the Sacramento Metropolitan Region remains one of the most affordable areas in the state (CAR 2007b).

6.1.13 Farmland Protection Policy Act

The Farmland Protection Policy Act (FPPA) is intended to minimize the impact of Federal programs with respect to the conversion of farmland to nonagricultural uses. It ensures that, to the extent possible, Federal programs are administered to be compatible with state, local, and private programs and policies to protect farmland. The Natural Resources Conservation Service (NRCS) is the agency primarily responsible for implementing the FPPA.

The proposed action requires converting areas of farmland along the perimeter of the Natomas Basin to flood control facilities. Additional areas of farmland would be used as sources of soil borrow material. The topsoil on these lands would be retained and replaced after several feet of underlying soil is removed, and most of these lands would continue to be farmable, although some would be converted to marsh habitat. In addition, mitigation intended to reduce project effects on farmland has been included in the mitigation monitoring program adopted by SAFCA as part of the CEQA compliance process and is included in this EIS. Mitigation includes the acquisition of agricultural conservation easements at a 1:1 ratio (i.e., 1 acre on which easements are acquired to 1 acre of Prime Farmland, Unique Farmland, and Farmland of Statewide Importance removed from agricultural use), with the lands on which the permanent easements are acquired maintained in agricultural use. Also, the proposed modifications of the agricultural irrigation and drainage infrastructure and function that are included in the proposed action and alternatives would support the maintenance of agricultural practices on the west side of the Natomas Basin.

By providing at least a 100-year level of flood protection to the Natomas Basin, the project would accommodate growth currently anticipated in the general plans of the City of Sacramento and Sacramento and Sutter Counties, and this growth would result in the conversion of agricultural land in the Natomas Basin to nonagricultural uses (see Section 5.2, "Growth Inducement"). As described in Section 2.1.1.2, "Reduced Natomas Urban Levee Perimeter," USACE in 1991 studied the feasibility of constructing a cross levee spanning the basin from east to west to limit the extent of flood protection improvements and associated development to the southern one-half to two-thirds of the basin. This flood protection option was determined to be impracticable and unlikely to prevent the urbanization of the northern portion of the basin without a very costly program for acquiring flowage easements and retiring development rights on the lands north of the cross levee. Consequently, improvements to the Natomas Basin perimeter levee system were at that time and subsequently determined by USACE, the State, and SAFCA to be the feasible method of providing adequate flood protection to the basin. Section 5.2.7, "Growth-Inducement Analysis for the Natomas Levee Improvement Program," discusses the implications of this determination with regard to accommodation of development of the basin as a whole, including the conversion of farmland to developed uses. As noted in this section, development in the Natomas Basin is consistent with the regional land use planning effort (the Sacramento Area Council of Governments Preferred Blueprint, discussed in Section 5.2.4) and the emerging State Plan of Flood Protection (described in Section 5.,2.5), which promote the concentration of urban growth within the borders of existing cities and their immediate adjacent areas, including the Natomas Basin specifically (see **Plate 17**), and discourage both sprawling development and development expansion into existing non-urbanized floodplains that would result in greater regional conversion of agricultural land to nonagricultural uses.

The project complies with the FPPA because it provides for compensation for unavoidable direct conversion of agricultural land to nonagricultural uses, would provide infrastructure that would support the continuation of agricultural uses on the west side of the Natomas Basin, and is consistent with state and regional planning efforts that will protect farmland on a regional scale from development.

6.2 STATE

6.2.1 California Environmental Quality Act

CEQA (Public Resources Code [PRC] Section 21000 et seq.) requires a public agency to prepare an environmental impact report (EIR) for any project it proposes to carry out or approve that may have a significant direct or indirect effect on the environment. SAFCA prepared a draft EIR on the preferred alternative that was distributed for public and agency review in September 2007, and prepared a final EIR in November 2007. The SAFCA Board of Directors certified the final EIR and approved the project in November 2007.

6.2.2 Central Valley Flood Protection Board Encroachment Permit

The California Central Valley Flood Protection Board (formerly The Reclamation Board) requires an encroachment permit for any non-Federal activity along or near Federal flood control project levees and floodways or in Board-designated floodways to ensure that proposed local actions or projects do not impair the integrity of existing flood control systems to withstand flood conditions.

SAFCA has received permits from the Board for this project. The permits are conditioned upon SAFCA receipt of permission from USACE for alteration of the Federal project works pursuant to 33 USC 408.

6.2.3 California Surface Mining and Reclamation Act

The California Surface Mining and Reclamation Act of 1975 (PRC Section 2710 et seq.) (SMARA) addresses surface mining of minerals and requires mitigation to reduce adverse impacts on public health, property, and the environment. SMARA applies to an individual or entity that would disturb more than 1 acre or remove more than 1,000 cubic yards of material through surface mining activities, including the excavation of borrow pits for soil material. SMARA is implemented through ordinances for permitting developed by local government “lead agencies” that provide the regulatory framework under which local mining and reclamation activities are conducted. The State Mining and Geology Board reviews the local ordinances to ensure that they meet the procedures established by SMARA.

Sutter and Sacramento Counties are the SMARA lead agencies for borrow excavation operations for the proposed action. In general, SMARA permitting requires lead agency approval of a permit and a reclamation plan and the posting of approved financial assurance for the reclamation of the mined land. SAFCA is coordinating with the Sacramento and Sutter planning departments to complete SMARA compliance for project borrow activities.

6.2.4 Clean Water Act Section 401

Under CWA Section 401(a)(1), applicants for a Federal license or permit to conduct activities that may result in the discharge of a pollutant into waters of the United States must obtain certification from the state in which the discharge would originate or, if appropriate, from the interstate water pollution control agency with jurisdiction over affected waters at the point where the discharge would originate. Therefore, all projects with a Federal component that may affect state water quality (including projects that require Federal agency approval such as issuance of a Section 404 permit) must also comply with CWA Section

401. The Section 401 water quality certification certifies that the proposed activity will not violate state water quality standards. The RWQCBs administer the Section 401 program with the intent of prescribing measures necessary to avoid, minimize, or mitigate adverse impacts of proposed projects on water quality and ecosystems.

SAFCA is applying to the Central Valley RWQCB for Section 401 water quality certification for the proposed action.

6.2.5 Porter-Cologne Water Quality Control Act and Clean Water Act Section 402

The SWRCB and RWQCBs regulate discharges of waste into waters of the state through National Pollutant Discharge Elimination System (NPDES) permits, authorized under Section 402 of the CWA for waste discharges to waters of the United States, and through waste discharge requirements (WDRs), authorized under the state's Porter-Cologne Water Quality Act (Porter-Cologne Act). The RWQCBs issue NPDES permits and WDRs to ensure that projects that may discharge wastes to land or water conform with water quality objectives and policies and procedures of the applicable water quality control plans. The Porter-Cologne Act defines waters of the state as "any surface water or ground water, including saline waters, within the boundaries of the state." Some waters that qualify as waters of the state, such as isolated wetlands, do not necessarily qualify as waters of the United States.

The RWQCBs issue NPDES permits for waste discharges to surface water from both point and nonpoint sources. The NPDES permit system includes an individual permit system for municipal wastewater treatment plants and several categories of stormwater discharges. General NPDES stormwater permits apply to industrial facilities and any general ground-disturbing construction activity greater than 1 acre. Before construction of such projects, applicants must submit a Notice of Intent (NOI) to the RWQCB and prepare a Storm Water Pollution Prevention Plan (SWPPP). A SWPPP generally describes proposed construction activities, receiving waters, stormwater discharge locations, and best management practices (BMPs) that will be used to reduce project construction effects on receiving water quality. A number of "good housekeeping" BMPs are also generally included in a SWPPP to control waste discharges during the dry months. An appropriate selection of postconstruction permanent pollution control and treatment measures must also be considered for implementation where necessary to prevent long-term water quality impairment.

The RWQCBs issue WDRs to regulate activities of entities subject to the state's jurisdiction that would discharge waste that may affect groundwater quality or that may discharge waste in a diffused manner (e.g., through erosion from soil disturbance). WDRs specify terms and conditions that must be followed during the implementation and operation of a project.

The RWQCB administers a general WDR/NPDES permit process for low-threat discharges from construction dewatering activities that discharge to surface waters (i.e., removal of accumulated water during excavation). SAFCA will be required to submit an NOI to discharge to the RWQCB before commencement of construction activities. The general order contains a set of standard terms and conditions for compliance with discharge prohibitions, specific effluent and receiving water limitations, required solids disposal activities, water quality monitoring protocols, and applicable water quality criteria. When numerous discharge locations are anticipated, the general order allows the applicant to submit a Pollution Prevention, Monitoring, and Reporting Plan that provides for consolidated identification of discharges, monitoring, and reporting procedures. The RWQCB can also issue a waiver to dewatering discharges if the discharge would not enter a water body.

6.2.6 California Endangered Species Act

Pursuant to the California Endangered Species Act (CESA), a permit from DFG is required for projects that could result in the take of a plant or animal species that is state listed as threatened or endangered. Under CESA, "take" is defined as an activity that would directly or indirectly kill an individual of a species, but the CESA definition of take does not include "harming" or "harassing," as the ESA definition does. As a result, the threshold for take is higher under CESA than under ESA. SAFCA has held several meetings with DFG to discuss project features and CESA compliance requirements and has applied to DFG for take authorization under Section 2081 of the California Fish and Game Code.

6.2.7 California Fish and Game Code Section 1602 Streambed Alteration Agreement

All diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream, or lake in California that supports wildlife resources are subject to regulation by DFG under Section 1602 of the California Fish and Game Code. Under Section 1602, it is unlawful for any person, governmental agency, or public utility to do the following without first notifying DFG:

- substantially divert or obstruct the natural flow of, or substantially change or use any material from, the bed, channel, or bank of any river, stream, or lake; or

- deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake.

A stream is defined as a body of water that flows at least periodically or intermittently through a bed or channel that has banks and supports fish or other aquatic life. This definition includes watercourses with a surface or subsurface flow that supports or has supported riparian vegetation. DFG's jurisdiction within altered or artificial waterways is based on the value of those waterways to fish and wildlife. A DFG streambed alteration agreement must be obtained for any project that would result in an impact on a river, stream, or lake.

SAFCA is applying for a Section 1602 agreement for the project.

6.3 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

NEPA requires that an EIS include a discussion of the relationship between short-term uses of the environment and long-term productivity. Within the context of the proposed action, "short-term" refers to the construction period, while "long-term" refers to the operational life of the proposed action and beyond.

Construction of the proposed action and alternatives (including a No-Action Alternative under which the Sacramento County Airport System [SCAS] would construct a compartment levee) would result in short-term construction-related effects such as interference with local traffic and circulation, limited air emissions, increase in ambient noise levels, dust generation, and disturbance of wildlife. These effects would be temporary, occurring only during construction, and are not expected to alter the long-term productivity of the natural environment. The proposed action would also result in long-term effects, including permanent loss of farmland and adverse effects on existing waters, wetlands, and woodland habitat.

The proposed action and alternatives would also assist in the long-term productivity of the environment by improving the levee system that protects the Natomas Basin by providing at least a 100-year level of

flood protection by the end of 2010 and a “200-year” level of protection by the end of 2012, and reducing wildlife hazards in the vicinity of the Airport. They would also preserve and improve, over the long term, critical habitat values upon which the Natomas Basin species of concern to USFWS and DFG depend, including by increasing acreages, connectivity, and habitat values of wetlands and other waters of the United States in the basin.

These long-term beneficial effects of the project would outweigh its potentially significant short-term impacts to the environment.

6.4 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

NEPA requires that an EIS include a discussion of the irreversible and irretrievable commitments of resources which may be involved should the project be implemented.

The irreversible and irretrievable commitment of resources is the permanent loss of resources for future or alternative purposes. Irreversible and irretrievable resources are those that cannot be recovered or recycled, or those that are consumed or reduced to unrecoverable forms. Alternatives 1, 2, and 3 and the No-Action Alternative—should SCAS construct a compartment levee to protect the Airport—would result in the irreversible and irretrievable commitment of energy and material resources during project construction and maintenance, including the following:

- construction materials, including such resources as soil and rocks;
- land and water area committed to new/expanded project facilities; and
- energy expended in the form of electricity, gasoline, diesel fuel, and oil for equipment and transportation vehicles that would be needed for project construction, operation, and maintenance.

The use of these nonrenewable resources is expected to account for a minimal portion of the region’s resources and would not affect the availability of these resources for other needs within the region. Construction activities would not result in inefficient use of energy or natural resources. Construction contractors selected would use best available engineering techniques, construction and design practices, and equipment operating procedures. Long-term project operation would not result in substantial long-term consumption of energy and natural resources.

7.0 CONSULTATION AND COORDINATION

This chapter summarizes public and agency involvement activities undertaken by the Sacramento Area Flood Control Agency (SAFCA) and the U.S. Army Corps of Engineers (USACE) that have been conducted to date for this project, and which satisfy the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) requirements for public scoping and agency consultation and coordination.

Additionally, consultation activities under the Native American contact program are described.

7.1 PUBLIC INVOLVEMENT UNDER CEQA

On June 4, 2007, SAFCA issued a notice of preparation (NOP) of a draft environmental impact report (DEIR) and filed the NOP with the State Clearinghouse. The public comment period on the NOP ended on July 3, 2007. A scoping meeting was held on June 19, 2007, to solicit input on the scope of the DEIR from interested agencies, individuals, and organizations.

In accordance with CEQA review requirements, the DEIR was distributed for public and agency review and comment for a 45-day period, which ended on October 29, 2007. SAFCA held a public hearing during the regular October 18, 2007 meeting of the SAFCA Board of Directors to receive input from agencies and the public on the DEIR. In addition, written comments from the public, reviewing agencies, and stakeholders were received during the review period.

SAFCA has held several meetings with landowner groups and other interest groups during conceptual project design and will continue to meet with these groups to address concerns and interests.

7.2 PUBLIC INVOLVEMENT UNDER NEPA

A notice was distributed to a large mailing list on December 17, 2007, to announce the public scoping meeting and solicit input from interested agencies and the public as to the scope and content of the environmental impact statement (EIS). The mailing list included over 600 federal, state, and local agencies, as well as individuals residing within the project area and homeowners associations.
The Sacramento Bee of December 19, 2007, also included an article announcing the scoping meeting and providing directions for submittal of scoping comments.

The public scoping meeting was held on January 9, 2008, to brief interested parties on the proposed action, and obtain the views of agency representatives and the public on the scope and content of the EIS. A notice of intent (NOI) to prepare an EIS was published in the Federal Register on January 31, 2008. Verbal and written comments were received during the scoping meeting, and additional written comments from agencies and individuals were received throughout the public comment period.

Scoping comments received by USACE focused on the following issue areas:

- effects of cutoff wall construction on groundwater,
- interruption of irrigation by construction activities,
- hydraulic effects of levee improvements,
- aircraft-wildlife strike impacts,
- regional flood control solutions,
- construction effects on local businesses,
- construction effects on residents (e.g., increases in noise, traffic, dust, etc.),

- giant garter snake habitat quality,
- loss of farmland,
- removal of trees,
- relocation of power poles,
- analysis of an appropriate range of project alternatives,
- global climate change,
- adequate compensation for landowners, and
- effects on Native American burial grounds.

Based on these comments and the history of the CEQA process undertaken by SAFCA, the major areas of controversy associated with the project are construction-related effects on Garden Highway residents and concerns about the hydraulic modeling used to analyze the project's hydraulic impacts. These two issues were the subject of a CEQA law suit brought against SAFCA by the Garden Highway Community Association, which is being settled. Commitments made by SAFCA in the settlement regarding construction practices are reflected, as appropriate, in the mitigation measures in this EIS, and the hydraulic modeling approach has been updated for this EIS.

7.3 NATIVE AMERICAN CONTACT PROGRAM

SAFCA's project archaeologists sent a letter of inquiry to the Native American Heritage Commission (NAHC) on June 12, 2007, asking for information or concerns regarding the project area, as well as a list of individuals or organizations that might have information or concerns regarding the project area. On June 19, 2007, Debbie Pilas-Treadway of the NAHC responded and indicated that no known sites were found in the Sacred Lands File that were located within the project area or in the immediate vicinity. Ms. Pilas-Treadway also provided the project archaeologists with a list of individuals who could be contacted concerning cultural resources in the project area. These individuals were sent contact letters on June 21, 2007, with information regarding the proposed project and a request for any information they might provide or concerns that they might have about the project. No written responses were received; therefore, follow-up phone calls were made on July 9, 2007. Only one individual, Rose Enos (referred to by the NAHC as "Miwok/Maidu"), answered. Ms. Enos expressed general concern regarding avoidance of burial sites and asked to be contacted if work is conducted on such sites. Messages were left for the remaining people on the contact list; however, no response from any of these individuals was received. In addition, Randy Yonemura of the Ione Band of the Miwok was contacted for information on areas of concern. Mr. Yonemura led an archaeologist on a field visit of the project area and provided anecdotal information on areas of potential Native American burials. In April 2008, in response to requests from the project archaeologists, the Native American Heritage Commission identified a Most Likely Descendant who is being consulted with regard to the disposition of prehistoric remains encountered in preliminary archaeological investigations in the project area.

7.4 COORDINATION WITH OTHER FEDERAL AGENCIES

SAFCA, in concert with the Sacramento County Airport System (SCAS), has coordinated with the Federal Aviation Administration (FAA) regarding project features within Sacramento International Airport (Airport) bufferland areas.

SAFCA has consulted informally with USFWS on several occasions regarding the Natomas Levee Improvement Program (NLIP) Landside Improvements Project (i.e., SAFCA's "early implementation project"). An initial meeting to introduce the program to USFWS staff was conducted in fall 2006. A presentation describing the NLIP, including anticipated flood control improvements and habitat creation components, was made by SAFCA to the Natomas Joint Vision coordination group on May 10,

2007. This meeting was attended by staff members of various regulatory and municipal agencies, including USFWS, USACE, DFG, the City of Sacramento, the Airport, and others. A followup meeting to specifically discuss project design and regulatory issues with USFWS and DFG was held on May 17, 2007.

Informal inter-agency meetings regarding project effects on habitats and the design of habitat features to offset project effects resumed in January 2008. USACE held coordination meetings with SAFCA, USFWS, and DFG on January 11 and 24. The executive director of The Natomas Basin Conservancy also attended the January 24 meeting. USACE and SAFCA have subsequently coordinated informally with USFWS on development of the biological assessment for the project and used input from USFWS in the development of this Environmental Impact Statement (EIS). Project biologists also coordinated informally with National Marine Fisheries Service (NMFS) in March 2008 regarding potential project effects on fish species. Formal consultation with USFWS and NMFS under Section 7 of the Endangered Species Act will proceed concurrent with public review of this Draft EIS.

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9.0 LIST OF PREPARERS

This EIS was prepared by EDAW at the direction of USACE. Part of the information in the EIS is based on the *Environmental Impact Report for the Natomas Levee Improvement Program Landside Improvements Project*, which was prepared for SAFCA by EDAW with assistance form MBK Engineers, HDR Engineering, Mead & Hunt, and Wood Rodgers.

Following is a list of the individuals who prepared sections of the EIS and the earlier EIR, provided significant background materials, or participated in preparing the EIS.

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SACRAMENTO AREA FLOOD CONTROL AGENCY

Timothy Washburn .....Agency Counsel
John Bassett .....Director of Engineering, Project Manager
Peter Buck.....Natural Resource Supervisor

EDAW

Name	Qualifications	Participation
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Steve Chainey	B.S. Landscape Architecture; M.S. Range and Wildlands Science; 26 years experience	Lead Ecologist/Habitat Planning
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Heather Phillips	B.S. Atmospheric Science; M.S. Atmospheric Science; 5 years experience	Air Quality
Chris Shields	B.A. Environmental Studies; 2 years experience	Noise
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MBK ENGINEERS

Name	Qualifications	Participation
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Ric Reinhardt	B.S. Civil Engineering; M.S. Civil Engineering; 14 years experience	Hydraulic Modeling Review
Mike Archer	B.S. Civil Engineering; M.S. Civil Engineering; 27 years experience	Hydraulic Modeling

HDR ENGINEERING

Name	Qualifications	Participation
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MEAD & HUNT

Name	Qualifications	Participation
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WOOD RODGERS

Name	Qualifications	Participation
Jonathan Kors, P.E.	B.S. Civil Engineering; 12 years experience	Project Manager, Natomas Cross Canal South Levee Design

10.0 LIST OF RECIPIENTS

10.1 ELECTED OFFICIALS AND REPRESENTATIVES

Bonnie Pannell, Sacramento City Council
Dan Silva, Sutter County Supervisor
Don Nottoli, Sacramento County Supervisor
Doris Matsui, Congresswoman, California's 5th District
Howard Schmidt, Sacramento County 3rd District
Jimmie Yee, Sacramento County Supervisor
John Doolittle, Congressman, 4th Congressional District
Kevin McCarty, Sacramento City Council
Lauren Hammond, Sacramento City Council
Mayor Heather Fargo, Sacramento City Council
Ray Tretheway, Sacramento City Council
Rob Fong, Sacramento City Council
Robbie Waters, Sacramento City Council
Roberta MacGlashan, Sacramento County Supervisor
Roger Dickinson, Sacramento County Supervisor
Sandy Sheedy, Sacramento City Council
Steve Cohn, Sacramento City Council
Susan Peters, Sacramento County Supervisor
Ted Wolter, Sacramento County 4th District

10.2 GOVERNMENT DEPARTMENTS AND AGENCIES

U.S. Government

FEMA Region IX
National Marine Fisheries Service
Natural Resources Conservation Service
Pacific Regional Office Bureau of Indian Affairs
U.S. EPA, Division 9
U.S. Fish and Wildlife Service
Federal Aviation Administration

State of California

California Bay-Delta Authority
California Environmental Protection Agency
Central Valley Flood Protection Board
Central Valley Regional Water Quality Control Board
Department of Boating and Waterways, Regulations Unit
Department of Fish and Game
Department of Water Resources
Native American Heritage Commission
State Historic Preservation Officer, Office of Historic Preservation
State Lands Commission

Regional, County, and City

Amador County
American River Flood Control District
Central Valley Flood Control Association
City of Davis
City of Sacramento
City of Sacramento Department of General Services
City of Sacramento Department of Transportation Engineering Services
City of West Sacramento
City of Woodland
Colusa County
Contra Costa County
El Dorado County
Feather River Air Quality Management District
Natomas Basin Conservancy
Natomas Mutual Water Company
Placer County Water Agency
Reclamation District 150
Reclamation District 307
Reclamation District 537
Reclamation District 730
Reclamation District 785
Reclamation District 900
Reclamation District 999
Reclamation District 1000
Reclamation District 1001
Reclamation District 1500
Reclamation District 1600
Regional Water Authority
Sacramento Air Quality Management District
Sacramento Area Council of Governments
Sacramento County
Sacramento County Airport System
Sacramento County Department of Environmental Review and Assessment
Sacramento County Department of Regional Parks
Sacramento County Department of Transportation
Sacramento County Planning and Community Development Department
Sacramento County Water Resources
San Joaquin County
San Joaquin County Flood Control and Water Conservation District
Sutter County
Sutter County Resource Conservation District
Three Rivers Levee Improvement Authority
Yolo County Flood Control and Water Conservation District
Yolo County Parks and Natural Resources Management Division
Yuba County
Yuba County Water Agency
Yuba-Sutter County Farm Bureau

10.3 PRIVATE ORGANIZATIONS AND BUSINESSES

APCO Worldwide
Cassidy & Associates
Central Library - Federal Documents
Citizens for Good Government
Daily Recorder
Dawson and Associates
ECOS
Friends of the River
Friends of the Sacramento River Greenway
Friends of the Swainson's Hawk
Garden Highway Homeowners Association
Gualco Consulting
Habitat 2020
Law Offices of Gregory Thatch
Metro Airpark
Natomas Community Association
Natomas Journal
Nature Conservancy - Sacramento River Program
Planning & Conservation League
Port of Sacramento
Sacramento Area Bicycle Advocates
Sacramento Association of Realtors
Sacramento Bee
Sacramento Builders Exchange
Sacramento Business Journal
Sacramento County Farm Bureau
Sacramento County Taxpayers
Sacramento Metro Chamber
Sacramento News & Review
Sacramento River Property Owners Assn
Save Our Sandhill Cranes
Save the American River Association
Sierra Club
Steinberg & Associates
Urban Creeks Council
Water Forum
West Sacramento Chamber of Commerce

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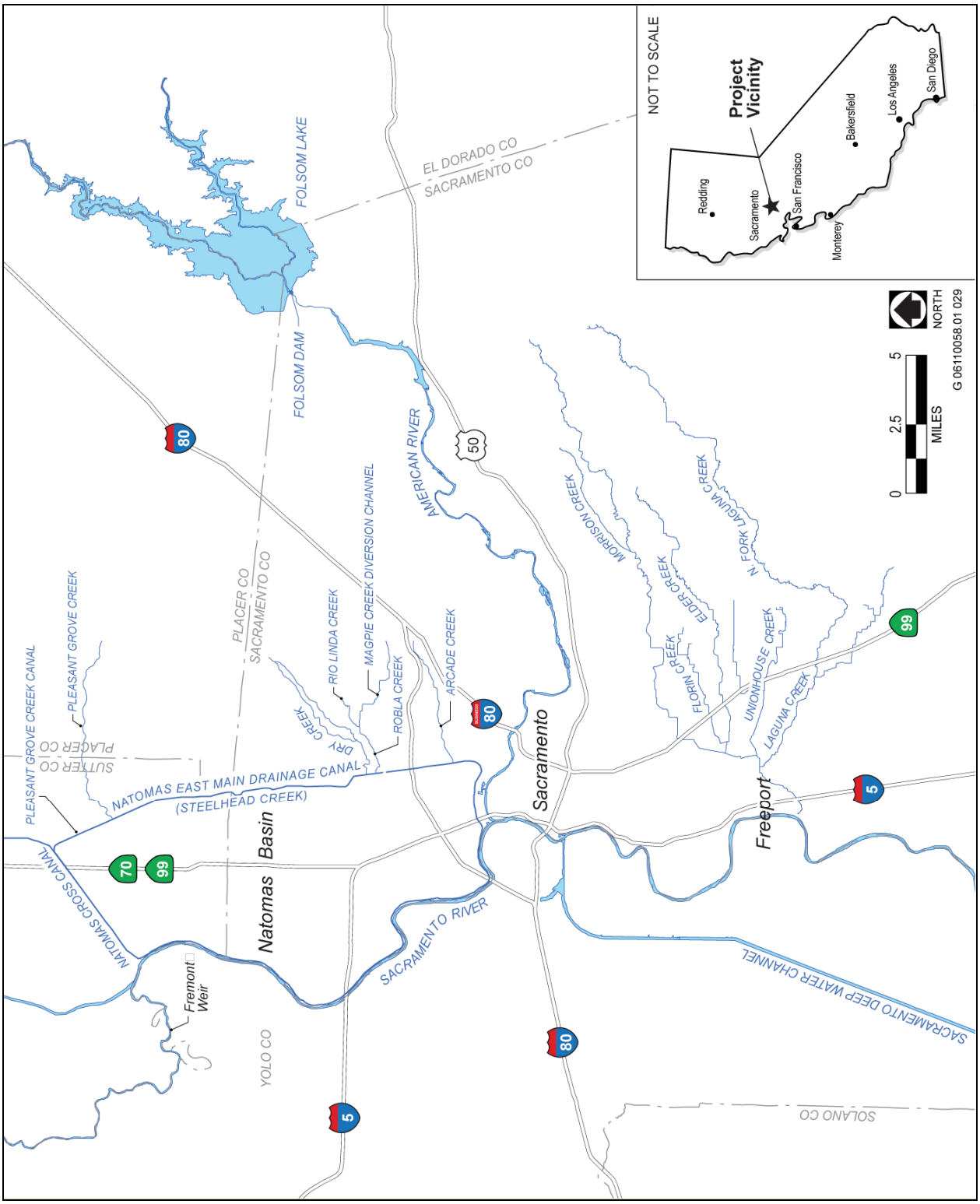
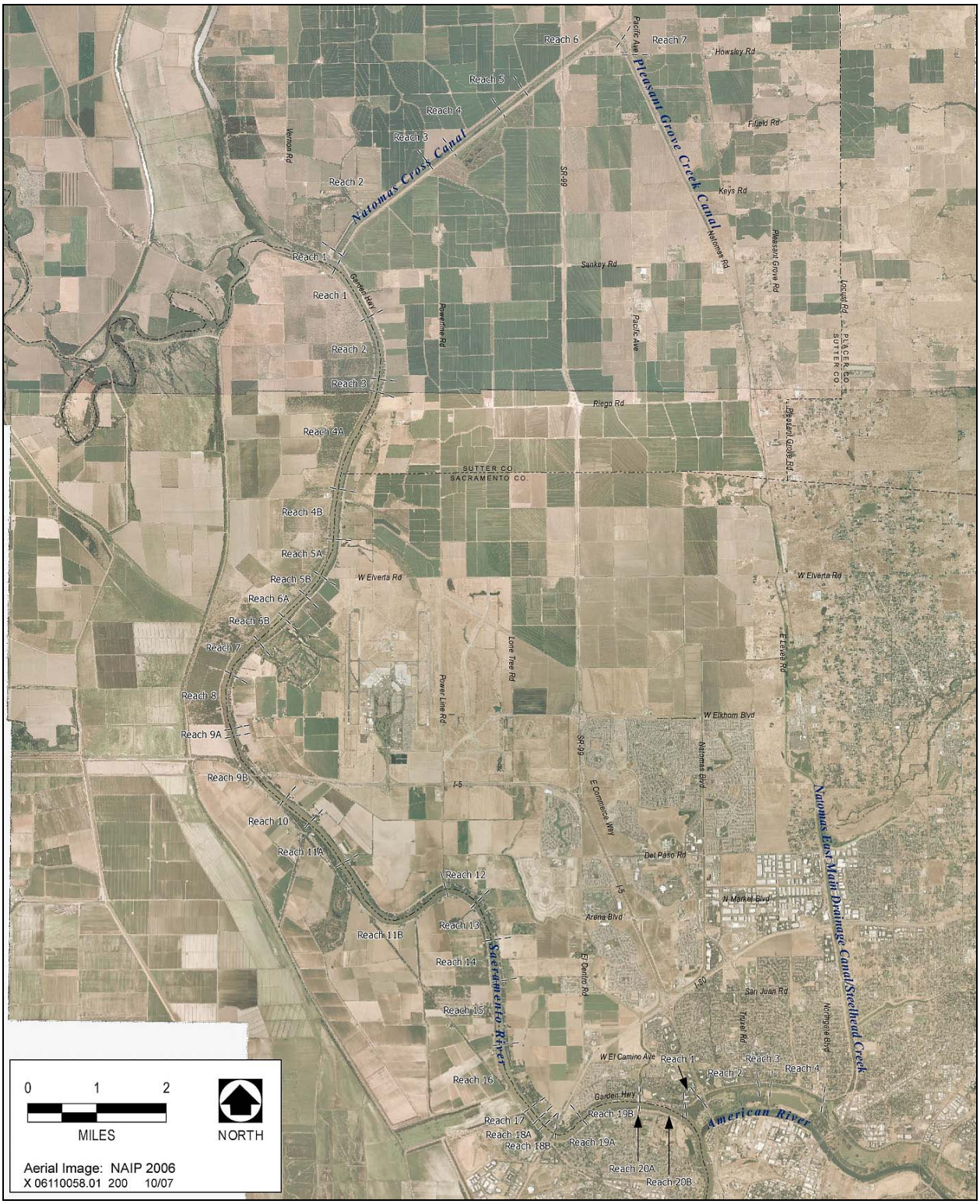


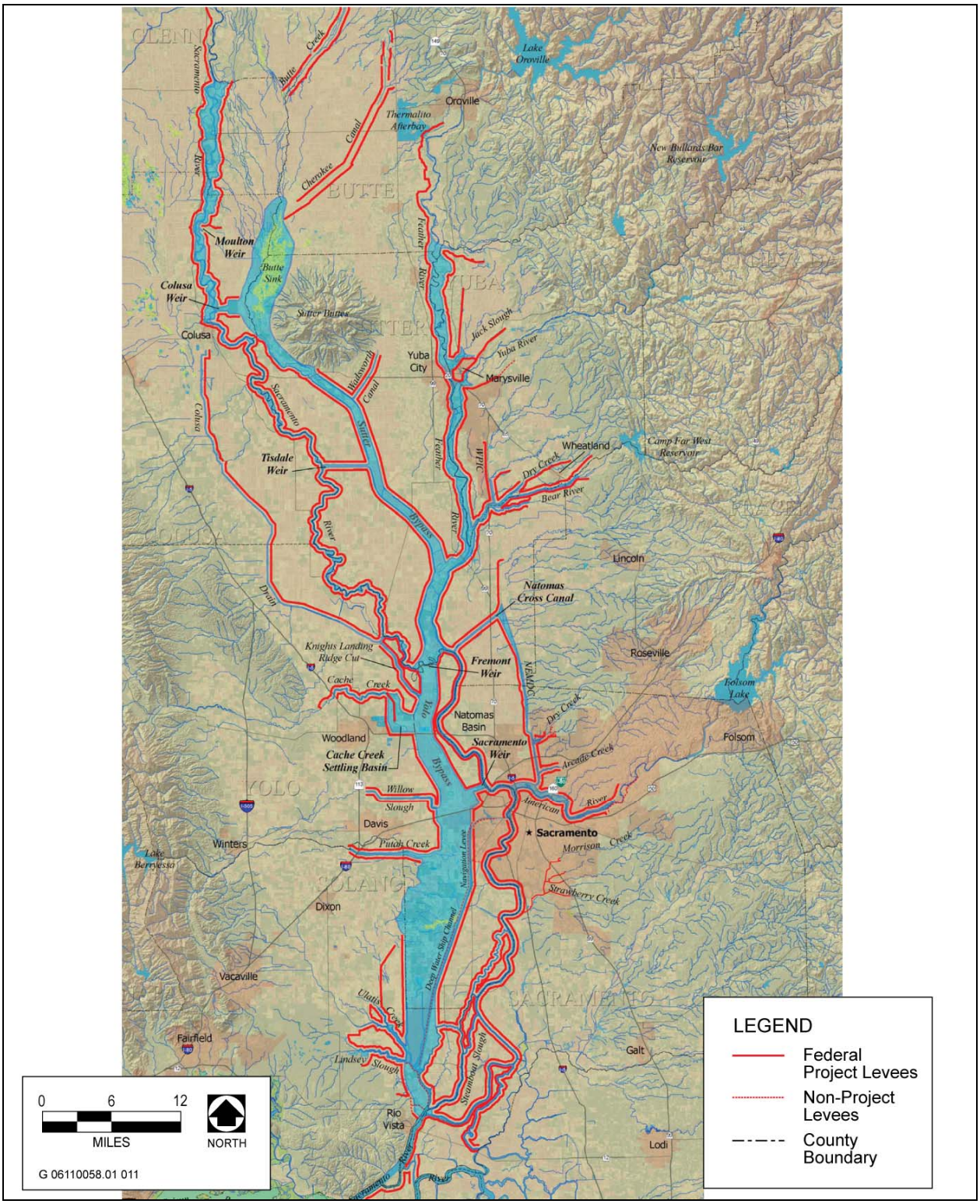
Source: CaSil, adapted by EDAW for SAFCA 2007, NLIP Landside Improvements Project DEIR

Project Location **Plate 1**



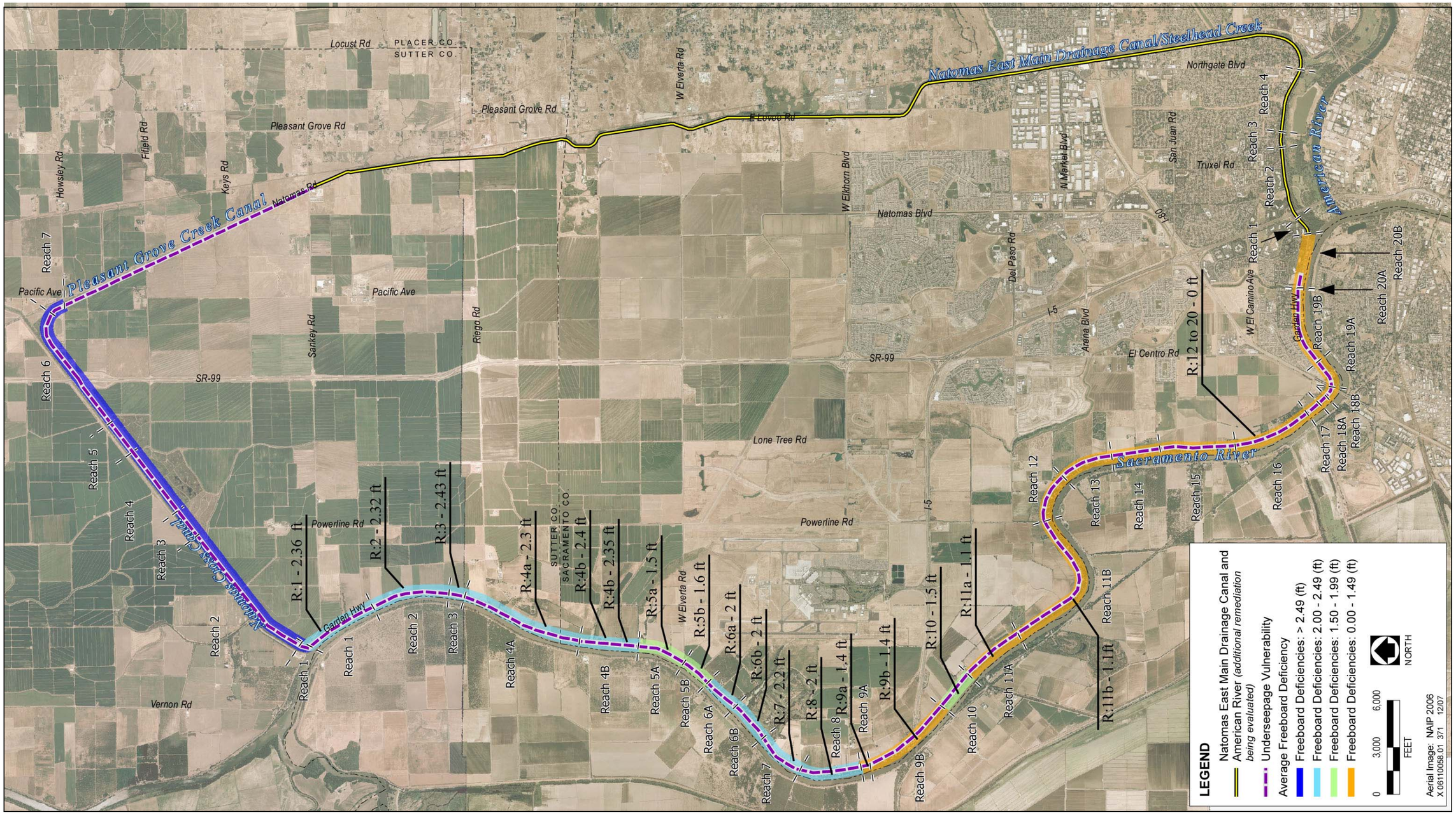
Source: Aerial image SACOG 2006, adapted by EDAW 2008

Natomas Basin Levee System **Plate 2**



Source: MKB Engineers 2006

Sacramento River Flood Control Project (SRFCP) **Plate 3**



Sources: Aerial image SACOG 2006, adapted by EDAW 2008 based on data from HDR 2007, Wood Rodgers 2007

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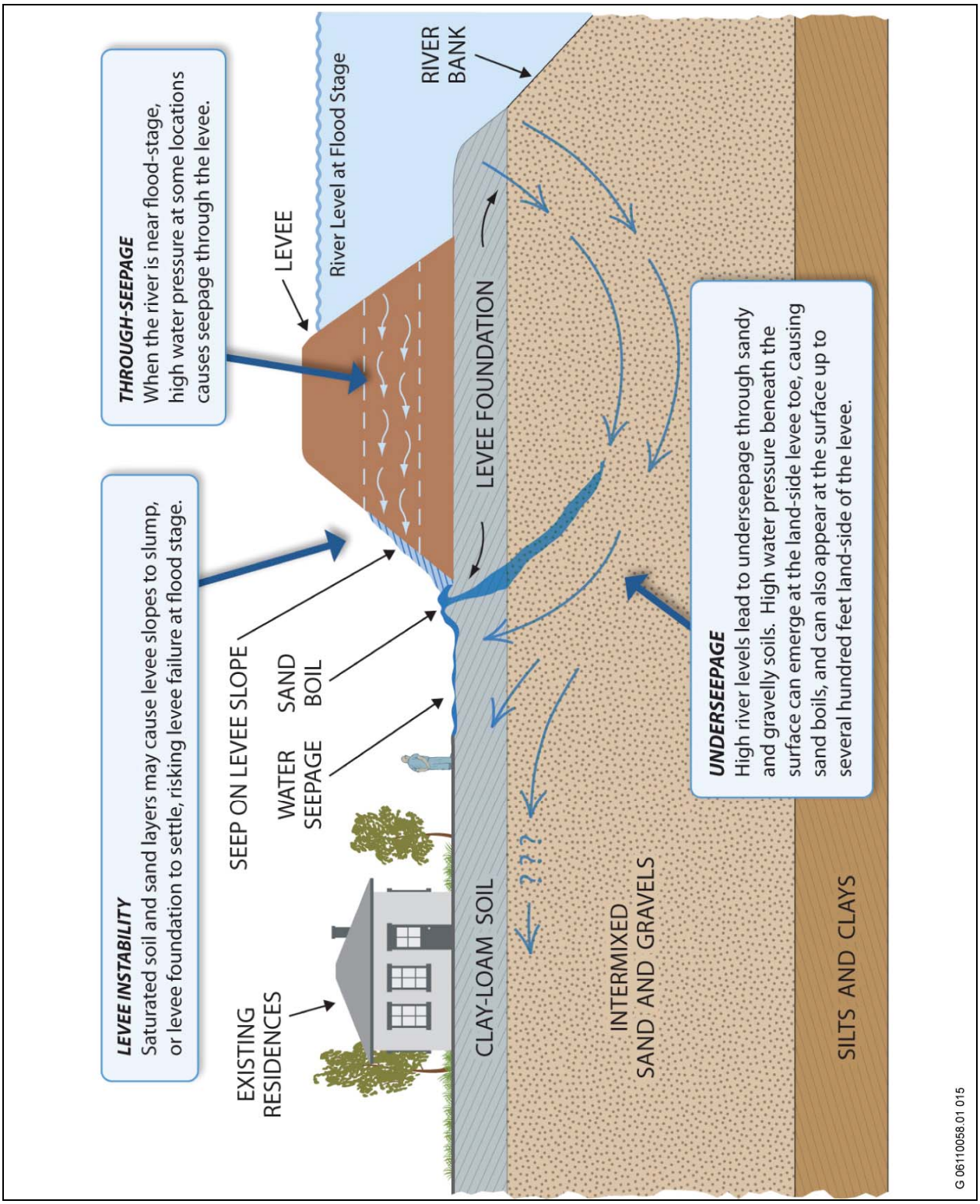
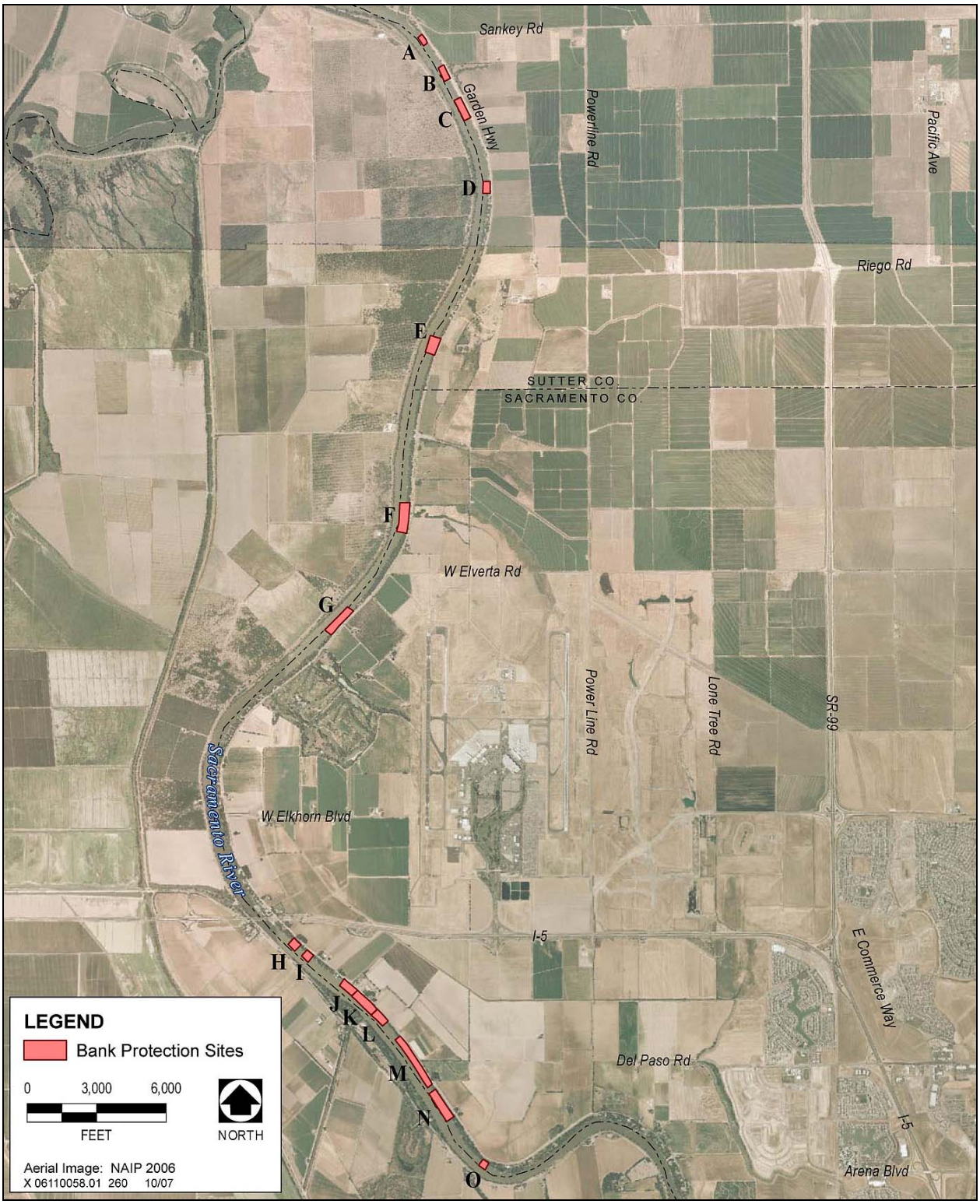


Source: SAFCA 2007, NLIP Landside Improvements Project DEIR – Illustration prepared by Jones & Stokes

Underseepage and Through-Seepage Levee Risks **Plate 5**



Source: Aerial image SACOG 2006, data from SAFCA 2007, adapted by EDAW 2007

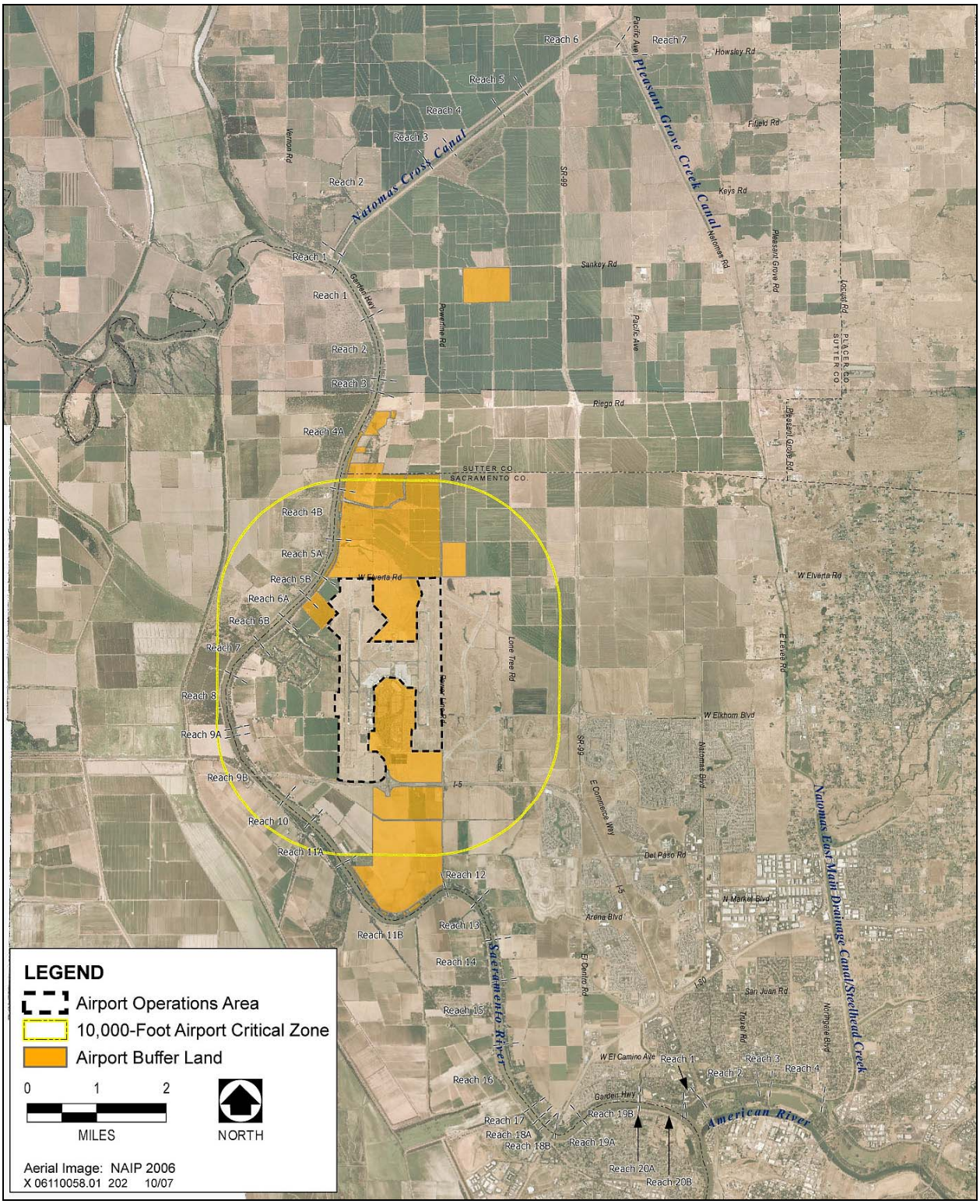
Natomas Basin Erosion Sites **Plate 6**

Source: EDAW 2007

Examples of Waterside Encroachments on the Sacramento River East Levee **Plate 7a**

Source: EDAW 2007

Examples of Waterside Encroachments on the Sacramento River East Levee **Plate 7b**



Source: Aerial image SACOG 2006, data Sacramento County Airport System 2007, adapted by EDAW 2007

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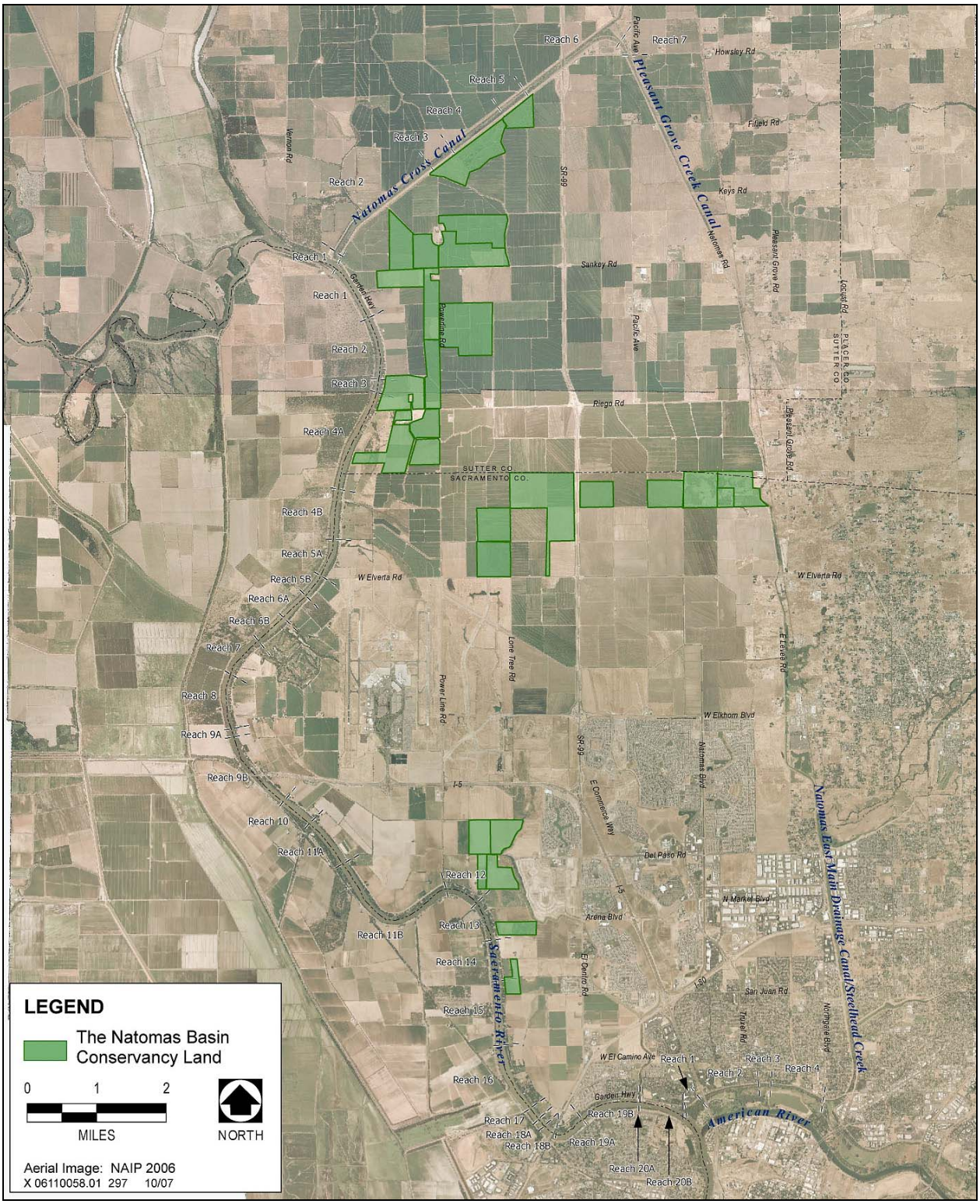

Source: Aerial image SACOG 2006, data The Natomas Basin Conservancy 2007, adapted by EDAW 2007

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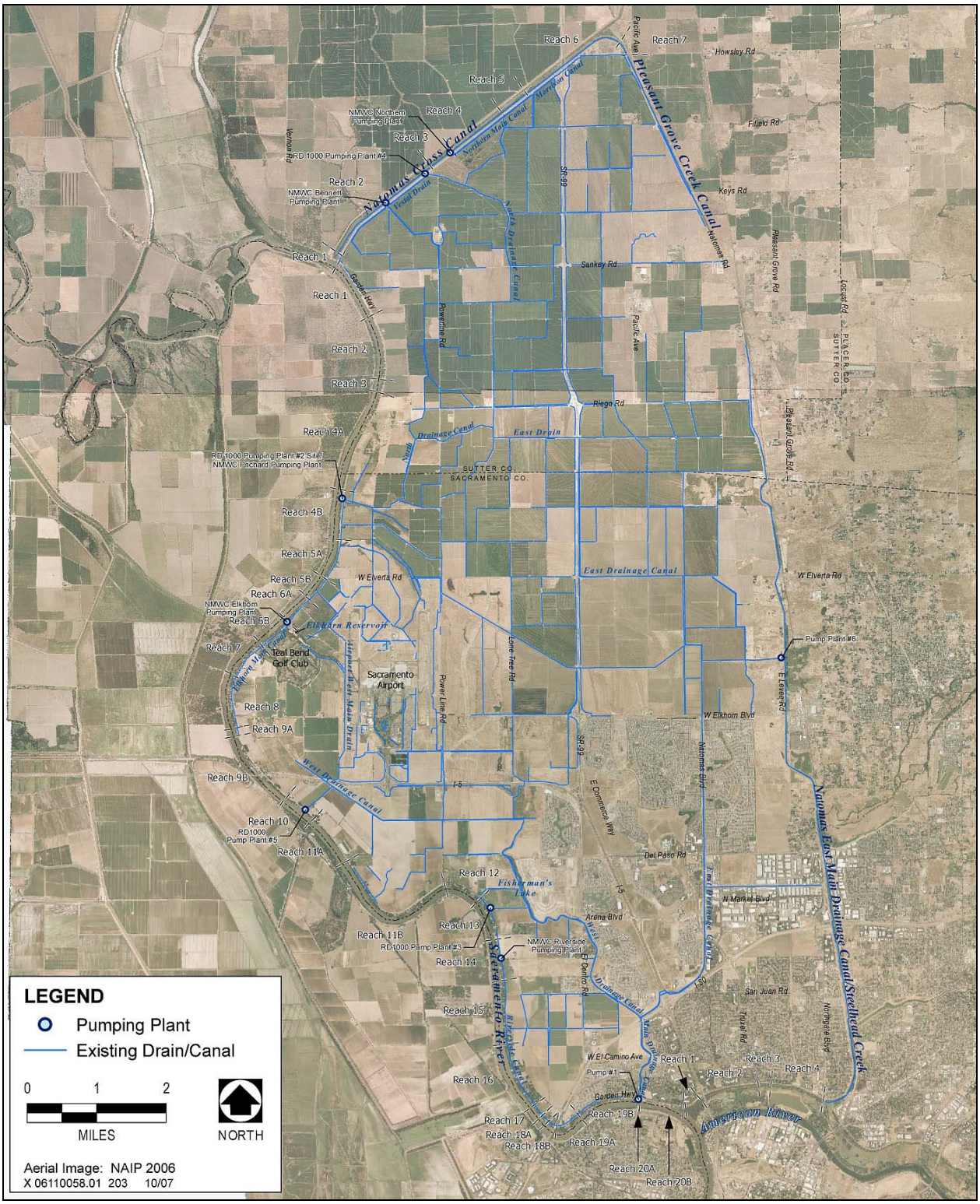
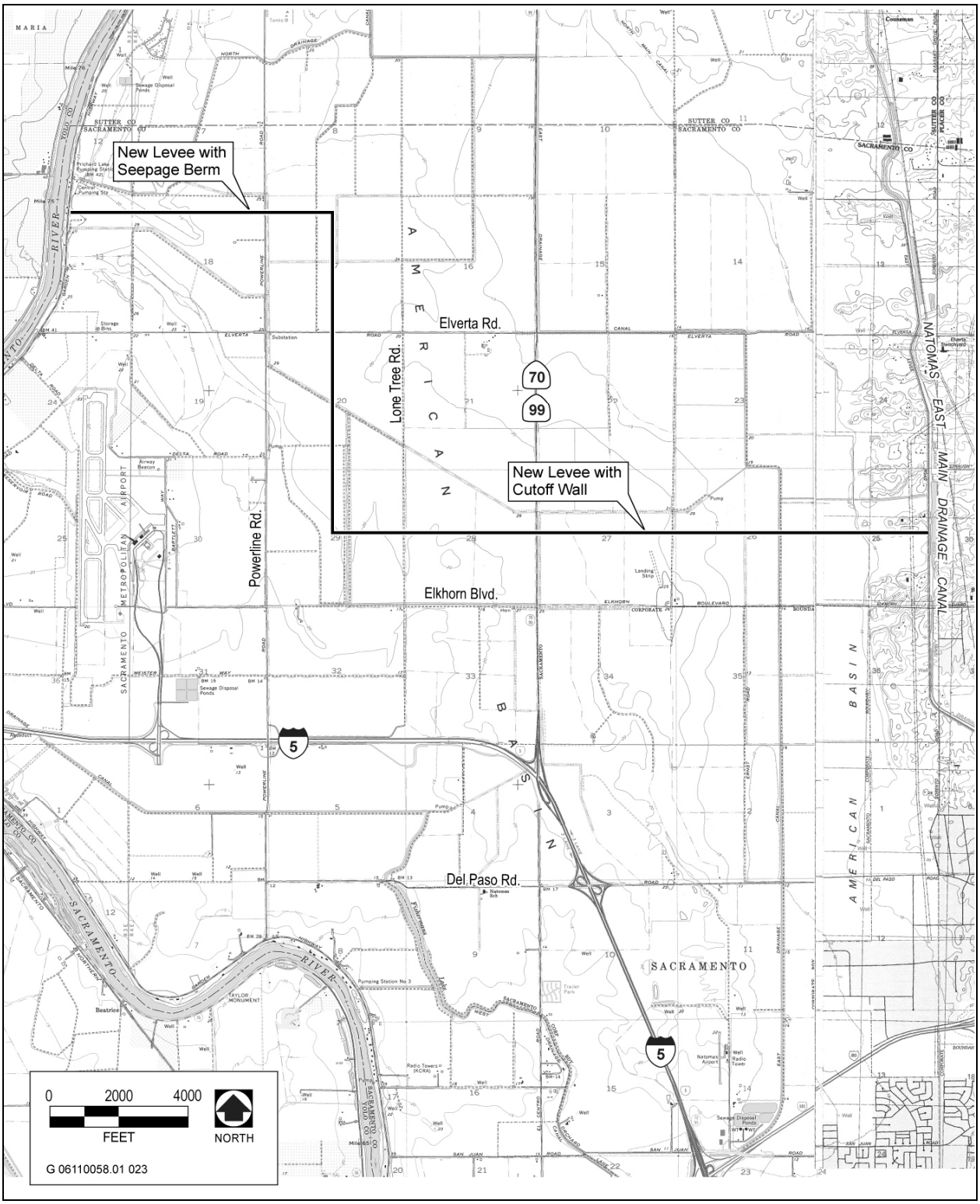


Source: Aerial image SACOG 2006, data Eric Hansen 2007, adapted by EDAW 2007

Existing Natomas Basin Drainage and Irrigation Features **Plate 10**



Source: Prepared by EDAW for SAFCA 2006, Local Funding Mechanisms DEIR

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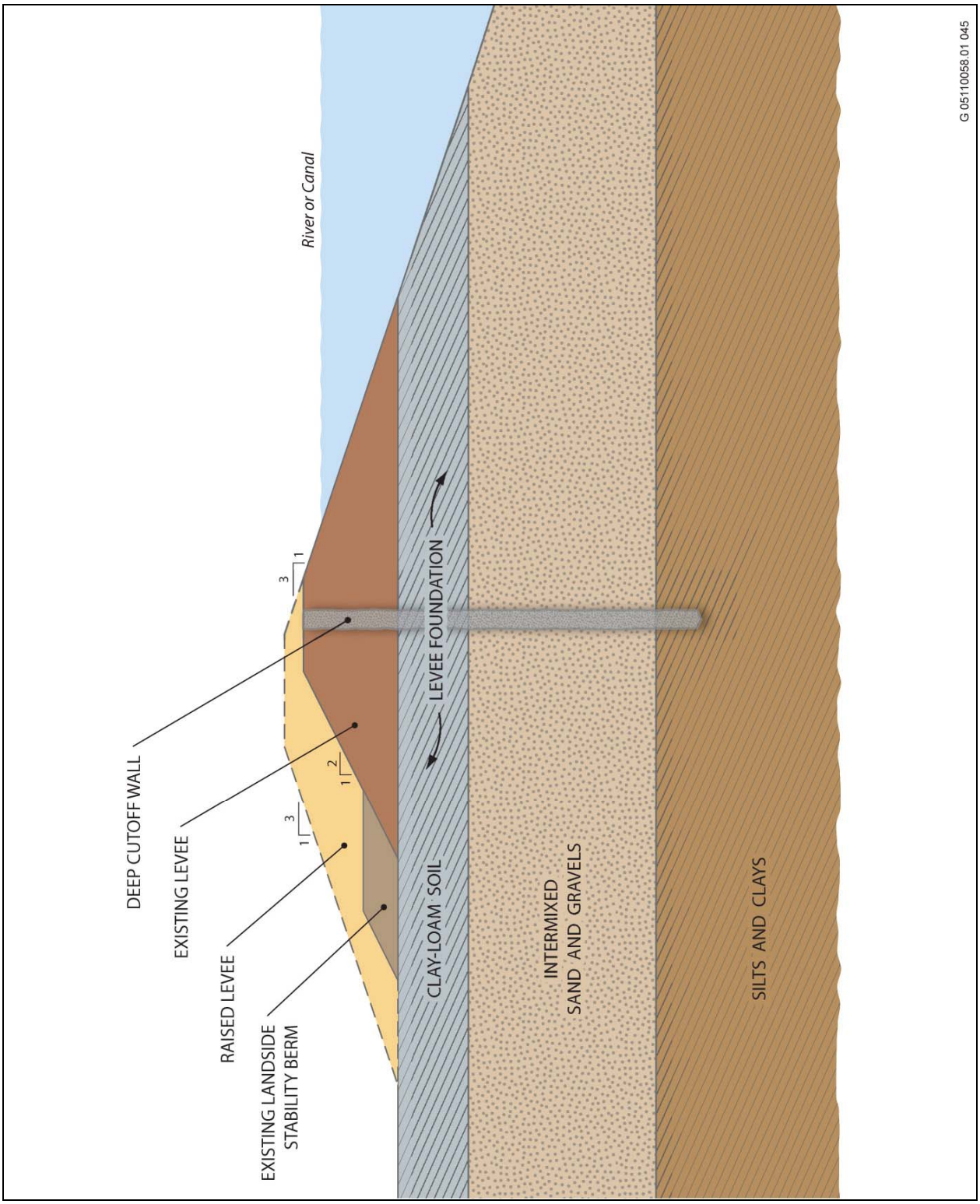
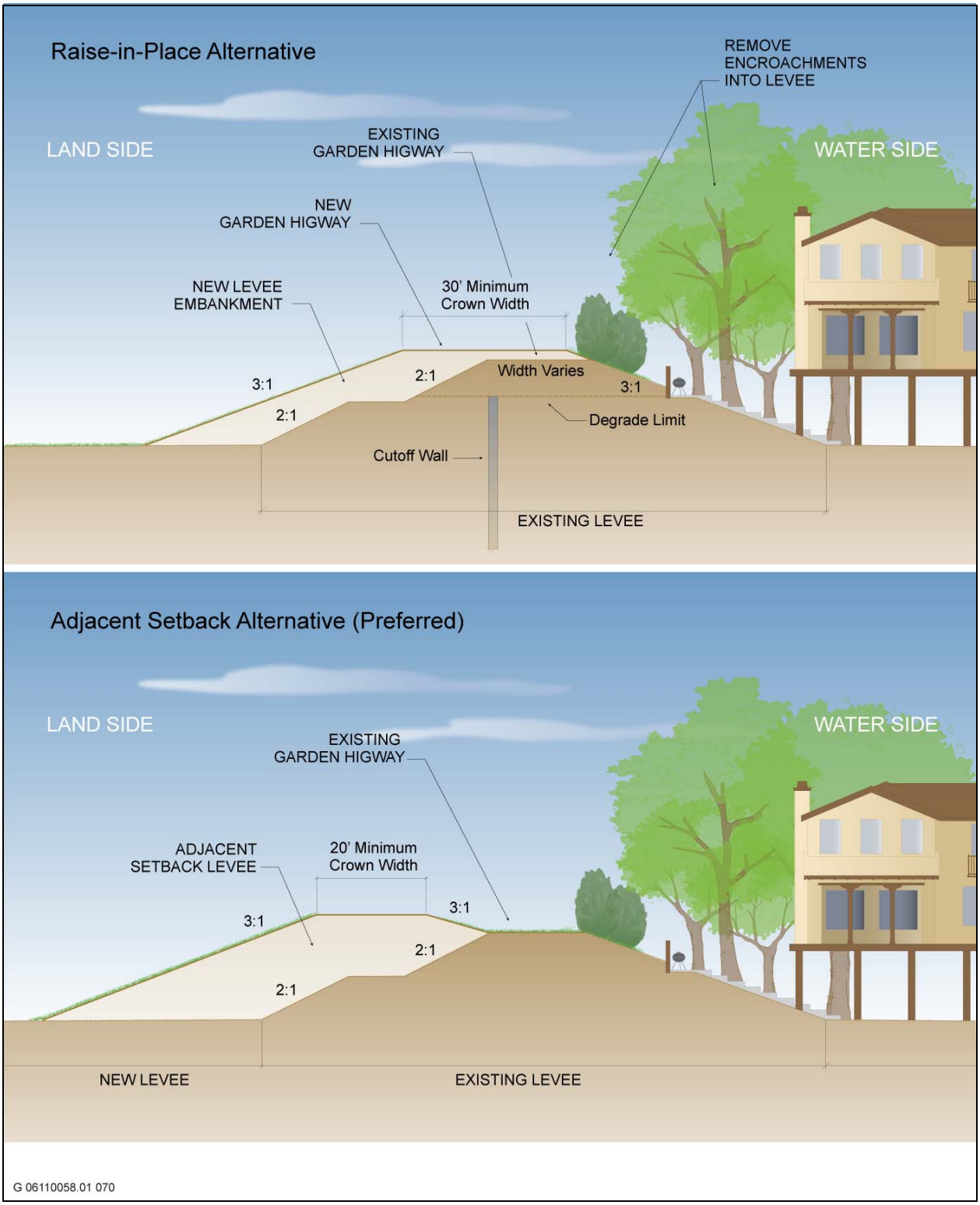


Source: SAFCA 2007, NLIP Landside Improvements Project DEIR – Illustration prepared by Jones & Stokes

Typical Levee Raise, Flattening of Landside Levee Slope, and Seepage Cutoff Wall Plate 12

Sources: HDR 2007, EDAW 2008



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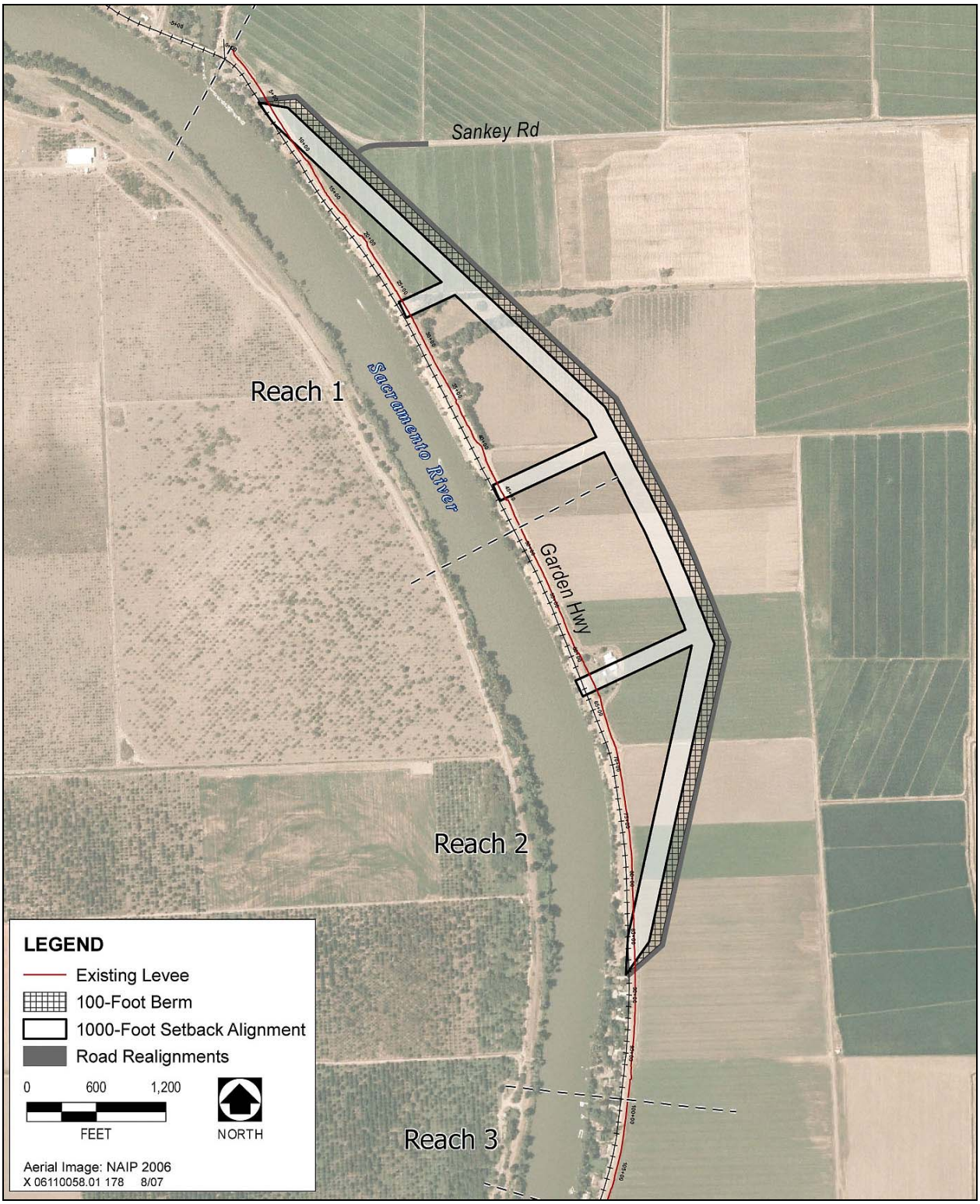
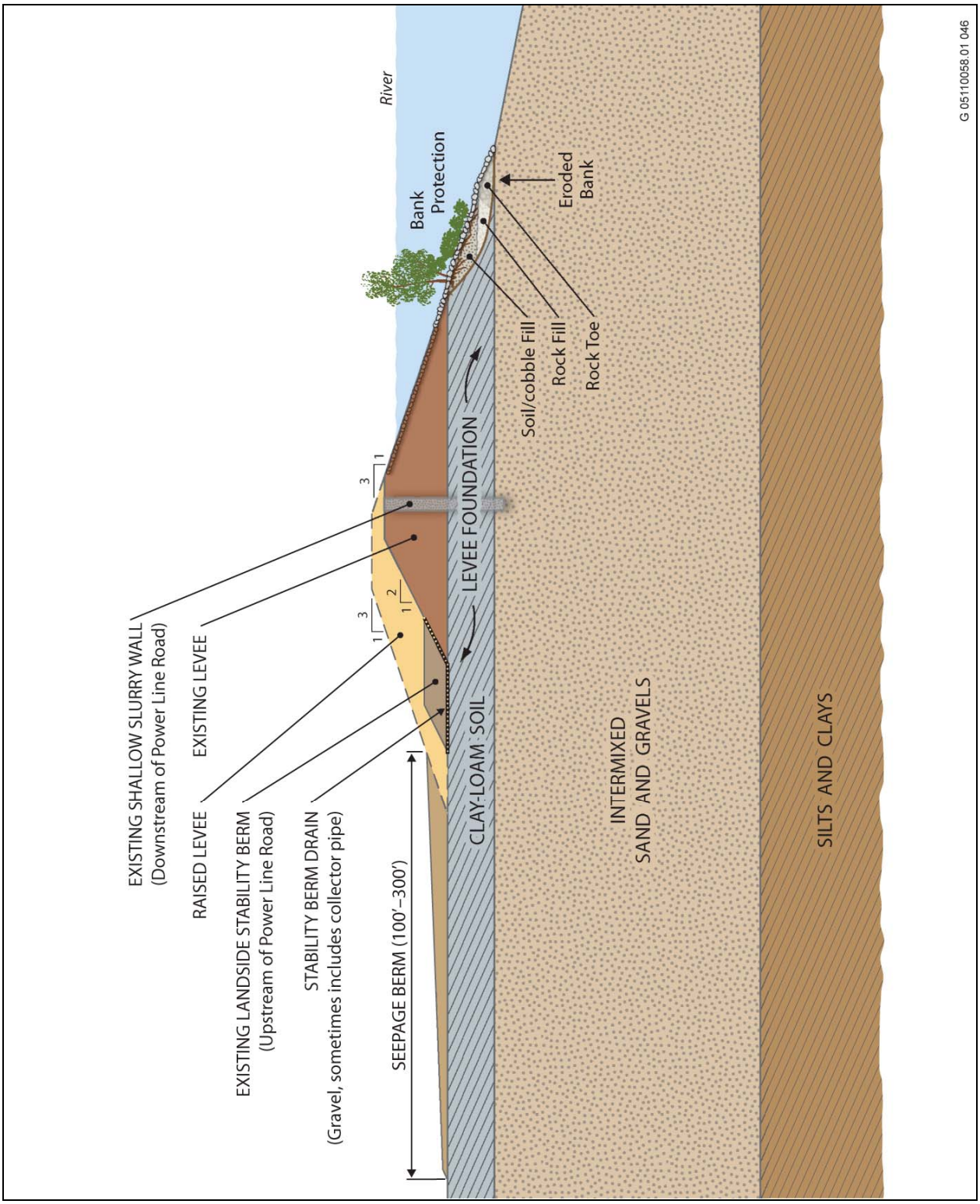


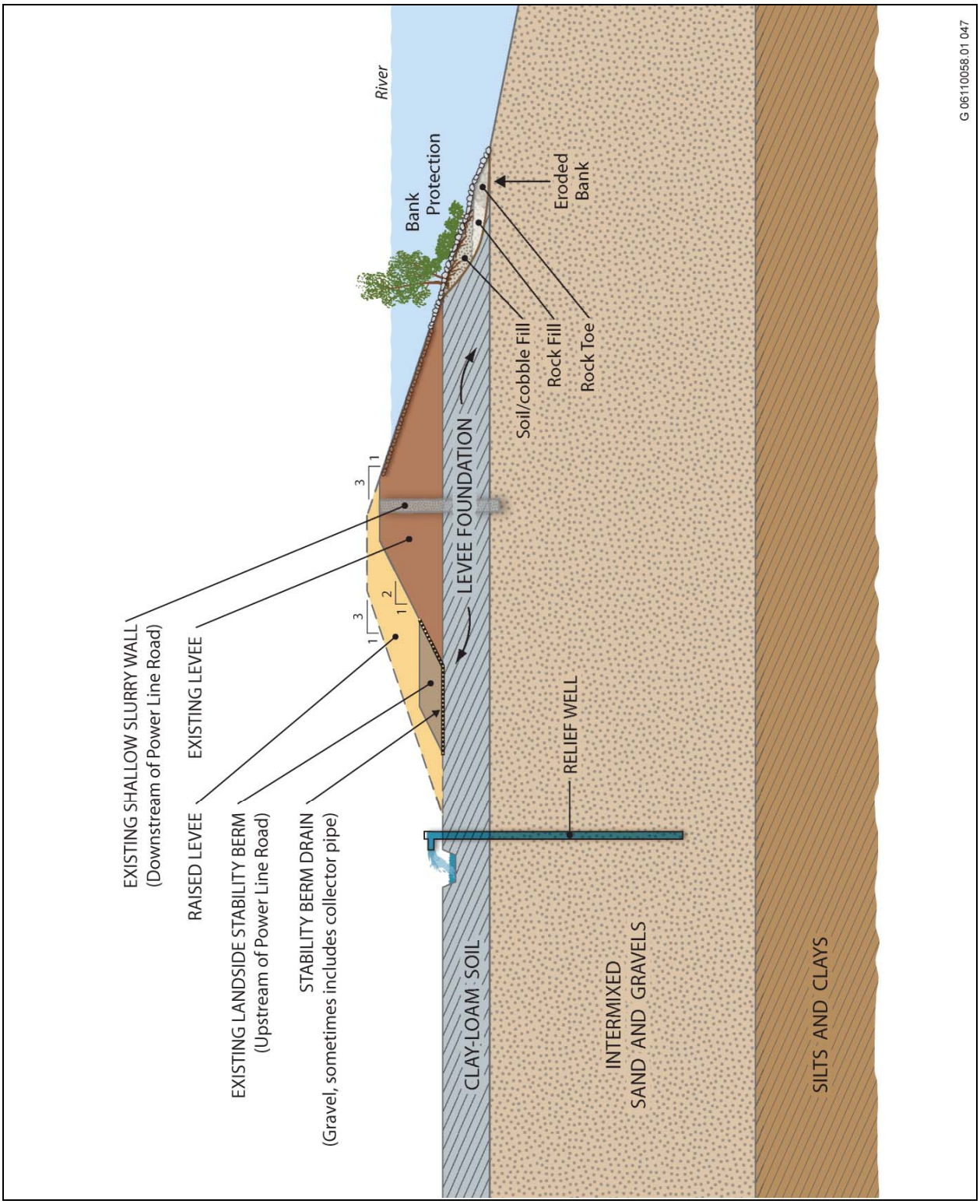
Source: Aerial image SACOG 2006, adapted by EDAW for SAFCA 2007, NLIP Landside Improvements Project DEIR

Concept Plan for a 1,000-Foot Setback Levee **Plate 14**



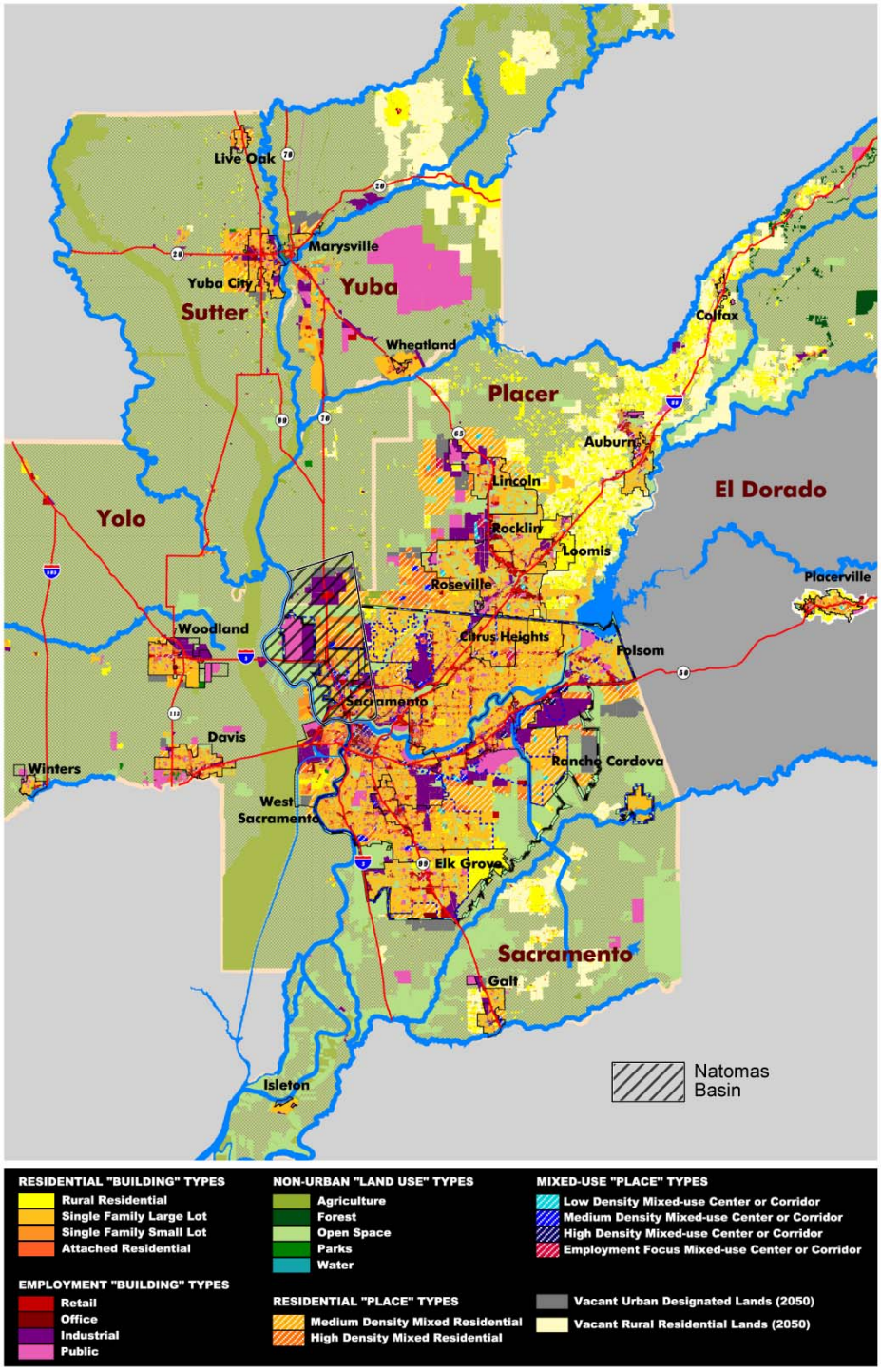
Source: SAFCA 2007, NLIP Landside Improvements Project DEIR – Illustration prepared by Jones & Stokes

Typical Seepage Berm **Plate 15**



Source: SAFCA 2007, NLIP Landside Improvements Project DEIR– Illustration prepared by Jones & Stokes

Typical Relief Well **Plate 16**



G 06110058.01 024

Source: SACOG and Valley Vision 2006, Sacramento Regional Blueprint

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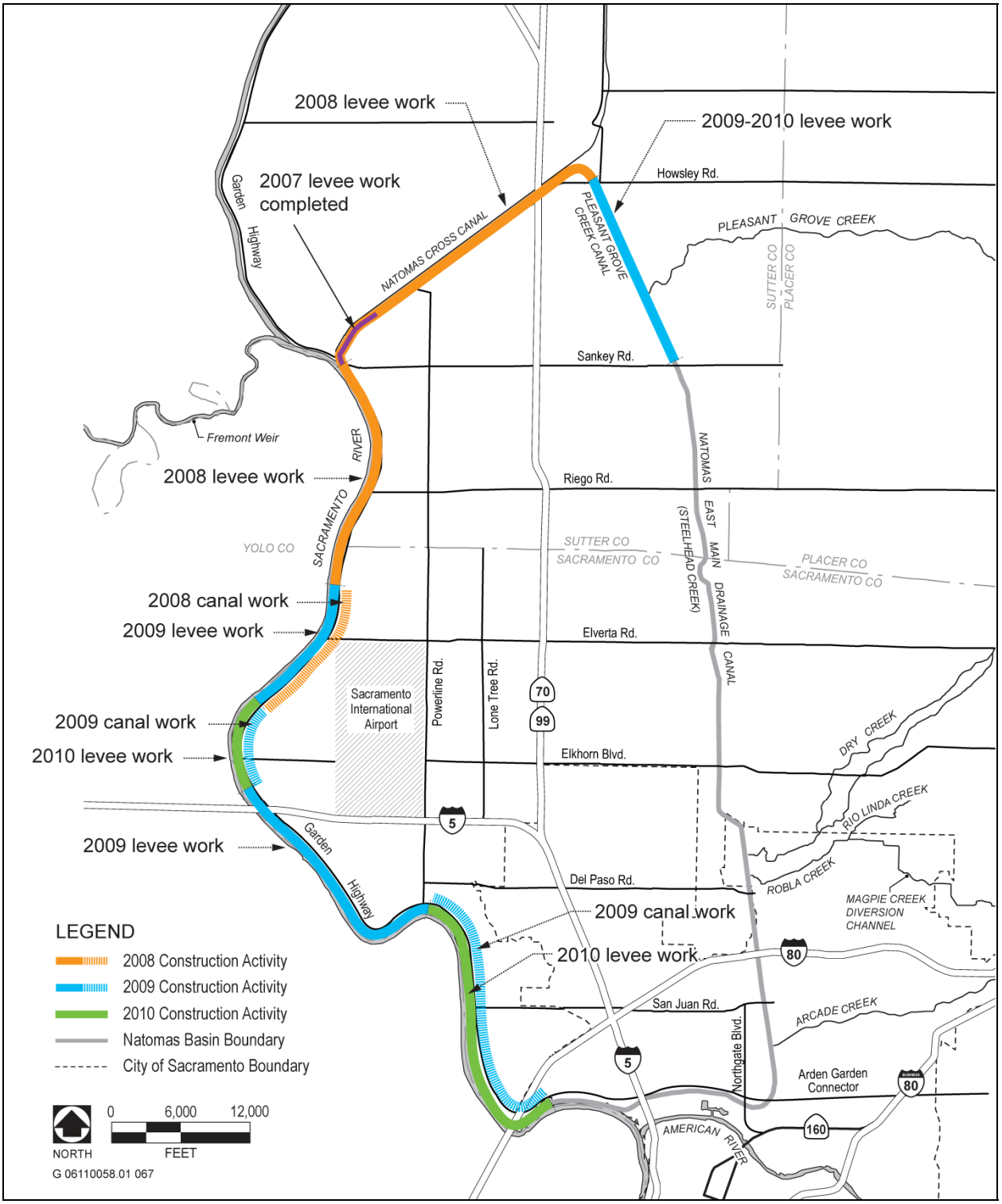

Source: CaSil; adapted by EDAW in 2007

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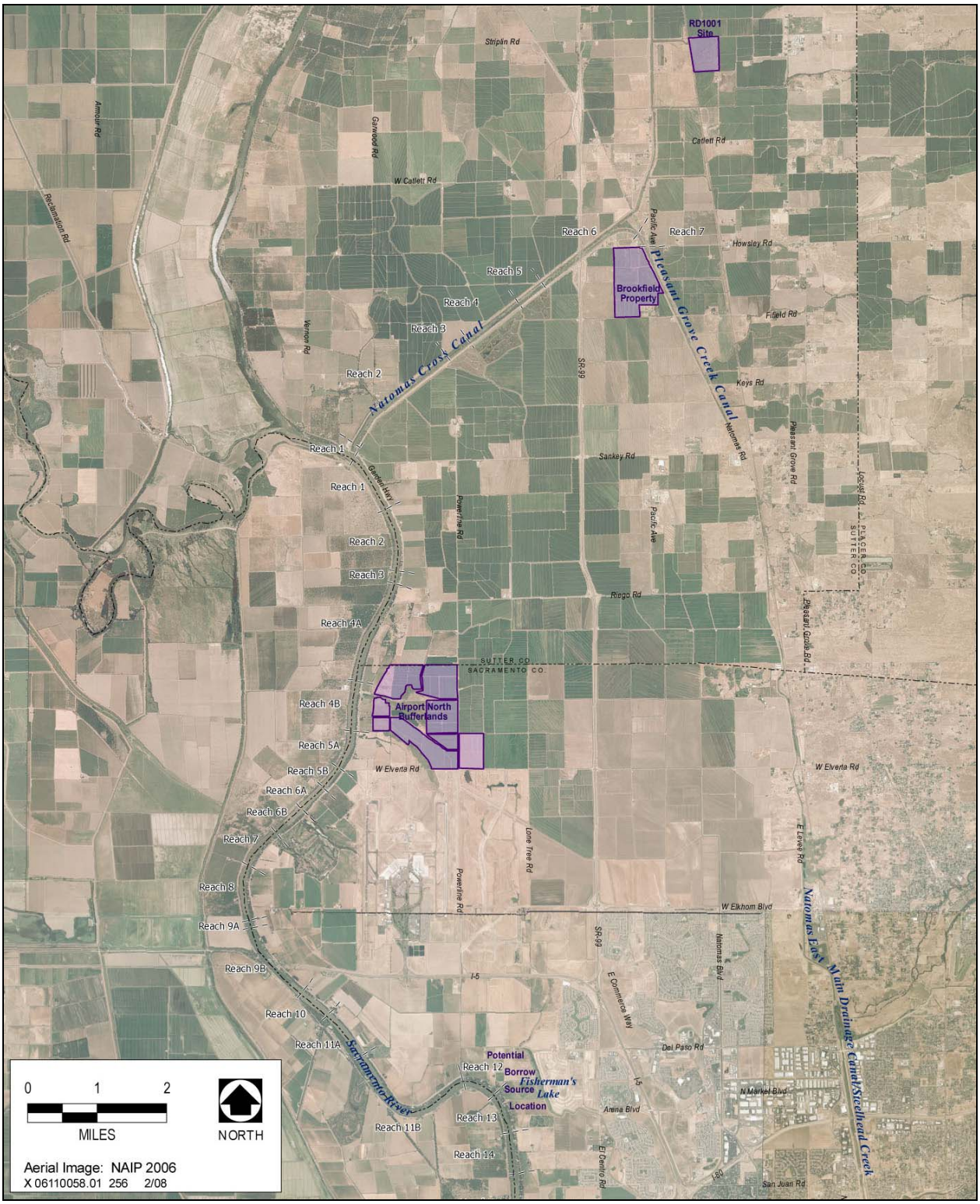

Sources: Aerial image SACOG 2006, adapted by EDAW in 2008 based on data from Mead & Hunt, SAFCA

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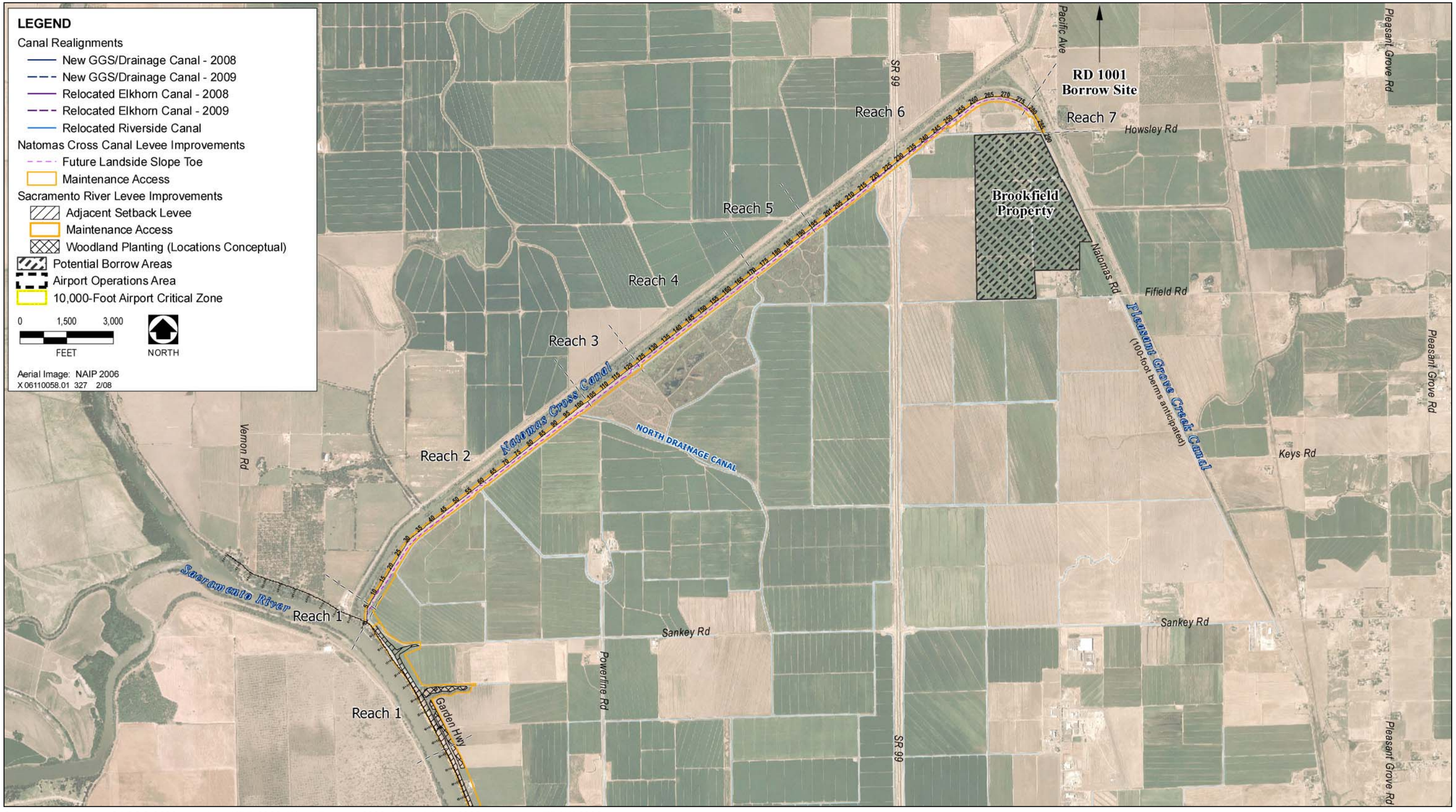
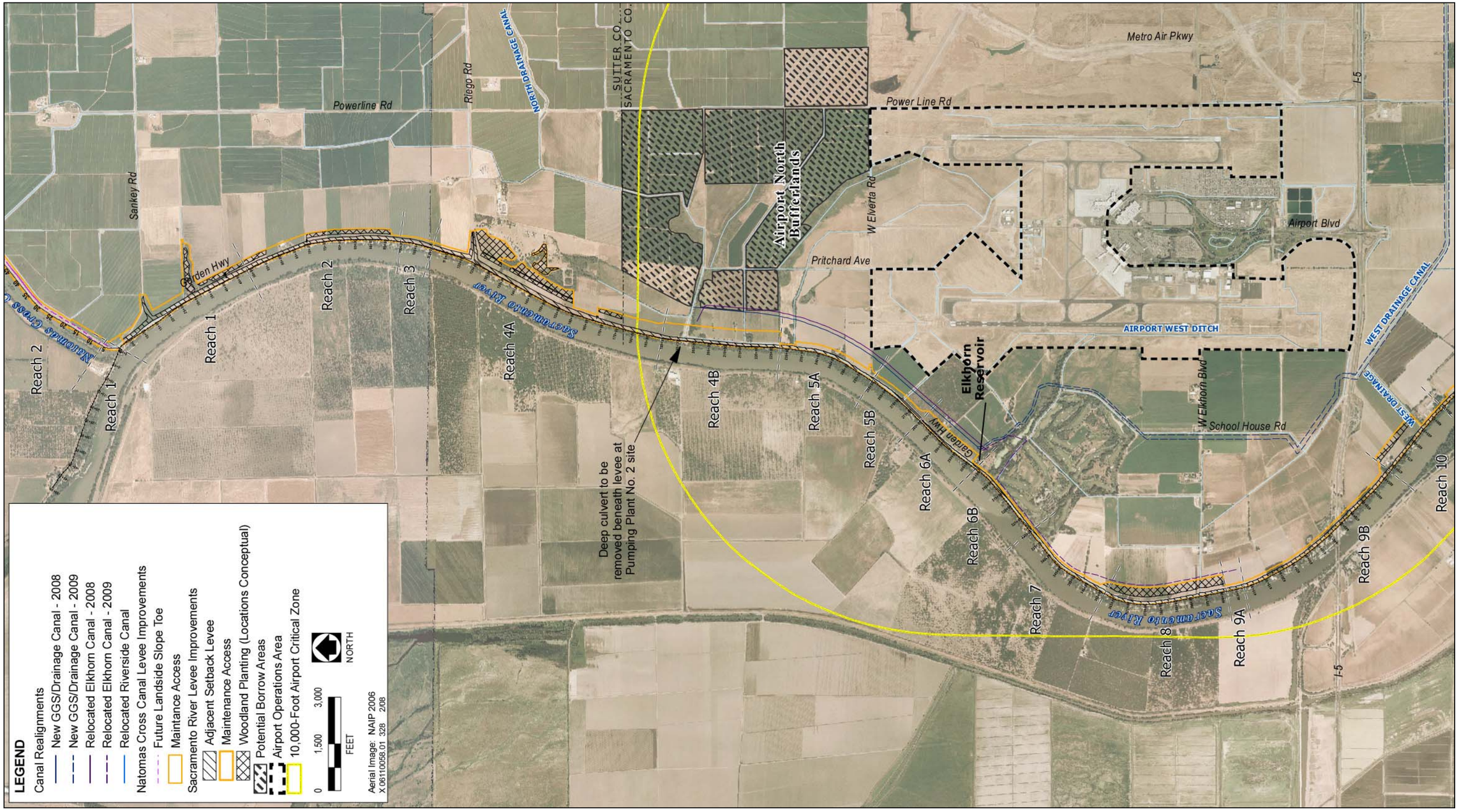


Sources: Aerial image SACOG 2006; data from HDR 2008, Wood Rodgers 2008, Mead & Hunt 2008; adapted by EDAW 2008

Overview of Proposed Project Features (2008–2010 Construction Phases)

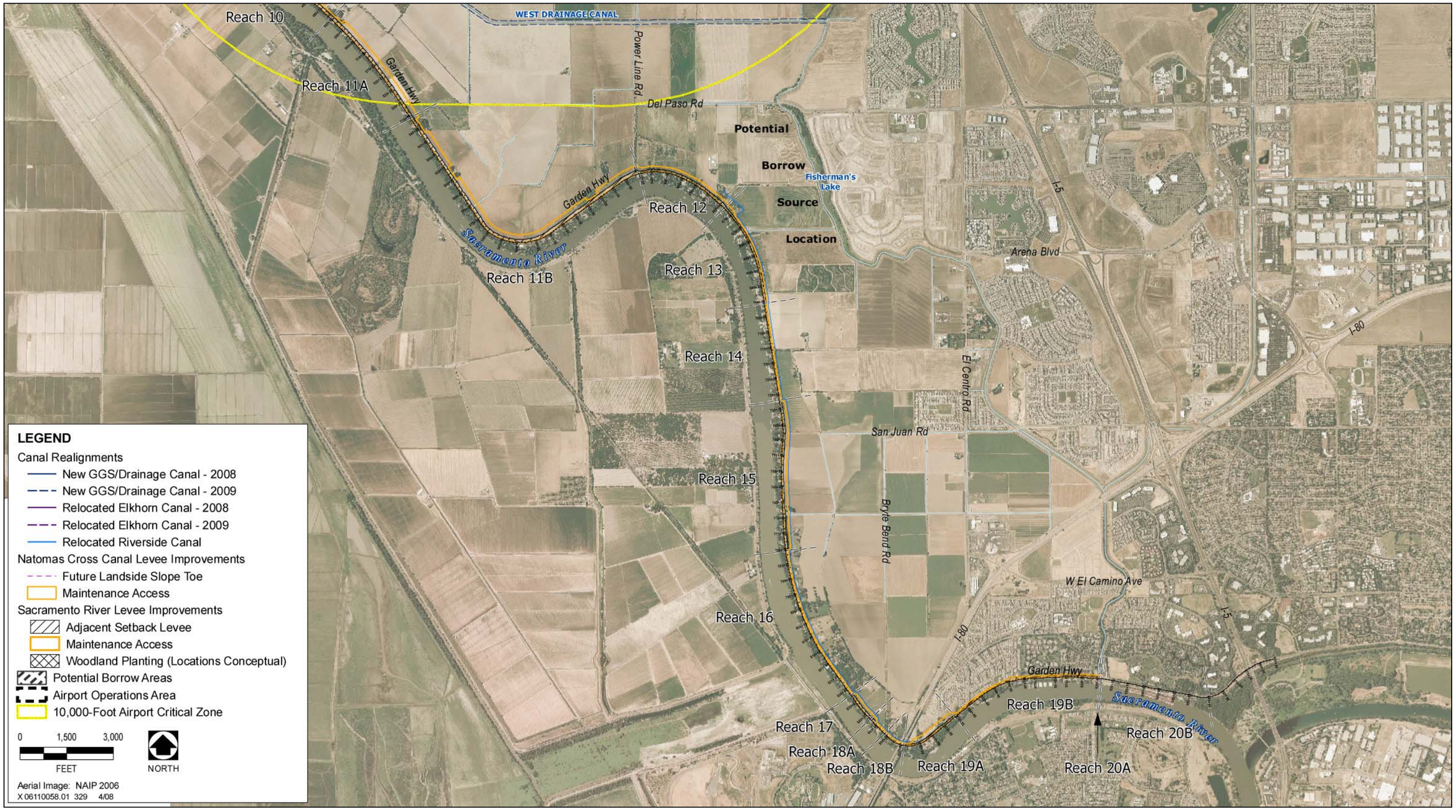
Plate 20a



Sources: Aerial image SACOG 2006; data from HDR 2008, Wood Rodgers 2008, Mead & Hunt 2008; adapted by EDAW 2008

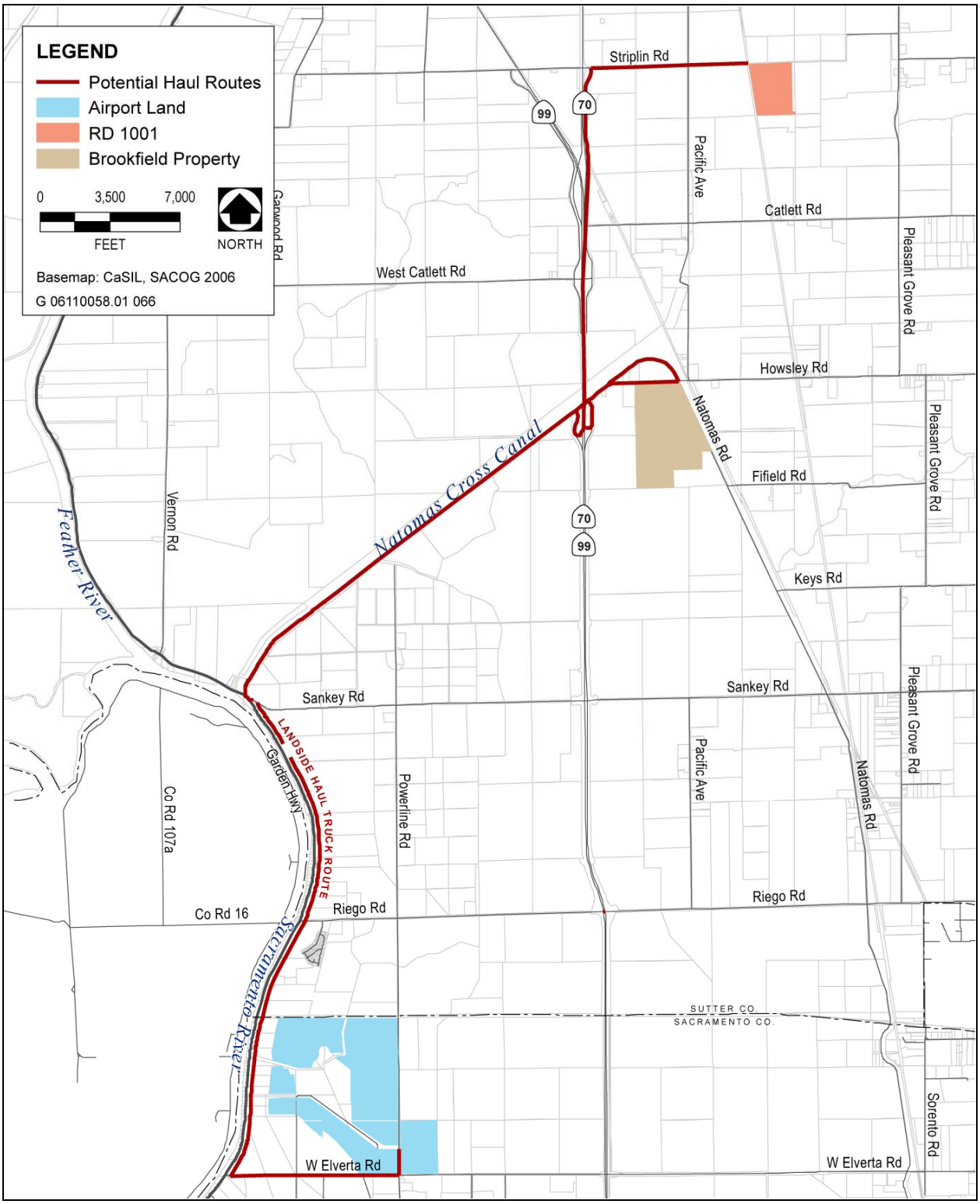
Overview of Proposed Project Features (2008–2010 Construction Phases)

Plate 20b



Sources: Aerial image SACOG 2006; data from HDR 2008, Wood Rodgers 2008, Mead & Hunt 2008; adapted by EDAW 2008

Overview of Proposed Project Features (2008–2010 Construction Phases) **Plate 20c**



Sources: Prepared by EDAW 2008

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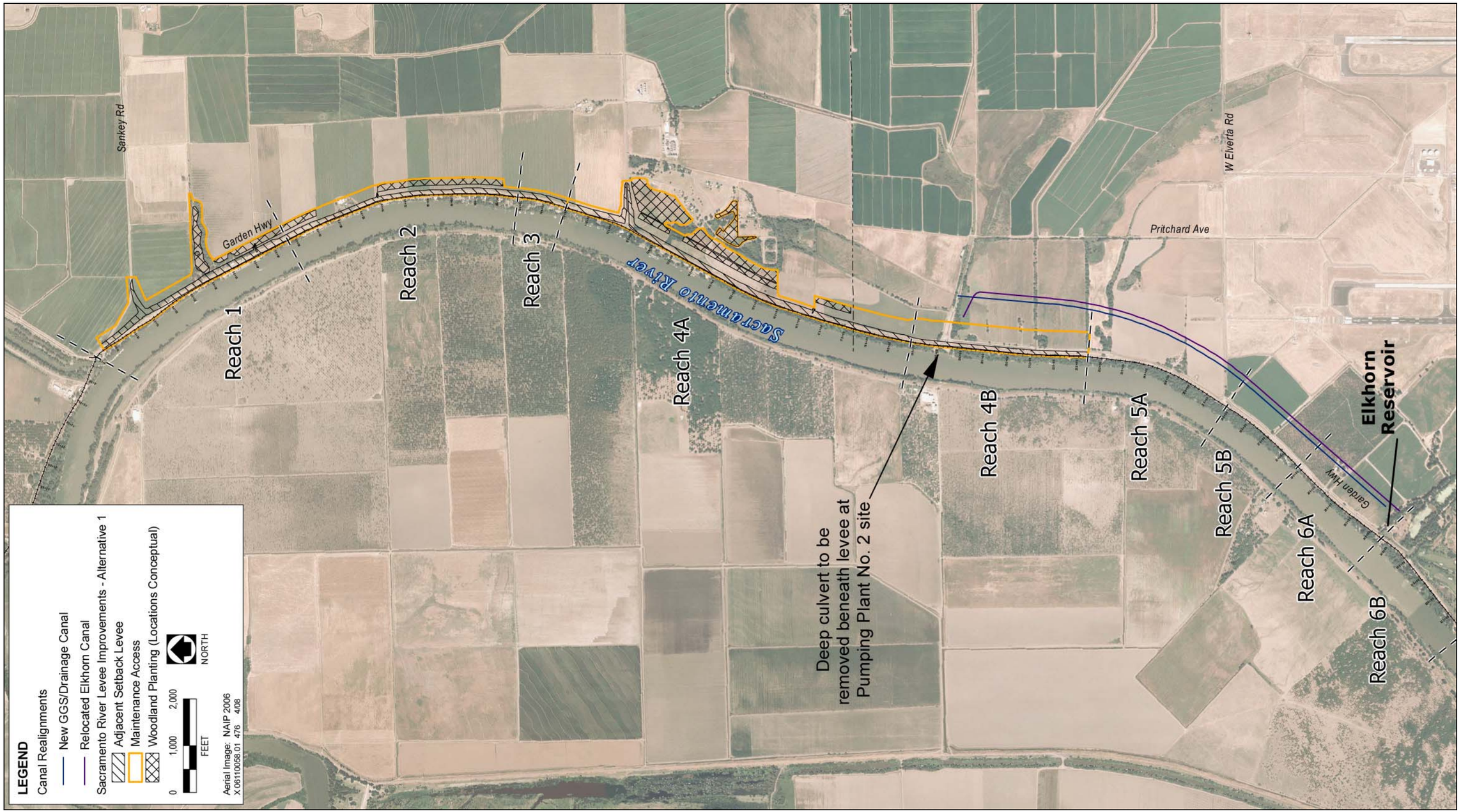
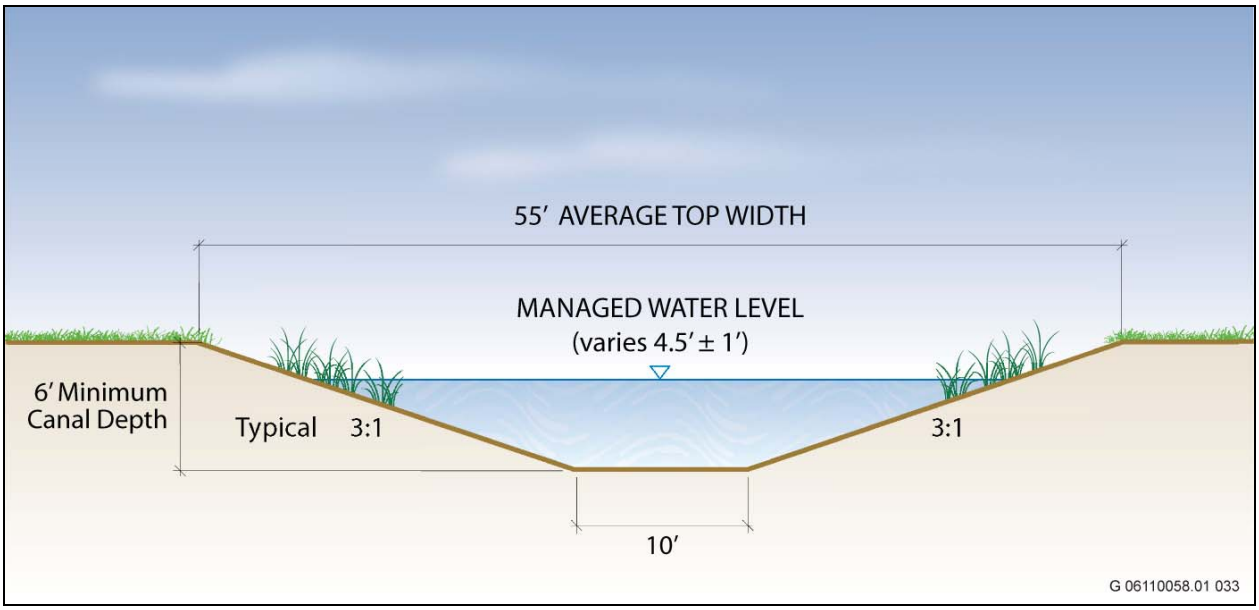


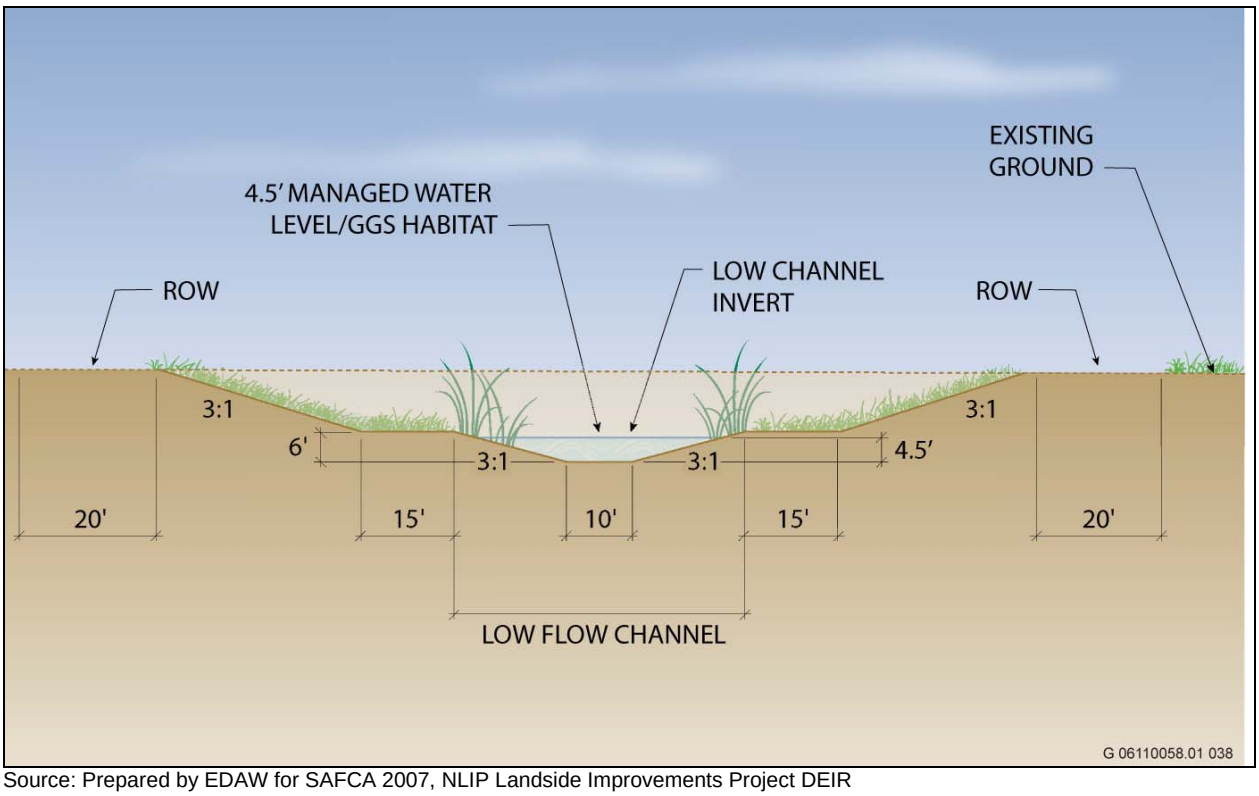
Sources: Aerial image SACOG 2006; data from HDR 2008, Wood Rodgers 2008, Mead & Hunt 2008; adapted by EDAW 2008

Sacramento River East Levee Features – 2008 Construction Phase for Alternative 1 **Plate 22**



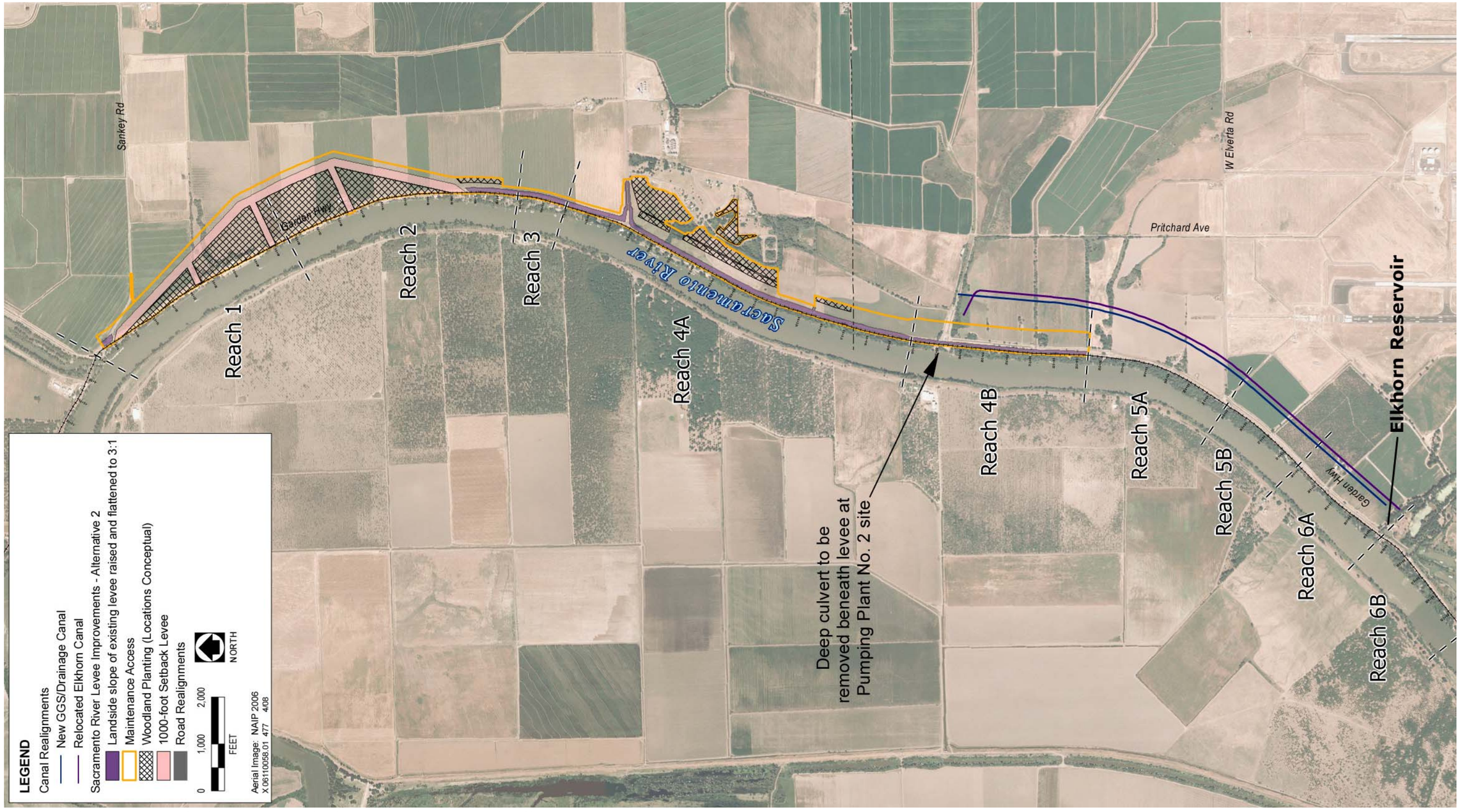
Source: Prepared by EDAW for SAFCA 2007, NLIP Landside Improvements Project DEIR

Typical Cross Section of the New GGS/Drainage Canal North of Reservoir Road (2008 Construction Phase) **Plate 23**



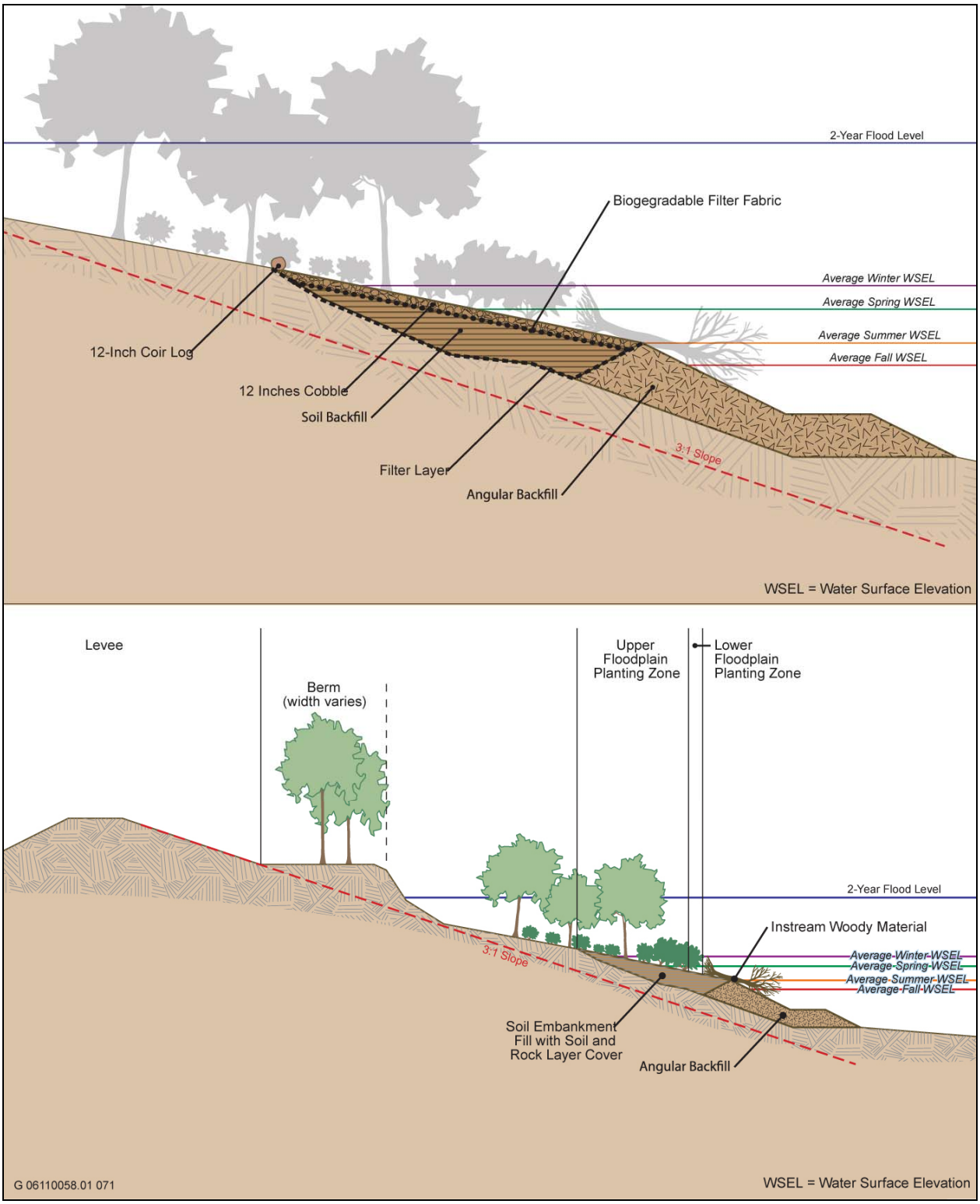
Source: Prepared by EDAW for SAFCA 2007, NLIP Landside Improvements Project DEIR

Typical Cross Section of the New GGS/Drainage Canal South of Teal Bend Golf Club and North of I-5 (2009 Construction Phase) **Plate 24**



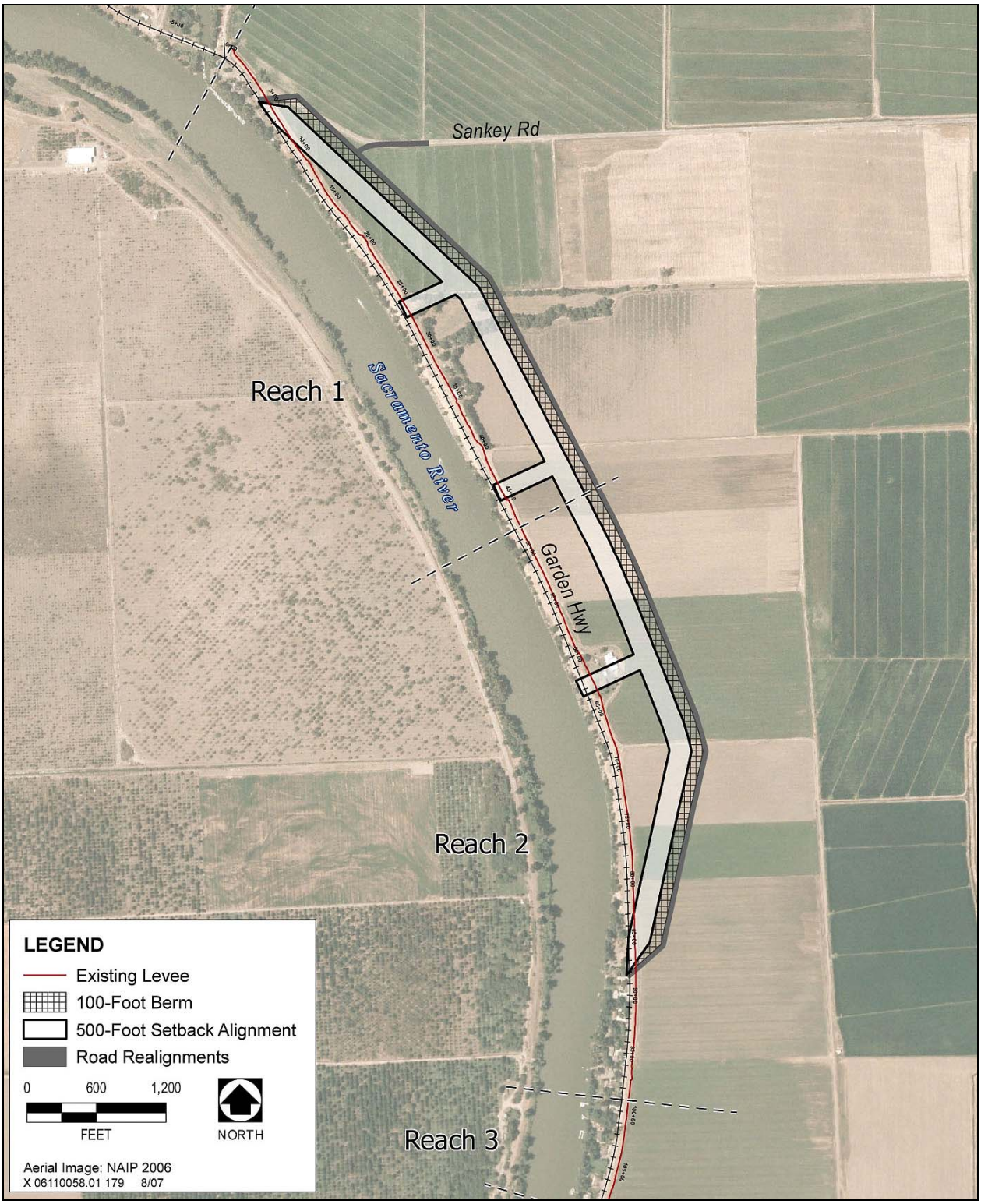
Sources: Aerial image SACOG 2006; data from HDR 2008, Wood Rodgers 2008, Mead & Hunt 2008; adapted by EDAW 2008

Sacramento River East Levee Features – 2008 Construction Phase for Alternative 2 **Plate 25**



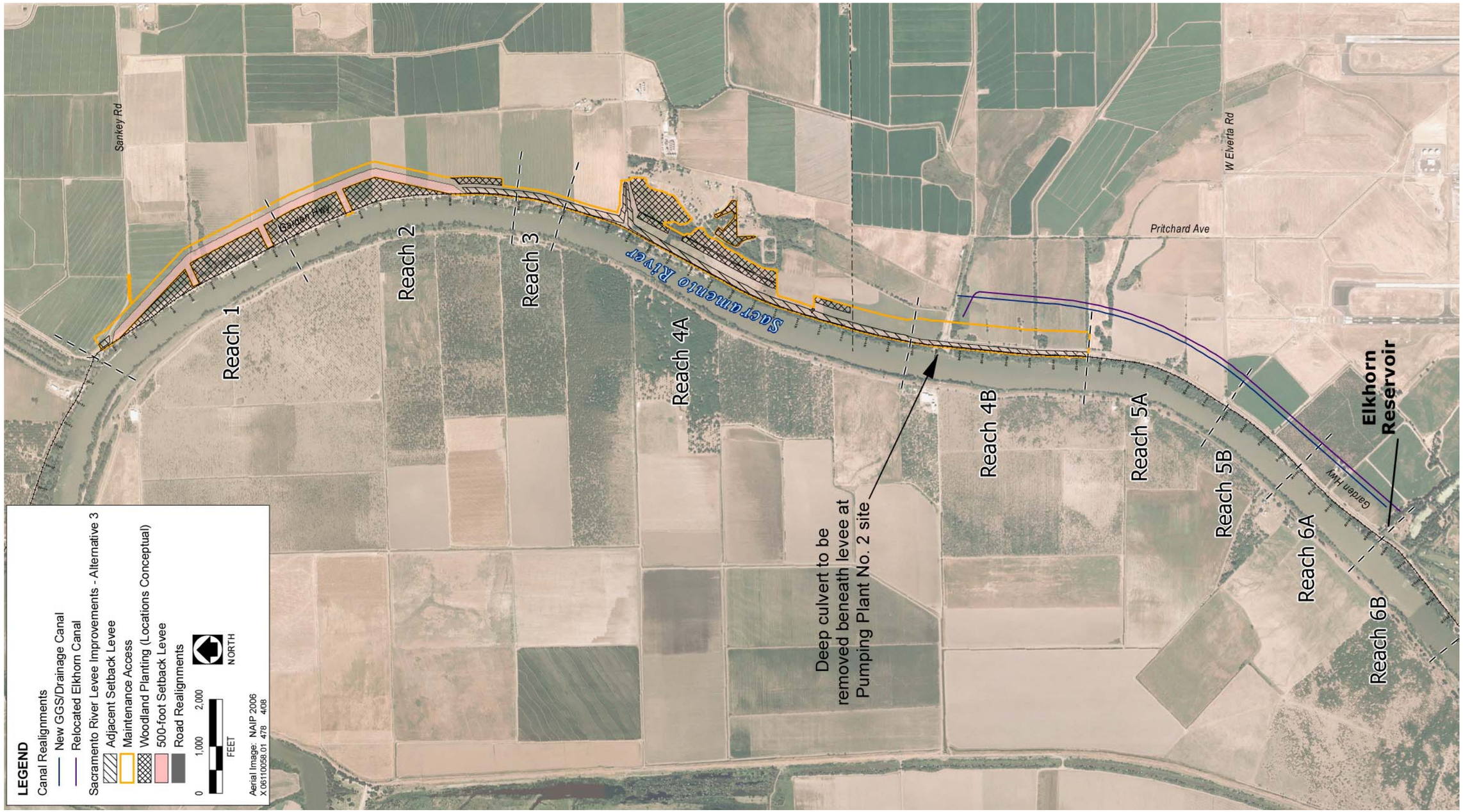
Source: Prepared by Jones & Stokes for SAFCA 2007, Bank Protection DEIR

Bank Protection Improvement Concept **Plate 26**



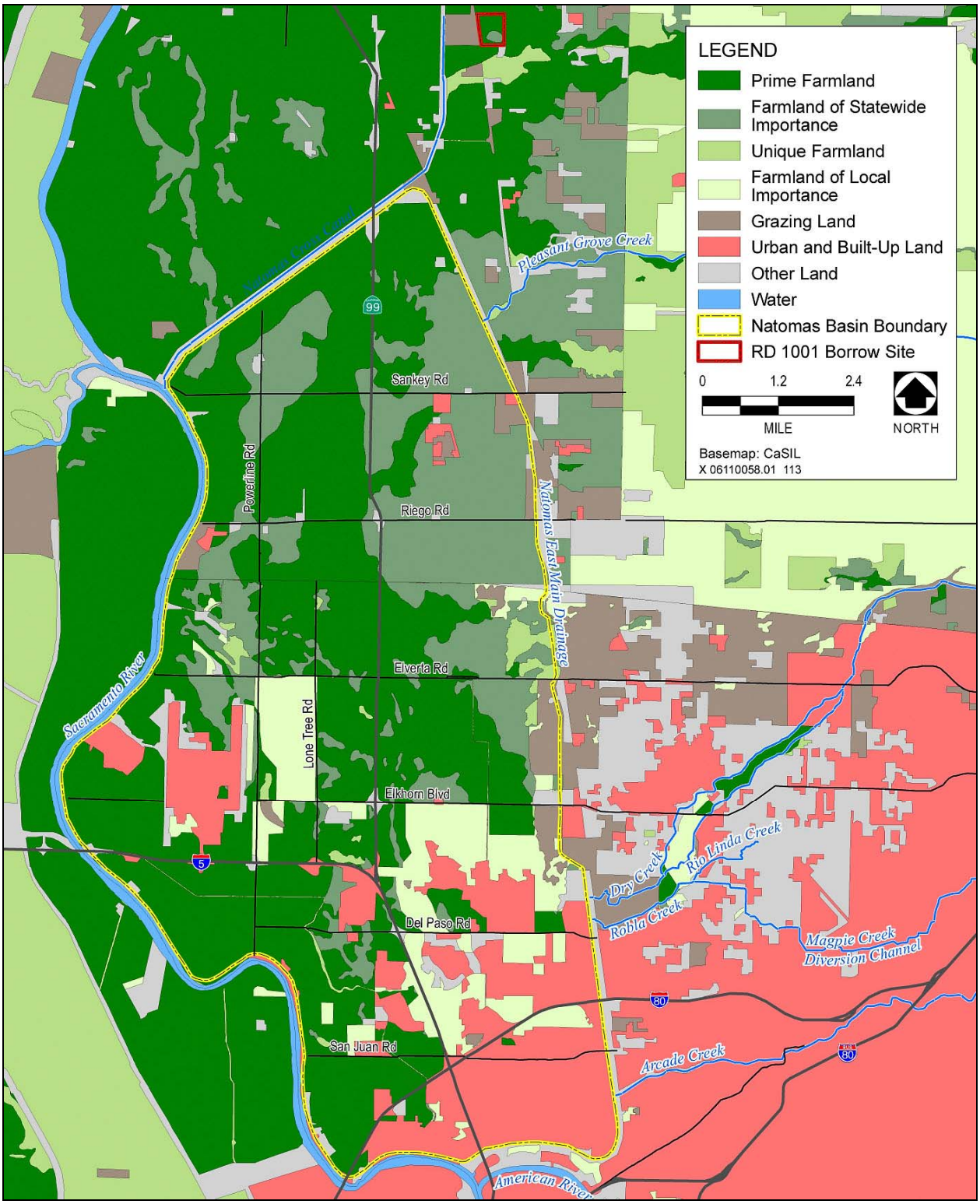
Source: Aerial image SACOG 2006, adapted by EDAW for SAFCA 2007, NLIP Landside Improvements Project DEIR

Concept Plan for a 500-Foot Setback Levee **Plate 27**



Sources: Aerial image SACOG 2006; data from HDR 2008, Wood Rodgers 2008, Mead & Hunt 2008; adapted by EDAW 2008

Sacramento River East Levee Features – 2008 Construction Phase for Alternative 3 **Plate 28**



Source: California Department of Conservation 2004, adapted by EDAW for SAFCA 2007 – Landside Improvements DEIR

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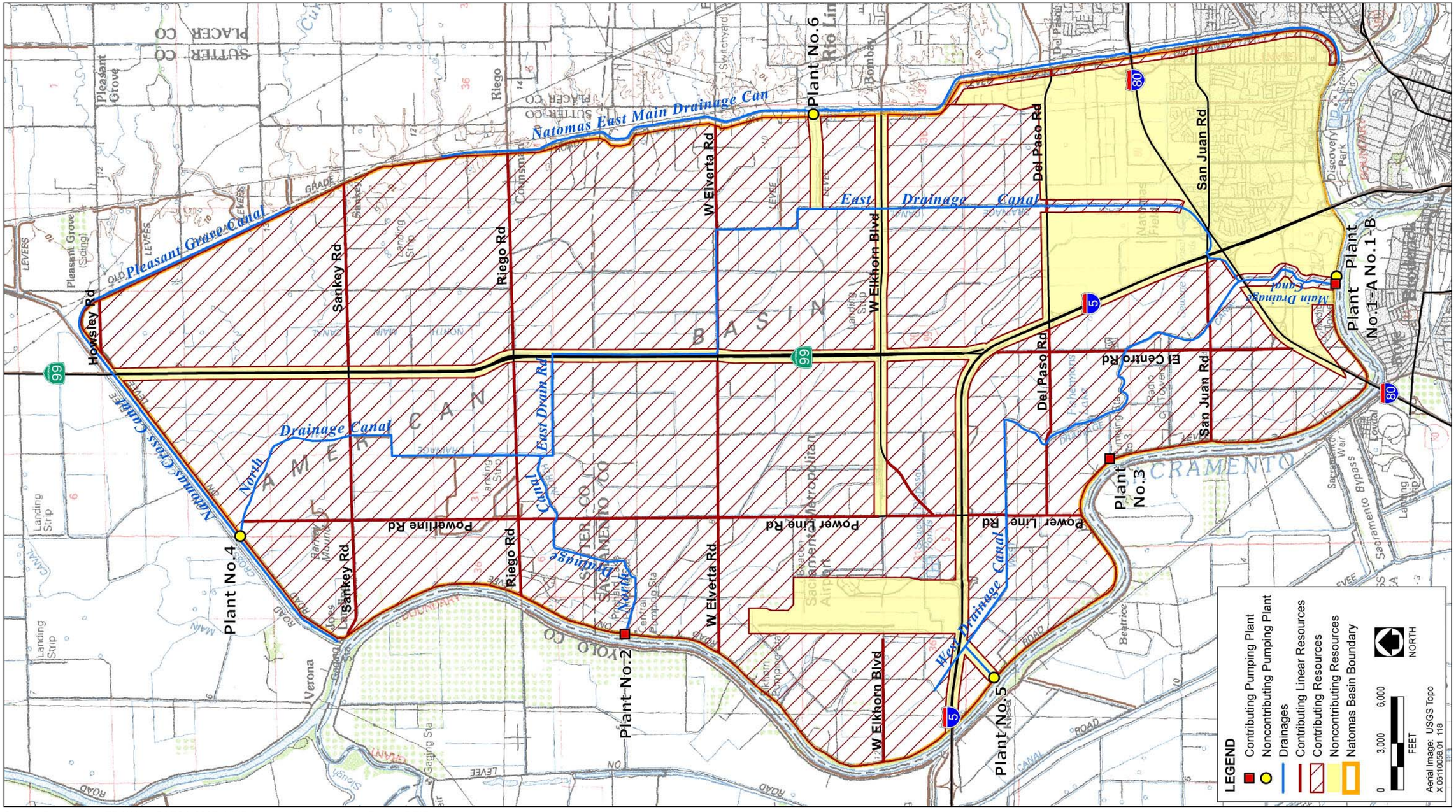

Source: Prepared by EDAW for SAFCA 2007, NLIP Landside Improvements Project DEIR

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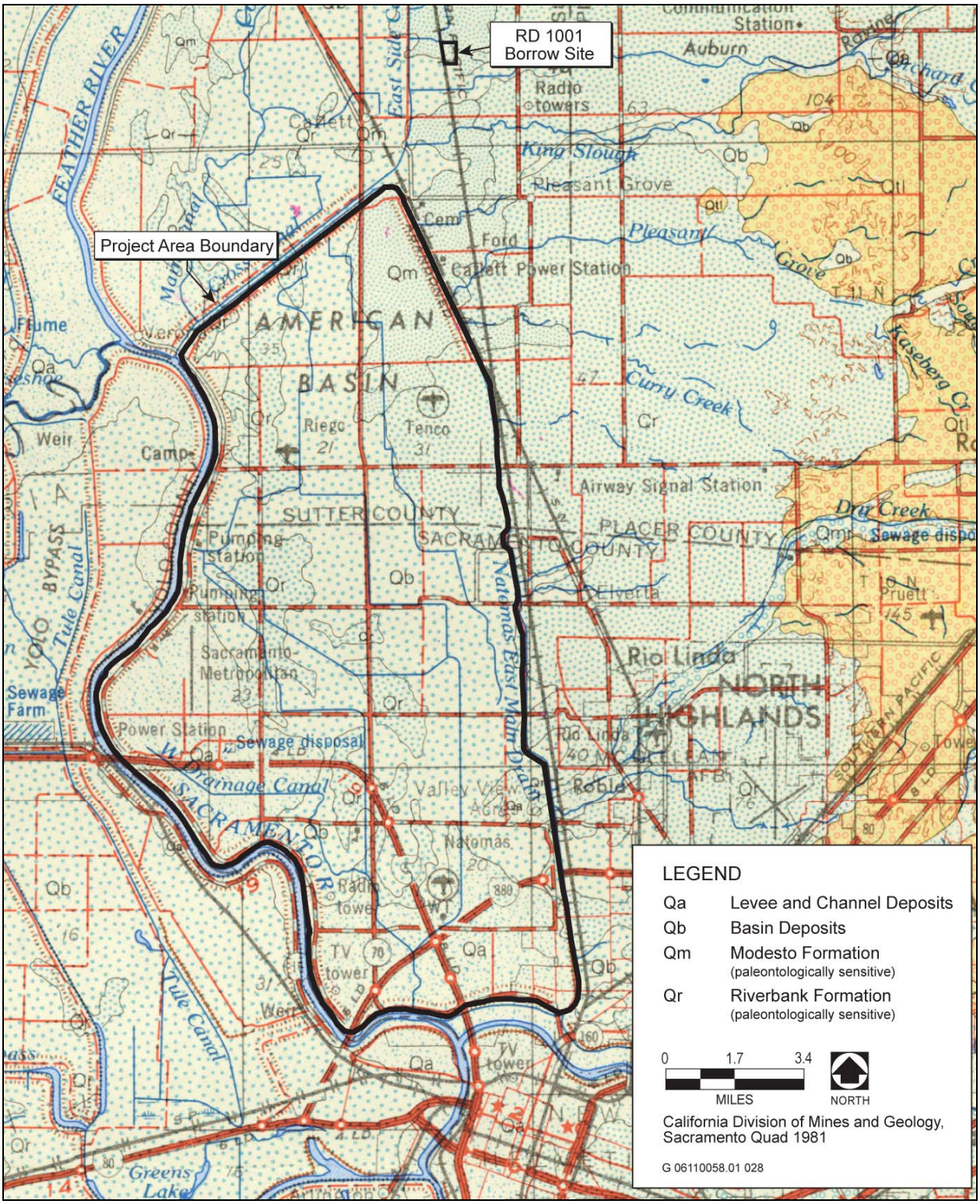

Source: Prepared by EDAW for SAFCA 2007, NLIP Landside Improvements Project DEIR based on data from Wagner et al. 1987

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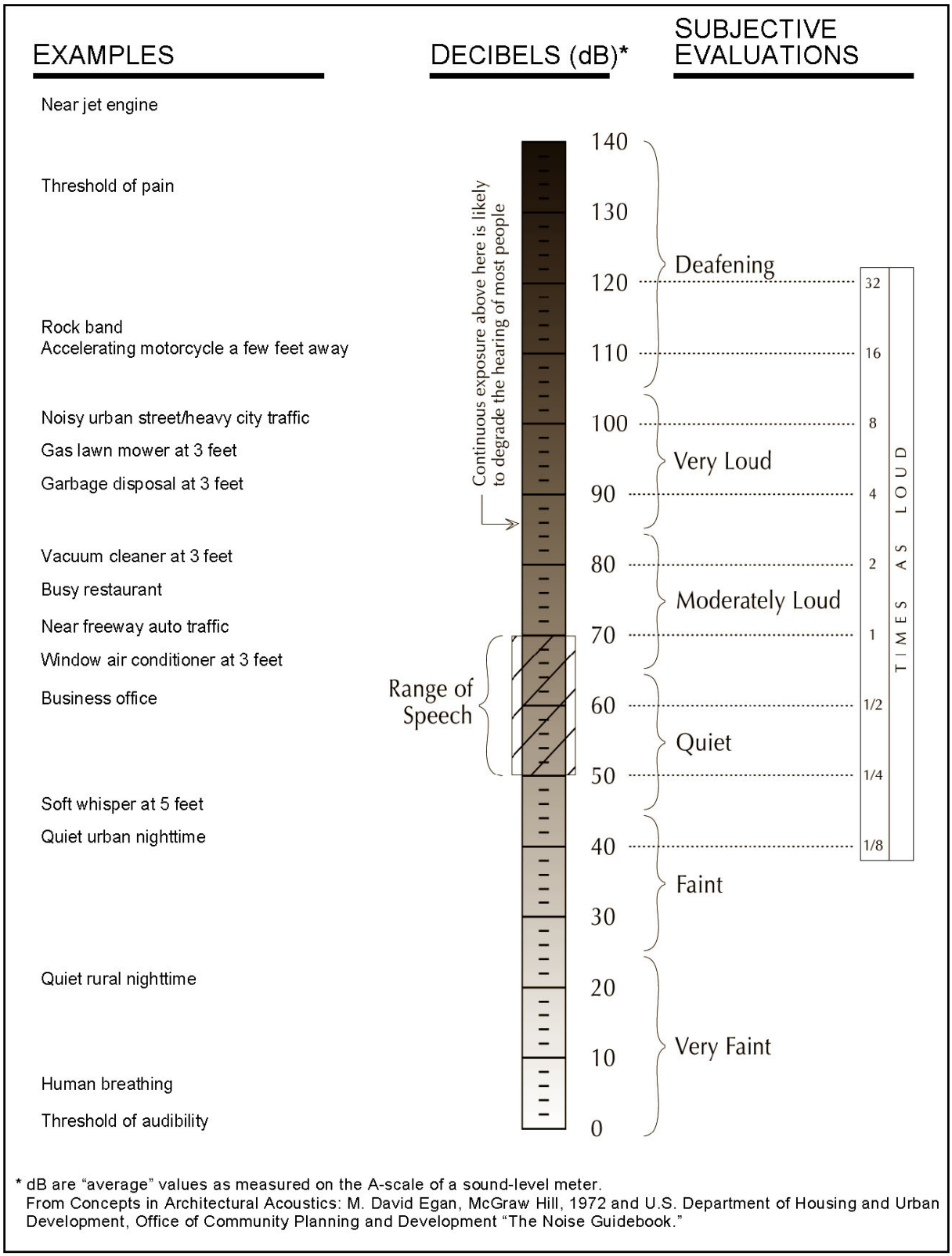

Source: Prepared by EDAW 2007

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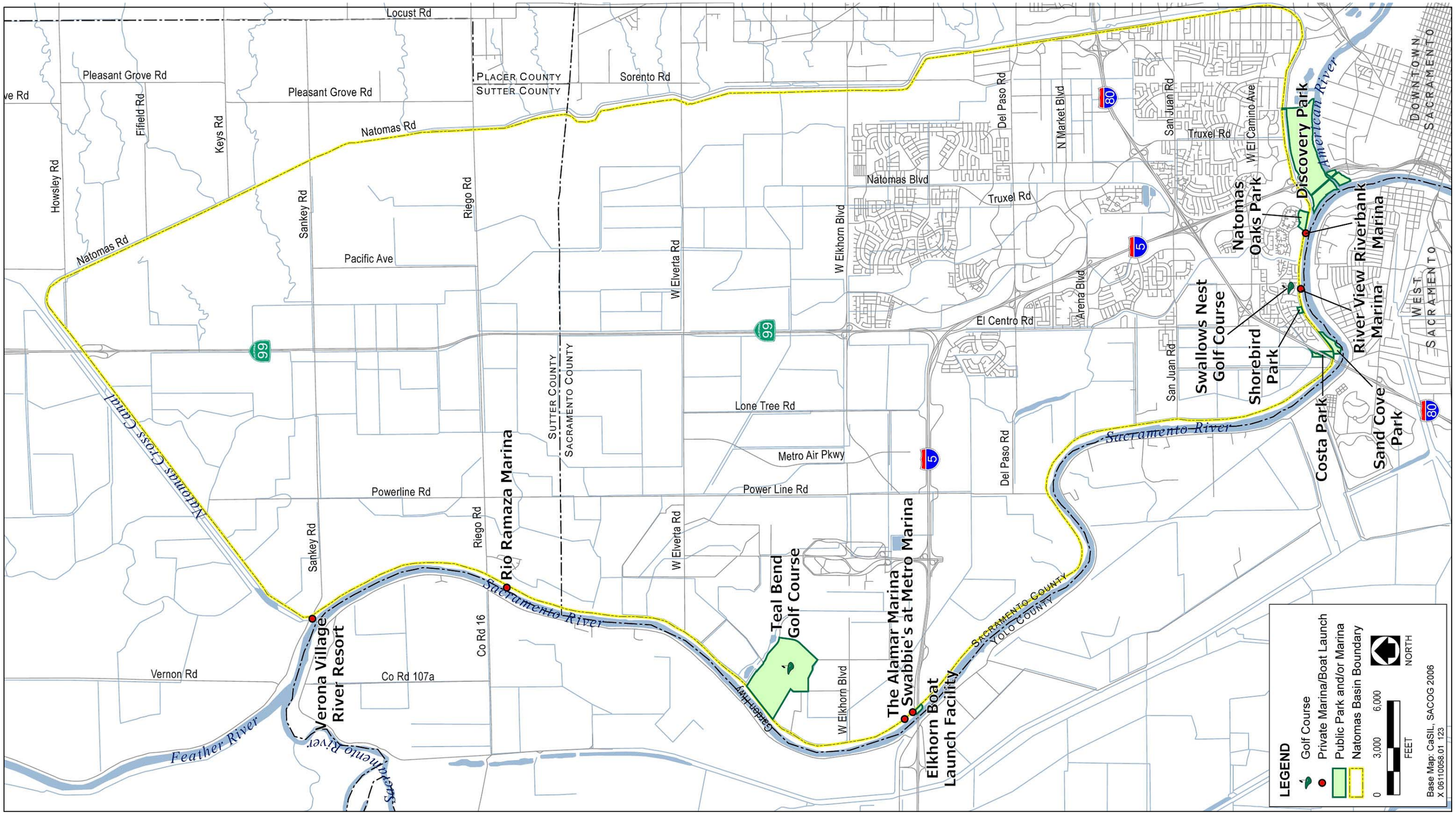

Source: Prepared by EDAW for SAFCA 2007, NLIP Landside Improvements Project DEIR

Recreation Facilities In or Near the Project Area **Plate 33**

APPENDIX A

Hydraulic Impact Analysis

SACRAMENTO AREA FLOOD CONTROL AGENCY

NATOMAS LEVEE IMPROVEMENT PROGRAM

SUMMARY REPORT ON HYDRAULIC IMPACT ANALYSES

Prepared for

Sacramento Area Flood Control Agency

Prepared by

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April 22, 2008

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1. OVERVIEW

The Sacramento Area Flood Control Agency (SAFCA) is proposing to raise and strengthen portions of the federal project levee system protecting the Natomas Basin in Sacramento and Sutter Counties in order to provide urban development in the basin with at least a 100-year level of flood protection as quickly as possible while laying the groundwork for providing at least a 200-year level of flood protection over time. This effort is referred to as the Natomas Levee Improvement Program (or "NLIP"). It is part of a larger program of improvements, including modifications to Folsom Dam that would provide the Sacramento area as a whole with at least a 200-year level of flood protection.

Under applicable federal law, no federal project levee or related flood control facility may be altered unless: Congress has authorized the alteration; or, pursuant to 33 U.S.C. 408, the Secretary of the Army acting through the Chief of Engineers of the U.S. Army Corps of Engineers ("USACE") has granted permission for the alteration based on a determination that the proposed work will not be injurious to the public interest and will not otherwise impair the usefulness of the affected facility. Under Title 23 of the California Water Code, such alterations must also be: authorized by the State Legislature; or permitted by the California Central Valley Flood Protection Board ("Board"), formerly the Reclamation Board. In order to coordinate these federal and state decision-making processes, the Board's recent practice has been to issue a letter to the USACE requesting permission for proposed alterations after the Board has made its own determination that the work will not have a detrimental impact on the affected flood control system.

At the heart of both processes is an analysis of the hydraulic effects of the proposed alteration. SAFCA has historically conducted this analysis by evaluating the potential effects of its levee improvement projects on water surface elevations in the stream and river channels in the project area and in the larger watershed within which the project is situated. This approach was used to evaluate the flood related impacts of the NLIP for purposes of meeting the requirements of the California Environmental Quality Act (CEQA). Specifically, SAFCA's engineering consultant, MBK Engineers ("MBK"), has used a UNET hydraulic computer model of the Sacramento River Flood Control Project ("SRFCP"), which was approved in 2006 by the USACE Sacramento District, to compare existing conditions in the waterways surrounding the Natomas Basin and in the larger SRFCP with and without the NLIP improvements and the other improvements comprising the 200-year flood protection program for the Sacramento area. MBK's initial routings assumed that the levees outside the project area would fail when overtopped. However, in order to test the sensitivity of this assumption, a later set of routings was performed assuming that none of these levees would fail even if overtopped (as several were overtopped in the 200-year model runs).

The results of the initial routings were presented in the program-level Environmental Impact Report ("EIR") on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area, which was certified by the SAFCA Board of Directors in February 2007. Using the same methodology, the analysis was performed again and presented in the Draft EIR for the NLIP Landside Improvements Project in September 2007. The 'no levee failure' routings were performed thereafter and presented in the Landside Improvements Final EIR

which was certified by the SAFCA Board in November 2007. The modeling showed that the proposed NLIP improvements by themselves would not alter any of the identified water surface elevations in the river channels comprising the SRFCP. Moreover, when the NLIP improvements are analyzed as part of the larger 200-year flood protection program for the Sacramento area, including modifications to Folsom Dam, the result is a lowering of water surface elevations for the 100-year and 200-year floods along the lower Sacramento River for most of the reach adjacent to the Natomas Basin. On this basis, SAFCA has concluded that the NLIP improvements would not cause any significant hydraulic impacts.

This report is a summary of the previous hydraulic impact analyses conducted for the NLIP. The report also presents new information requested by the USACE as part of their National Environmental Policy Act (NEPA) compliance for review of the proposed levee alterations.

2. SRFCP SYSTEM BACKGROUND

The perimeter levee system around the Natomas Basin is part of a larger integrated system of levees, dams, and bypass channels comprising the SRFCP (Figure 1). This system encompasses five historic flood basins in the Sacramento Valley (Colusa, Sutter, Feather, Yolo and American Flood Basins) and the sub-basins contained therein. Planning, design, and construction of the SRFCP has been ongoing since the early 1900s under the leadership of the USACE and the State of California (State), with local levee and reclamation districts playing the principal role in operating and maintaining the system.

The SRFCP levees were set close to the river channel in order to improve navigation by having the rivers scour hydraulic mining sediments. The design of the system assumed no levee failures but included five engineered diversions and one natural overflow diversion. The natural diversion is to Butte Basin, which is upstream from the SRFCP levees. This diversion did not include flowage easements because the Butte Basin is a historic flood basin. The five engineered diversions include two additional diversions to Butte Basin (Moulton and Colusa Weirs), one diversion to the Sutter Bypass (Tisdale Weir), and two diversions to the Yolo Bypass (Fremont and Sacramento Weirs). All of the engineered diversions included the acquisition of property rights to support the diversions. The deliberate planning, construction, and maintenance of the diversions assured that they would function during flood conditions and serve as reliable features of the flood project.

Initially, the river channel and bypass levees in each segment of the system were constructed based on a standard geometry. The levees were designed with a predetermined freeboard allowance tied to specified flows and associated water surface elevations generally matched to observed conditions during the 1907 and 1909 floods. Over time, the standard levee section was increased because of numerous levee failures. The minimum standard levee changed from a levee with a top width of 10 feet to one with a top width of 20 feet. In addition, the design flows were modified substantially on the Feather and American Rivers. This was the result of floods that occurred after 1909, which demonstrated these rivers could produce substantially greater flows than occurred during the 1907 and 1909 floods. Because numerous levee failures occurred along the Feather River levees between 1920 and 1934, these levees were set back and enlarged

to accommodate greater flows. These changes were summarized in memorandums issued by the USACE which define the minimum freeboard requirements for each segment of the SRFCP, collectively referred to as the "USACE 1957 Profile." Over the years, the system capacity of the SRFCP was also greatly expanded by the construction of five major multiple-purpose reservoirs (Shasta, Black Butte, Oroville, New Bullards Bar, and Folsom Reservoirs) containing 2.7 million acre-feet of dedicated flood control storage space.

The record floods of 1986 and 1997 triggered additional system modifications. Although these floods were significantly larger than the 1907 and 1909 floods, the availability of reservoir storage largely prevented flows in the system from exceeding the design of the SRFCP. Nevertheless, numerous project levees experienced unexpectedly severe stress and some failed. This experience caused the USACE, the State, and their local partners to perform a series of geotechnical evaluations on the SRFCP's levees and to adopt new, more rigorous levee design standards for urban areas, including updated standards for seepage through and under project levees. To meet these standards, USACE, the State, and local flood control agencies have made substantial investments in addressing identified deficiencies in levees throughout the SRFCP and in improving the level of flood protection provided by the levees, particularly in urban areas. Federal, State and local support for these levee improvements has been secured under several federally authorized projects, including the Sacramento Urban Levee Reconstruction Project, the American River Watershed Investigation, the West Sacramento Levee Improvement Project, the Sutter Basin Project and the Yuba River Basin Project. In the aftermath of the flooding of New Orleans, these authorized projects are being expanded to support an even broader scope of urban levee improvement activity.

The evolution of these urban levee improvements is occurring within a SRFCP management framework that has historically allowed necessary adaptations to the system without undermining its basic operational principles. These principles may be summarized as follows. First, the SRFCP is not intended to provide a uniform level of flood protection (statistical probability of flooding) to the various sub-basins within the protected area. Rather, each sub-basin is protected by levees that are required to at least meet the SRFCP's minimum geometrical standards, including freeboard reflecting the water surface profile prescribed for that segment of the system. Second, each sub-basin's flood protection is dependent on the fitness of its own levees and not on the condition (or failure) of any other sub-basin's levees. Accordingly, each sub-basin has the right to keep its levees in the fittest possible condition to ensure that these levees will perform as reliably as possible in a flood. This right ensures the orderly operation and maintenance of the system since even the most modest levee work has the potential to trigger a "transfer of risk" from one sub-basin to another, at least in theory, and there are no data or modeling tools available to quantify such transfers of risk, assess their significance, or determine how they might be mitigated. Third, for this reason, the administration of the SRFCP has historically relied on "change in design water surface elevation" as the guideline for evaluating the effects of any proposed levee work.

The strictest scrutiny is given to levee work involving physical changes in the geometry of the river channel since these changes have the most potential to alter water surface elevations prescribed by the "USACE 1957" water surface profiles. This work includes placement of fill or construction of structures in the floodway, construction of new levees, relocation of existing

levees, excavation within the floodway, construction of large berms for protecting riverbanks, raising an existing levee (waterside raise), construction of a new bypass, and planting of vegetation within the floodway. Landside levee work of the type proposed as part of the NLIP, such as placing a cutoff wall in a levee, adding a seepage berm to a levee, placing a field of seepage relief wells along a levee, raising a levee (landside raise), widening a levee (increased top width), and relocating a seepage ditch, is also strictly scrutinized but is not likely to cause impacts.

The standard procedure for this evaluation is to use hydrologic and hydraulic computer modeling tools such as, HEC-1, HEC-2, UNET, HEC-RAS, RMA2, FESWMS, etc. The analysis consists of calibrating the hydraulic model to historic flood events using high-water marks and stream gage data. The calibration activity is normally conducted on a system-wide basis instead of a site-specific basis. However, data available for computer model calibration can be sparse or nonexistent. In addition, assumptions must be made regarding reservoir operations. Because all of the reservoirs that contribute to the operation of the SRFCP (Shasta, Black Butte, Oroville, New Bullards Bar and Folsom) are governed by water control manuals issued by USACE, current reservoir operations are assumed to continue except where it is reasonably foreseeable that the current operation would change. Examples of such changes are at the Folsom Dam and Reservoir: where Congress has directed USACE to formalize the variable space storage operation that has been in effect by agreement between SAFCA and the U.S. Bureau of Reclamation since 1995; and where water control structures are being modified as part of the Folsom Dam Joint Federal Project.

3. APPROACH TO MODELING ANALYSIS

As discussed above, in order to evaluate the hydraulic impacts of the levee alterations proposed as part of the NLIP, MBK used a UNET hydraulic computer model calibrated to historic flood events using high-water marks and stream gage data gathered in connection with the 1997 Flood. Figure 2 displays the geographical extent of the UNET model. Figure 3 provides the UNET model river mile stationing around the Natomas Basin. The results of the calibration model output compared to the high water mark and stream gage data are shown on Figure 4.

The hydraulic impacts of the levee alterations proposed as part of the NLIP were evaluated based on the potential of the proposed levee alterations to increase one or more of the SRFCP's recognized design water surface elevations: (1) the "USACE 1957" water surface profiles that serve as the minimum design standard for the SRFCP; (2) the 100-year flood elevations that govern management of SRFCP protected floodplains under the National Flood Insurance Program (33 CFR. 65.10); and (3) the 200-year water surface elevations that are likely to govern implementation of floodplain management standards recently adopted by the State Legislature (Statutes of 2008, Chapter 364 [adding Water Code Section 9602(i)]). In addition, SAFCA has provided information on the project impacts to the 500-year flood elevation. This flood represents the extreme limit of the flows that could reach the NLIP project area.

The modeling runs compare the "Existing", "Without Project" and "With Project" conditions under each of the above flood scenarios. The Existing Condition analysis provides an evaluation

of the levee and reservoir system as it exists in April 2008. The Without Project condition assumes implementation of federally authorized improvements to Folsom Dam and anticipated improvements to the levees protecting existing urban areas outside the Natomas Basin (American River Basin, West Sacramento, Yuba Basin and Sutter Basin) so as to provide these areas with 200-year flood protection. The With Project condition adds the improvements proposed as part of the NLIP to the Without Project condition.

In order to compare these conditions, assumptions about the performance of SRFCP levees under flow conditions that exceed the design of the levee system are necessary for the 100-year, 200-year and 500-year floods. As noted above, the design of the SRFCP was not historically based on assumed levee failures. For floods exceeding the design of the SRFCP, it is improbable to assume that no levees will fail even in extreme floods that would cause vast lengths of levee overtopping throughout the system. Therefore, these floods have been modeled assuming that failure will occur when the water reaches the top of the levee. However, in order to test the sensitivity of this approach, and in order to model a scenario that resembles the SRFCP's "no basin relies on another basin's failure for protection" tenet, a secondary "no levee failure" scenario has also been modeled. Under this scenario it is assumed that SRFCP levees that do not currently meet the minimum freeboard requirements of the SRFCP are raised to meet the minimum levee standard and that levees, which are overtopped under any of the targeted flood conditions will not fail. The assumptions supporting these modeling scenarios are summarized in Table 1.

Table 1. Definition of model assumptions for various conditions

Condition	Top of Levee Assumption	Levee Failure Assumption	Reservoir Ops Assumption
Existing	Existing top of levee grade April 2008	Levees fail when water reaches the top of the levee	Existing reservoirs and current (2008) operation criteria
Without Project	Same as Existing with the following changes. Federally authorized improvements to Folsom Dam are implemented and urban area levees outside the Natomas Basin are assumed to have levees at 200-year water surface + 3 feet of freeboard. NLIP levees same as Existing Condition.	Levees fail when water reaches the top of levee.	Same as Existing except Folsom Dam will be operated in accordance with the Joint Federal Project currently under construction
With Project	Same as Without Project except NLIP levees raised to design level	Same as Without Project	Same as Without Project
Without Project Sensitivity Analysis	Same as Without Project except that SRFCP levees with top elevations below SRFCP design standard are assumed to be raised to meet this standard	No levee failures	Same as Without Project
With Project Sensitivity Analysis	Same as With Project except that SRFCP levees with top elevations below SRFCP design standard are assumed to be raised to meet this standard	No levee failures	Same as Without Project

As noted above, the Without Project condition assumes that urban areas (outside the Natomas Basin) will be provided with 200-year protection. This is the most likely near term future condition of the levee system based on the information currently available. This condition is reasonable based on California voters November 2006 approval of a bond measure that would provide over $3 billion for urban levee improvements in the Central Valley. Additionally, in September 2007 the State Legislature enacted the Central Valley Flood Protection Act of 2008 (Act), Water Code Section 9600 et seq., which was signed into law by the governor in October 2007. The Act is based on the following findings:

- The Central Valley of California is experiencing unprecedented development, resulting in the conversion of historically agricultural lands and communities to densely populated residential and urban centers.

- The legislature recognizes that by their nature, levees, which are earthen embankments typically founded on fluvial deposits, cannot offer complete protection from flooding, but can decrease its frequency.

- The legislature recognizes that the level of flood protection afforded rural and agricultural lands by the original flood control system would not be adequate to protect those lands if they are developed for urban uses, and that a dichotomous system of flood protection for urban and rural lands has developed through many years of practice.

- The legislature further recognizes that levees built to reclaim and protect agricultural land may be inadequate to protect urban development unless those levees are significantly improved.

- Cities and counties rely upon federal floodplain information when approving developments, but the information available is often out of date and the flood risk may be greater than that indicated using available federal information.

- The legislature recognizes that the current federal flood standard is not sufficient to protect urban and urbanizing areas within flood prone areas throughout the Central Valley.

  (Statutes of 2007, Chapter 364, Section 9.)

Based on these findings, the Act embraces a new flood protection standard for urban areas (defined as “developed areas in which there are 10,000 residents or more”) located in levee protected floodplains in the Central Valley. This new “urban level of flood protection” is defined as “the level of protection that is necessary to withstand flooding that has a 1-in-200 chance of occurring in any given year using criteria consistent with, or developed by, the Department of Water Resources.” (Statutes of 2007, Chapter 364 [adding Water Code Section 9602(i)]).

4. RESULTS OF MODELING ANALYSIS

The flood routings described herein indicate that under the Existing condition, all SRFCP levees would contain the USACE 1957 design flood profile. The 100-year flood would overtop some non-urban levees but this flood would be contained by all urban levees under the Existing condition. The 200-year flood would generate multiple levee overtopping locations in several non-urban areas under both the Existing and Without Project conditions and along the Lower American River under the Existing condition. However, this flood would be effectively contained under both the Existing and Without Project conditions by all existing urban levees outside the American River basin, including the levees around the Natomas Basin. The 500-year flood would cause massive levee overtopping affecting all segments of the system under the Existing and Without Project conditions. Only West Sacramento and the Natomas Basin would avoid overtopping under these conditions with upstream levee failures. Table 2 provides a summary of these conditions.

Table 2. Levee Failure Summary (Number of Levee Failures)

Condition	Design Flood			
	USACE 1957 Design	100-year	200-year	500-year
Existing	0	3	36	65
Without Project	0	3	18	75
With Project	0	3	16	74

Tables 3, 4 and 5 summarize the maximum water surface elevations at several locations in and around the project area for the Existing, Without Project, and With Project conditions for the 100-year, 200-year and 500-year flood events, respectively.

Table 3. 100-year Maximum Water Surface Elevation Summary, Levees Fail When Water Reaches Top of Levee

Location (Comp Study River Mile)	Maximum Water Surface Elevation (ft NGVD29)			Change (ft)	
	Existing	Without Project	With Project	Existing to Without Project	Without Project to With Project
Sacramento River					
at Knight's Landing (90.22)	41.46	41.46	41.46	0	0
at Fremont Weir, west end (84.75)	40.16	40.17	40.17	+0.01	0
At Natomas Cross Canal (79.21)	40.20	40.19	40.19	-0.01	0
at I-5 (71.00)	35.79	35.72	35.72	-0.07	0
at Sacramento Bypass (63.82)	31.68	30.80	30.80	-0.88	0
at NEMDC (61.0)	32.15	31.29	31.29	-0.86	0
at I St. (59.695)	31.88	31.02	31.02	-0.86	0
at Freeport Bridge (46.432)	25.64	24.90	24.90	-0.74	0
Natomas Cross Canal					
u/s Hwy 99/70 (4.82)	40.44	40.37	40.37	-0.07	0
Pleasant Grove Creek Canal					
at Sankey Rd. (3.65)	40.38	40.36	40.36	-0.02	0
at Fifield Rd. (1.49)	40.48	40.44	40.45	-0.04	+0.01
Feather River					
at Nicolaus Gage (8.00)	48.53	48.53	48.53	0	0
Yolo Bypass					
at Woodland Gage (51.10)	32.65	32.59	32.59	-0.06	0
American River					
at H St. (6.471)	43.05	40.70	40.70	-2.35	0

Table 4. 200-year Maximum Water Surface Elevation Summary, Levees Fail When Water Reaches Top of Levee

Location (Comp Study River Mile)	Maximum Water Surface Elevation (ft NGVD29)			Change (ft)	
	Existing	Without Project	With Project	Existing to Without Project	Without Project to With Project
Sacramento River					
at Knight's Landing (90.22)	41.68	41.70	41.70	+0.02	0
at Fremont Weir, west end (84.75)	40.93	40.97	40.97	+0.04	0
At Natomas Cross Canal (79.21)	41.03	41.04	41.04	+0.01	0
at I-5 (71.00)	37.37	36.63	36.63	-0.74	0
at Sacramento Bypass (63.82)	35.33	32.59	32.59	-2.74	0
at NEMDC (61.0)	36.35	33.10	33.10	-3.25	0
at I St. (59.695)	36.02	32.82	32.82	-3.2	0
at Freeport Bridge (46.432)	28.49	26.48	26.48	-2.01	0
Natomas Cross Canal					
u/s Hwy 99/70 (4.82)	41.01	41.06	41.06	+0.05	0
Pleasant Grove Creek Canal					
at Sankey Rd. (3.65)	41.00	41.01	41.03	+0.01	+0.02
at Fifield Rd. (1.49)	41.07	41.09	41.10	+0.02	+0.01
Feather River					
at Nicolaus Gage (8.00)	50.15	50.16	50.16	+0.01	0
Yolo Bypass					
at Woodland Gage (51.10)	33.68	33.60	33.60	-0.08	0
American River					
at H St. (6.471)	46.49	44.23	44.23	-2.26	0

Table 5. 500-year Maximum Water Surface Elevation Summary, Levees Fail When Water Reaches Top of Levee

Location (Comp Study River Mile)	Maximum Water Surface Elevation (ft NGVD29)			Change (ft)	
	Existing	Without Project	With Project	Existing to Without Project	Without Project to With Project
Sacramento River					
at Knight's Landing (90.22)	41.63	41.68	41.68	+0.05	0
at Fremont Weir, west end (84.75)	40.86	40.92	40.93	+0.06	+0.01
At Natomas Cross Canal (79.21)	41.01	40.99	40.99	-0.02	0
at I-5 (71.00)	37.68	37.58	37.58	-0.10	0
at Sacramento Bypass (63.82)	35.63	35.36	35.37	-0.27	+0.01
at NEMDC (61.0)	36.66	36.34	36.34	-0.32	0
at I St. (59.695)	36.33	36.02	36.02	-0.31	0
at Freeport Bridge (46.432)	28.69	28.56	28.56	-0.13	0
Natomas Cross Canal					
u/s Hwy 99/70 (4.82)	41.33	41.30	41.31	-0.03	+0.01
Pleasant Grove Creek Canal					
at Sankey Rd. (3.65)	41.71	41.73	41.75	+0.02	+0.02
at Fifield Rd. (1.49)	41.73	41.77	41.78	+0.04	+0.01
Feather River					
at Nicolaus Gage (8.00)	50.12	50.10	50.10	-0.02	0
Yolo Bypass					
at Woodland Gage (51.10)	33.75	33.63	33.63	-0.12	0
American River					
at H St. (6.471)	46.54	47.90	47.90	+1.36	0

Tables 6, 7 and 8 present the same information as Tables 4, 5 and 6 but for the Sensitivity analyses.

Table 6. 100-year Maximum Water Surface Elevation Summary, No Levee Failures (Sensitivity Analysis)

Location (Comp Study River Mile)	Maximum Water Surface Elevation (ft NGVD29)		Change (ft.)
	Without Project	With Project	Without Project to With Project
Sacramento River			
at Knight's Landing (90.22)	42.10	42.10	0
at Fremont Weir, west end (84.75)	40.90	40.90	0
At Natomas Cross Canal (79.21)	41.45	41.45	0
at I-5 (71.00)	36.90	36.90	0
at Sacramento Bypass (63.82)	31.45	31.45	0
at NEMDC (61.0)	32.02	32.02	0
at I St. (59.695)	31.74	31.74	0
at Freeport Bridge (46.432)	25.54	25.54	0
Natomas Cross Canal			
u/s Hwy 99/70 (4.82)	41.50	41.50	0
Pleasant Grove Creek Canal			
at Sankey Rd. (3.65)	41.37	41.37	0
at Fifield Rd. (1.49)	41.50	41.50	0
Feather River			
at Nicolaus Gage (8.00)	48.90	48.90	0
Yolo Bypass			
at Woodland Gage (51.10)	33.21	33.21	0
American River			
at H St. (6.471)	40.81	40.81	0

Table 7. 200-year Maximum Water Surface Elevation Summary, No Levee Failures (Sensitivity Analysis)

Location (Comp Study River Mile)	Maximum Water Surface Elevation (ft NGVD29)		Change (ft.)
	Without Project	With Project	Without Project to With Project
Sacramento River			
at Knight's Landing (90.22)	43.39	43.39	0
at Fremont Weir, west end (84.75)	42.47	42.48	+0.01
At Natomas Cross Canal (79.21)	42.90	42.92	+0.02
at I-5 (71.00)	38.24	38.24	0
at Sacramento Bypass (63.82)	33.48	33.48	0
at NEMDC (61.0)	34.06	34.07	+0.01
at I St. (59.695)	33.78	33.78	0
at Freeport Bridge (46.432)	27.40	27.41	+0.01
Natomas Cross Canal			
u/s Hwy 99/70 (4.82)	42.92	42.94	+0.02
Pleasant Grove Creek Canal			
at Sankey Rd. (3.65)	42.65	42.67	+0.02
at Fifield Rd. (1.49)	42.90	42.91	+0.01
Feather River			
at Nicolaus Gage (8.00)	51.19	51.20	+0.01
Yolo Bypass			
at Woodland Gage (51.10)	34.56	34.57	+0.01
American River			
at H St. (6.471)	44.40	44.40	0

Table 8. 500-year Maximum Water Surface Elevation Summary, No Levee Failures (Sensitivity Analysis)

Location (Comp Study River Mile)	Maximum Water Surface Elevation (ft NGVD29)		Change (ft.)
	Without Project	With Project	Without Project to With Project
Sacramento River			
at Knight's Landing (90.22)	44.27	44.31	+0.04
at Fremont Weir, west end (84.75)	43.79	43.85	+0.06
At Natomas Cross Canal (79.21)	43.68	43.85	+0.17
at I-5 (71.00)	39.76	39.85	+0.09
at Sacramento Bypass (63.82)	37.97	38.00	+0.03
at NEMDC (61.0)	37.97	38.00	+0.03
at I St. (59.695)	37.67	37.69	+0.02
at Freeport Bridge (46.432)	30.28	30.30	+0.02
Natomas Cross Canal			
u/s Hwy 99/70 (4.82)	43.45	43.71	+0.26
Pleasant Grove Creek Canal			
at Sankey Rd. (3.65)	43.25	43.40	+0.15
at Fifield Rd. (1.49)	43.50	43.71	+0.21
Feather River			
at Nicolaus Gage (8.00)	53.45	53.47	+0.02
Yolo Bypass			
at Woodland Gage (51.10)	35.96	36.01	+0.05
American River			
at H St. (6.471)	49.16	49.17	+0.01

Computed water surface elevation profiles for each of the key flow conditions in the project area (Sacramento River channel downstream of the Fremont Weir) are shown in Figures 5 through 12. Figures 5 and 6 show the relationship between the 1957 design and the height of the levees on both sides of the Sacramento River and Natomas Cross Canal, respectively. Figure 6 also indicates the locations in which the non-urban Sacramento River west levee would be raised to meet the minimum freeboard requirements of the USACE 1957 design standard under the Sensitivity analysis. Figures 7 and 8 indicate the profile of the current 100-year flood. Figures 9 and 10 indicate the profile of the 200-year (no levee failure) design flood. Figures 9 and 10 also show the likely 200-year water surface profile assuming upstream levee failures in non-urban areas. Figure 9 shows that the current height of the Sacramento River east levee along the Natomas Basin is essentially at the same elevation as the 200-year (no levee failure) design water surface profile and considerably higher than the likely water surface profile assuming upstream levee failures. It also shows the extent to which the Sacramento River west levee across from Natomas would be overtopped in a 200-year flood. Because the levees protecting the Natomas Basin are already nearly high enough to contain the 200-year (no levee failure) design flood, the NLIP does not increase water surface elevations for the 200-year flood under the likely levee

failure scenario and produces a maximum water surface increase of only 0.02 feet with the unlikely no levee failure scenario. Figures 11 and 12 show the profiles for the 500-year flood with upstream levee failures. The 500-year (with levee failures) water surface elevation in the Sacramento River channel is lower throughout the most critical portion of this reach than the 200-year (no levee failure) design water surface elevation. As reflected in Figures 11 and 12, under the likely assumption that upstream levees will fail when water reaches the top of the levee, the water surface elevations around Natomas would be dramatically lower than the 200-year (no levee failure) profile that was used for design of NLIP. This 200-year levee design condition thus represents a worst-case scenario for the Sacramento River and the Natomas Cross Canal and underscores the high degree of protection against Natomas Basin levee overtopping that would be provided by the design of the NLIP improvements.

Under the sensitivity analysis of the 500-year (no levee failure) flood, the maximum water surface elevation change on the Sacramento River between the Without Project and With Project conditions, as shown in Table 8, is 0.17 feet. The maximum water surface change in the NCC is 0.26. However, even these relatively minor impacts are considered extremely implausible given that over 80 miles of upstream and adjacent levees could be overtopped (see Table 9) by this flood without any levee failures occurring.

Table 9. Extent of Levee Overtopping, 500-year Flood Event, No Failures

River	Total Leveed Length	Left Bank		Right Bank	
		Length of Overtopped Levee	Approx. Maximum Depth of Overtopping	Length of Overtopped Levee	Approx. Maximum Depth of Overtopping
American River	~13 miles	~7 miles	~4 ft	~12 miles	~3 ft
Feather River	~50 miles	~14 miles	~3 ft	~13 miles	~3 ft
Natomas Cross Canal	~5 miles	~4 miles	~1 ft	~3.5 miles	~2.5 ft
Sacramento Bypass	~1.7 miles	~0.5 miles	~0.5 ft	~0.2 miles	~0.5 ft
Sacramento River upstream of Natomas Cross Canal	~90 miles	~13 miles	~4 ft	~7 miles	~3 ft
Sacramento River Adjacent to Natomas	~18 miles	~8 miles	~1 ft	~6 miles	~3 ft
Sacramento River downstream of American River	~60 miles	~2 miles	~2 ft	~2 miles	~2 ft
Sutter Bypass	~30 miles	~4 miles	~4 ft	~7 miles	~4 ft
Tisdale Bypass	~4 miles	~0.5 miles	~0.5 ft	~0.5 miles	~1 ft
Wadsworth Canal	~4 miles	~4 miles	~1 ft	~4 miles	~2 ft
Yolo Bypass	~37 miles	~5 miles	~2.5 ft	~2 miles	~2 ft

5. SUPPORT OF IMPACT ANALYSIS METHODOLOGY

California Legislature

Consistent with its approval of a new more rigorous standard for urban flood protection, the State Legislature also approved “the project features necessary to provide a 200-year level of flood protection along the American and Sacramento Rivers and within the Natomas Basin as described in the final engineer’s report dated April 19, 2007, adopted by the Sacramento Area Flood Control Agency.” (Statutes of 2007, Chapter 641 [amending Water Code Section

12670.14(b)]). Moreover, in connection with this approval, the legislature adopted the following findings and declarations (Statutes of 2007, Chapter 641, Section 1[k]):

As evidenced by the environmental impact reports certified in connection with these projects, including the hydrology and hydraulics impact analysis set forth in the environmental impact report prepared by the Sacramento Area Flood Control Agency with regard to local funding mechanisms for comprehensive flood control improvements for the Sacramento area dated February 2007, the increase in flood protection associated with improving the American and Sacramento River levees and modifying Folsom Dam will be accomplished without altering or otherwise impairing the design flows and water surface elevations prescribed as part of the Sacramento River Flood Control Project. Accordingly, these improvements will not result in significant adverse hydraulic impacts to the lands protected by the Sacramento River Flood Control Project. Thus, it is not necessary or appropriate to require these projects to include hydraulic mitigation.

The projects authorized in Section 12670.14 of the Water Code will increase the ability of the existing flood control system in the lower Sacramento Valley to protect heavily urbanized areas within the City of Sacramento and the Counties of Sacramento and Sutter against very rare floods without altering the design flows and water surface elevations prescribed as part of the Sacramento River Flood Control Project or impairing the capacity of other segments of the Sacramento River Flood Control Project to contain these design flows and to maintain water surface elevations. Accordingly, the projects authorized in that section will not result in significant adverse hydraulic impacts to the lands protected by the Sacramento River Flood Control Project and neither the Reclamation Board nor any other state agency shall require the authorized projects to include hydraulic mitigation for these protected lands.

Although these findings are not legally binding, they indicate the legislature's concurrence with SAFCA's approach to analyzing hydraulic impacts. Congressional authorization for raising and strengthening a twelve-mile reach of the Sacramento River east levee in the 1996 Water Resources Development Act ("WRDA") and for raising and strengthening all five-plus miles of the NCC south levee in the 1999 WRDA without in either case requiring hydraulic mitigation offers additional indirect legislative support for SAFCA's approach.

<u>USACE HQ</u>

USACE has been using a risk-based analysis for economic evaluation for some time and has been moving to a risk-based analysis for system performance, largely for certification of levees for FEMA. However, in his memo dated *August 2, 2007, Subject: Section 408 Approval of a Flood Control Project Alteration - Sacramento River Flood Control Project, Feather and Yuba Rivers, California* (copy enclosed), Deputy Director of Civil Works Steven L. Stockton indicated that the discussion of flood protection in terms such as 100-year or 200-year level of protection is acceptable to comply with NEPA and other environmental statues. However, a risk-based analysis as required by ER 1105-2-100 and ER 1105-2-101 will be needed to determine the terms of any eventual Section 104 reimbursement.

6. NLIP COORDINATION WITH REGIONAL IMPROVEMENTS

SAFCA's approach to providing an urban standard of flood protection to the Natomas Basin is being replicated in the other urbanizing sub-basins in the lower Sacramento Valley (West Sacramento, Marysville extending south to Reclamation District 784, and Yuba City). However, these improvements are intended to complement rather than substitute for pursuing improvements on a regional scale that would improve the flow of water through the Yolo and Sacramento Bypass systems and lower water surface elevations throughout the lower Sacramento Valley. In 2002 through 2003, SAFCA made substantial investments in hydraulic studies and analyses of the improvements that would be required to move more flood water into and through the Yolo Bypass during large flood events in the Sacramento-Feather River watershed to reduce flows and water surface elevations in the Sacramento River channel downstream of the Fremont weir. The Lower Sacramento River Regional Project Initial Report (SAFCA 2003) indicated that this could be accomplished by widening the Fremont weir, setting back the levees on the east side of the Yolo Bypass, discharging flood flows into the Sacramento Deep Water Ship Channel and eliminating low, restricted elevation levees at the lower end of the Yolo Bypass. However, these improvements would be extremely costly and time consuming to implement; they would occur entirely outside SAFCA's jurisdiction, and would require extraordinary cooperation among affected federal, state, and local interests; and they would not resolve the seepage problems affecting the Sacramento River east levee and the Natomas Cross Canal south levee adjacent to the Natomas Basin. For these reasons, SAFCA concluded that this alternative would not achieve the objectives of the NLIP and, therefore, it was not carried forward for further analysis.

On a long-term basis, however, regionally oriented improvements to the Yolo and Sacramento Bypass systems would help to address potential changes in hydrology due to climate change and would reduce the risk of uncontrolled flooding on a system-wide basis. Although this flooding is most likely to occur in lightly populated agricultural areas, reducing its frequency by increasing the conveyance capacity of the SRFCP would avoid the cost of repairing and reconstructing damaged levees and other public infrastructure and would increase public support for the "dichotomous system of flood protection for urban and rural lands" that exists in the Sacramento Valley. Early implementation of the NLIP, as well as early implementation of proposed improvements to SRFCP levees protecting other urban areas, would not preclude any of the alternatives contemplated for the update of the Central Valley Flood Protection Plan.

7. CONCLUSION

Raising and strengthening portions the federal project levee system protecting the Natomas Basin in Sacramento and Sutter Counties as proposed by SAFCA would not result in any significant, adverse hydraulic impacts to other sub-basins protected as part of the SRFCP. Furthermore, these improvements would be consistent with the principles that have guided the management of the SRFCP over the past century and with the policies adopted by the State Legislature calling for an immediate and comprehensive effort to increase the level of flood protection provided to Sacramento and the other urban areas within the SRFCP. The NLIP improvements would also be consistent with the direction given by Congress when it approved raising and strengthening 12 miles of the Sacramento River east levee (WRDA 1996) and 5.3 miles of the Natomas Cross Canal south levee (WRDA 1999).

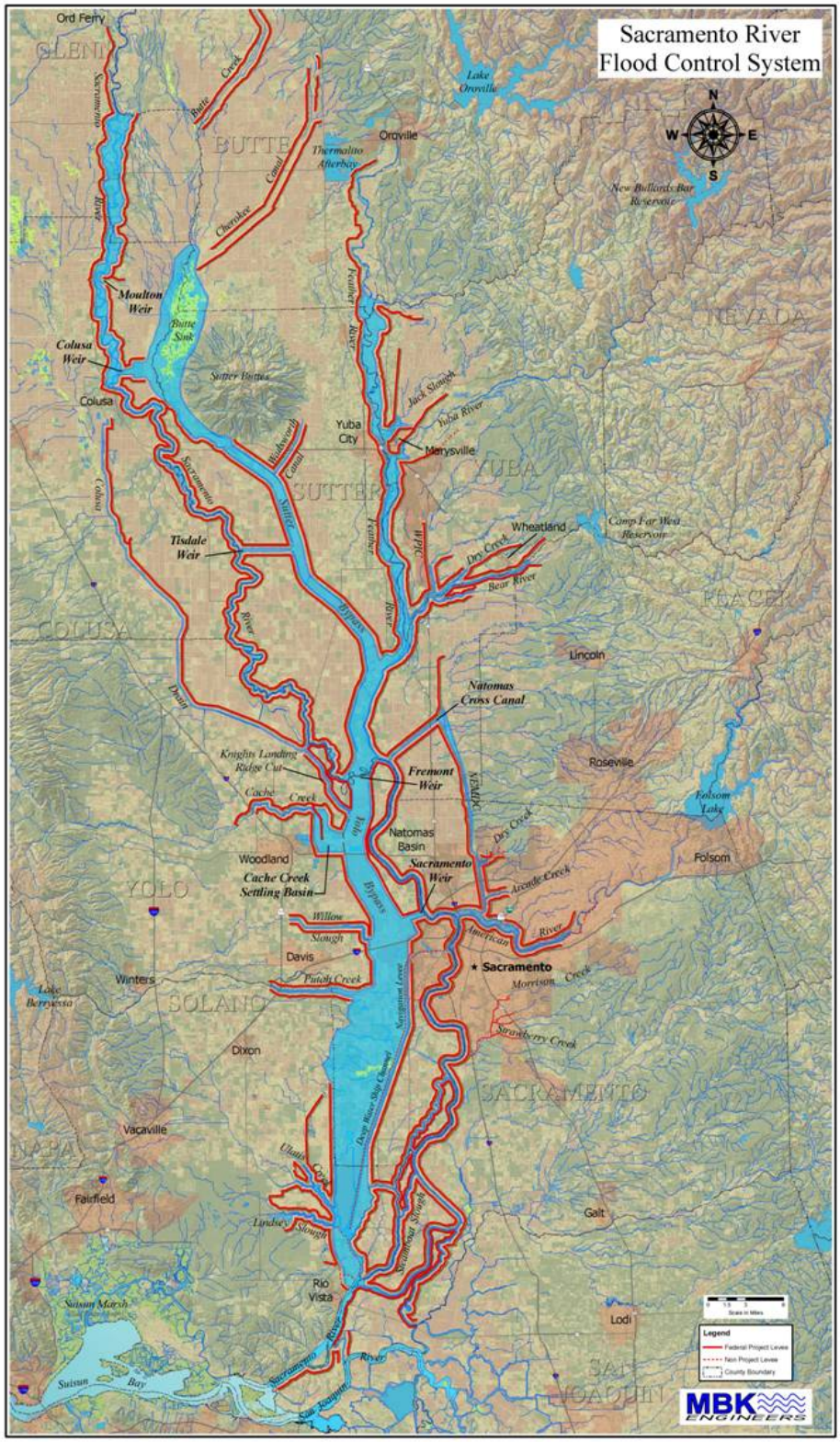

Figure 1. Sacramento River Flood Control System Map

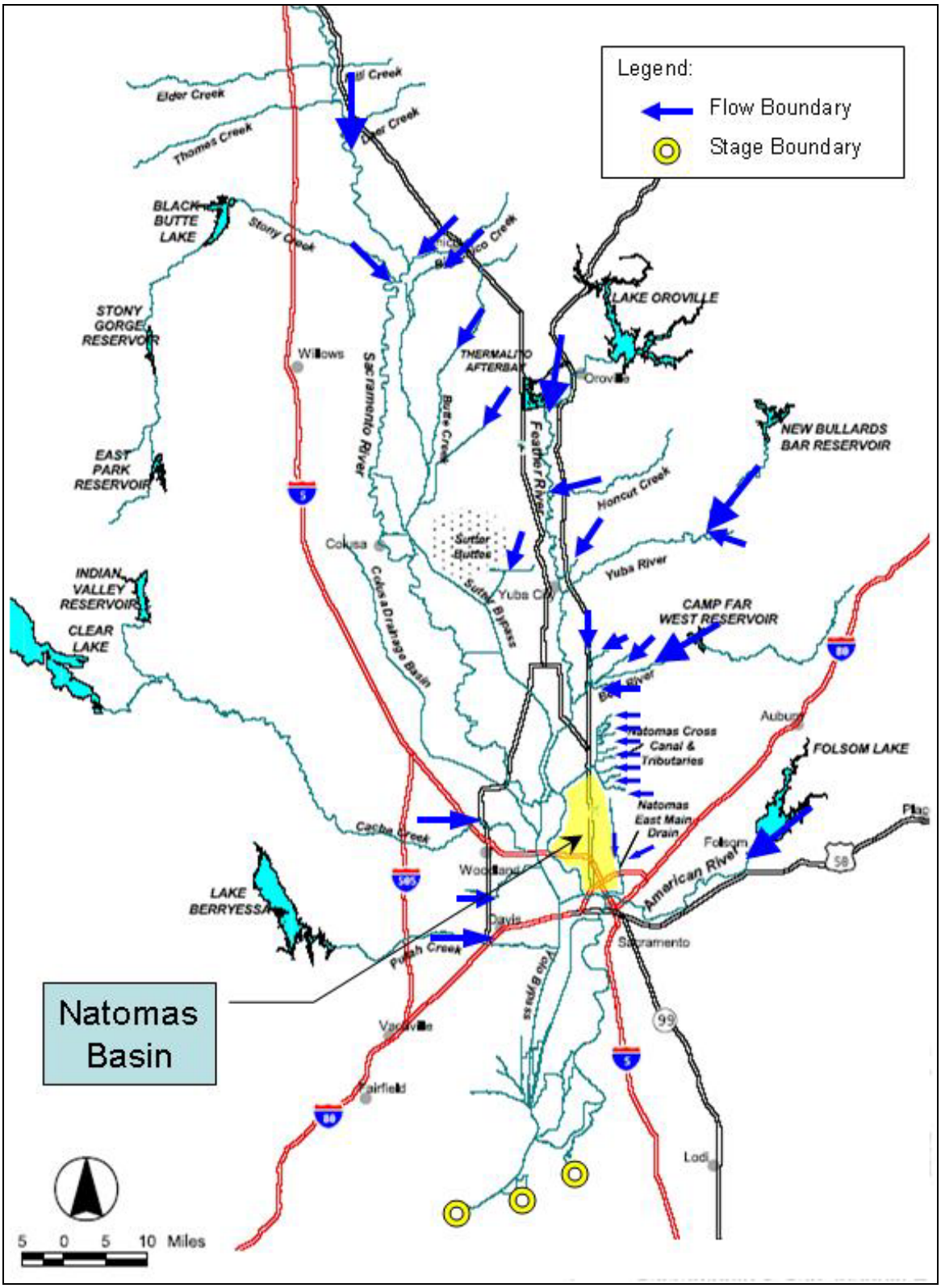

Figure 2. Sacramento River UNET Model Extents

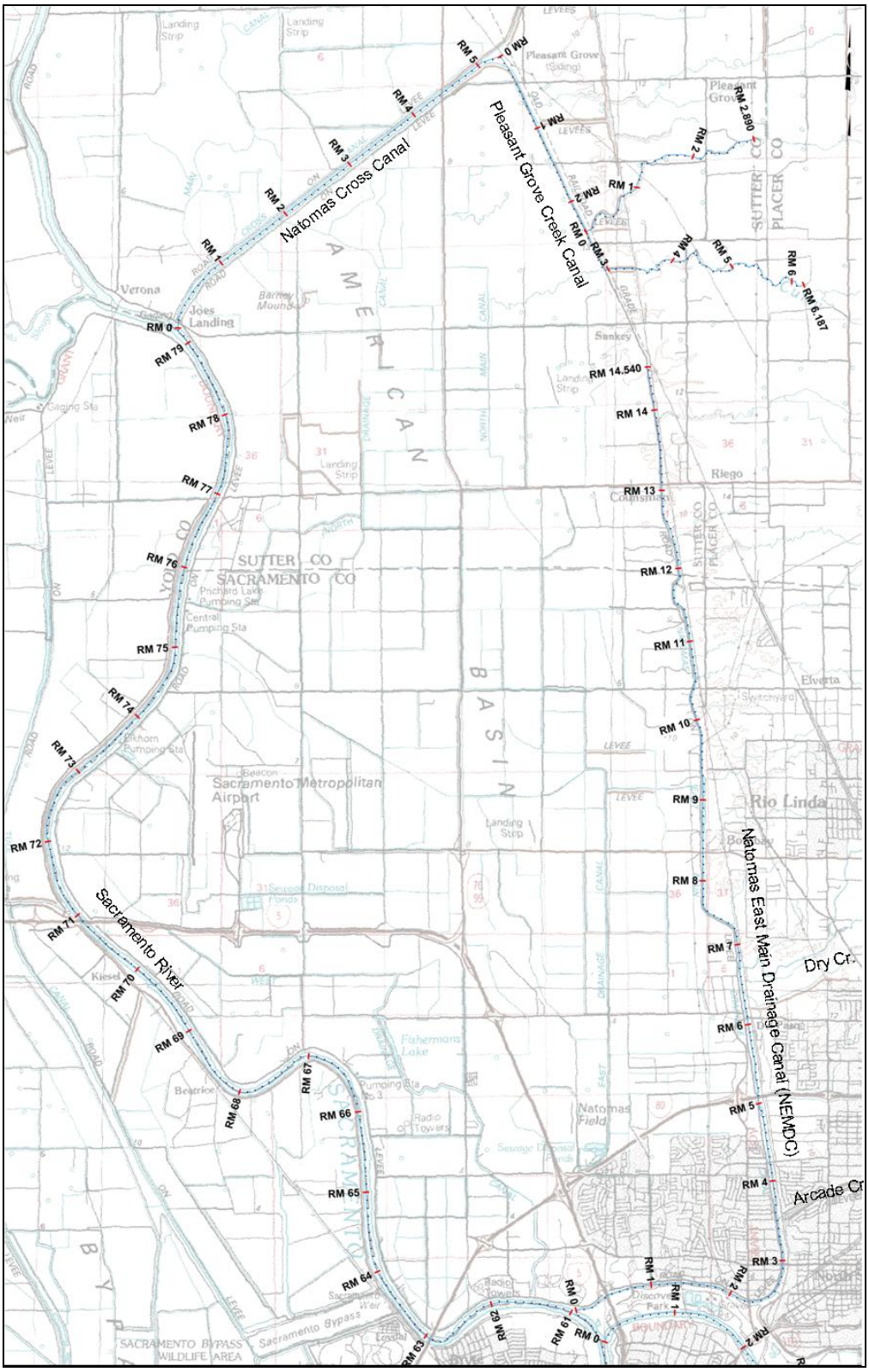

Figure 3. Natomas Levee Improvement Program Study Area

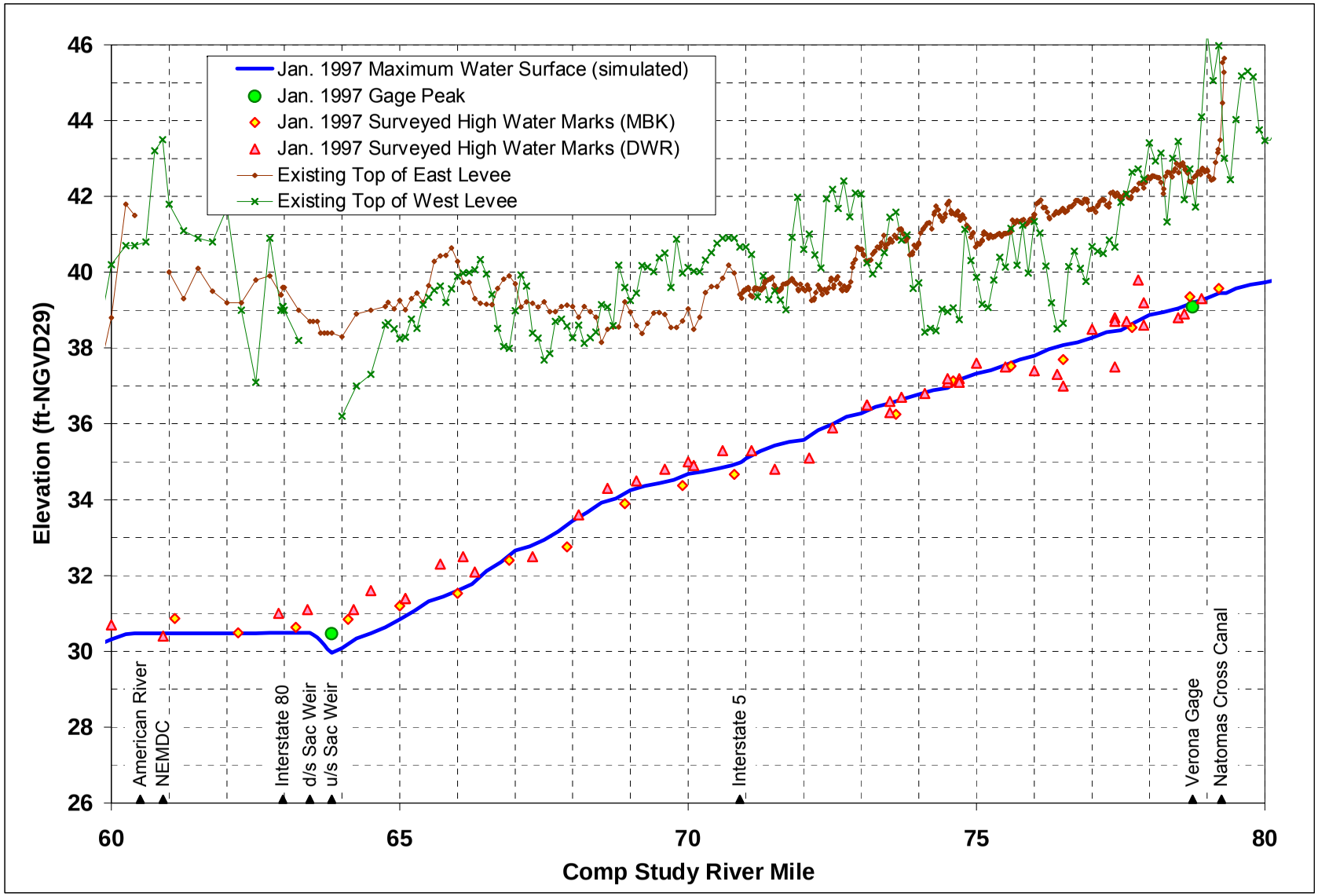

Figure 4. Water Surface Profile – Model Calibration vs. 1997 Flood Event High Water Marks

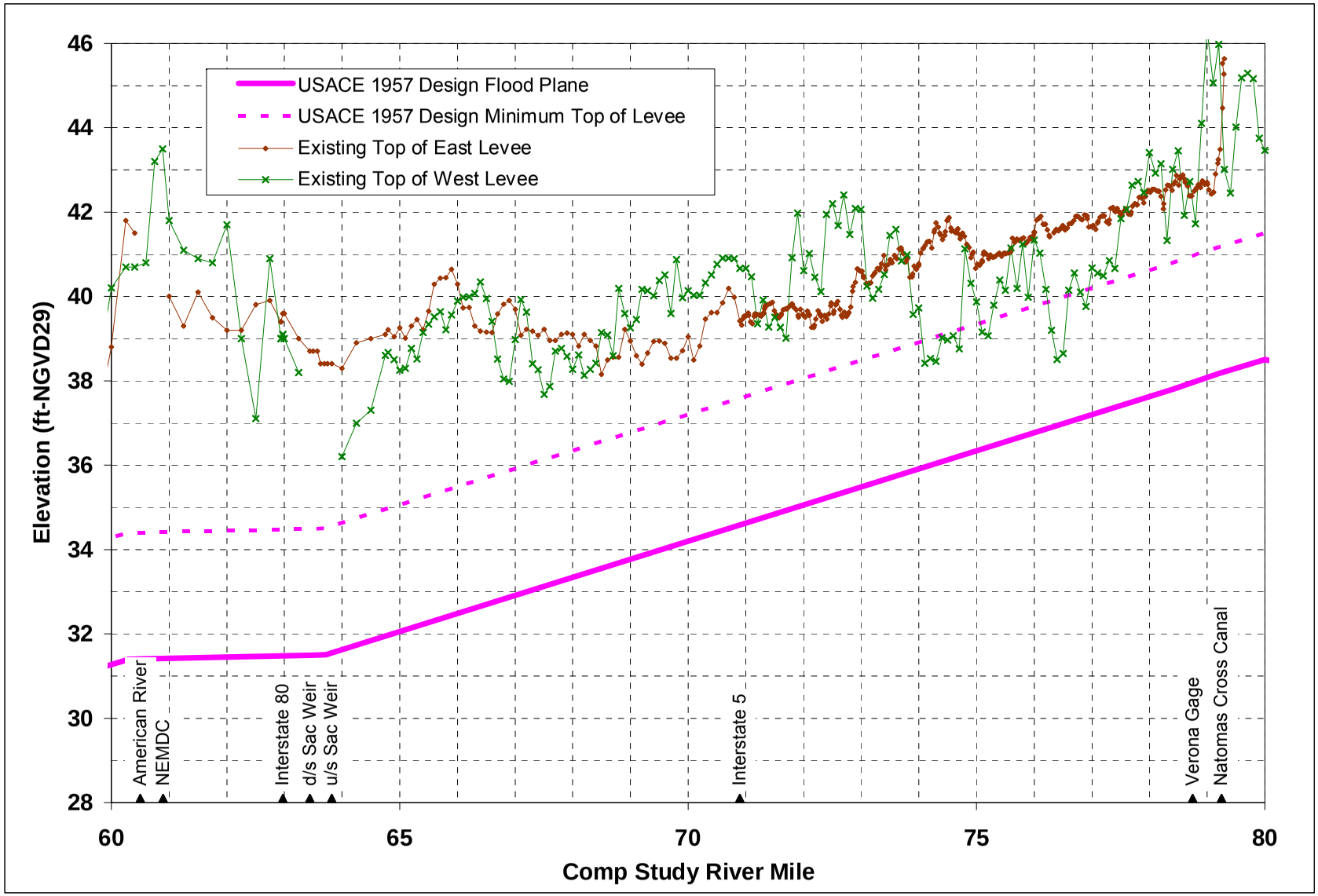

Figure 5. Water Surface Profile – USACE SRFCP 1957 Design Profile, Sacramento River Natomas Reach

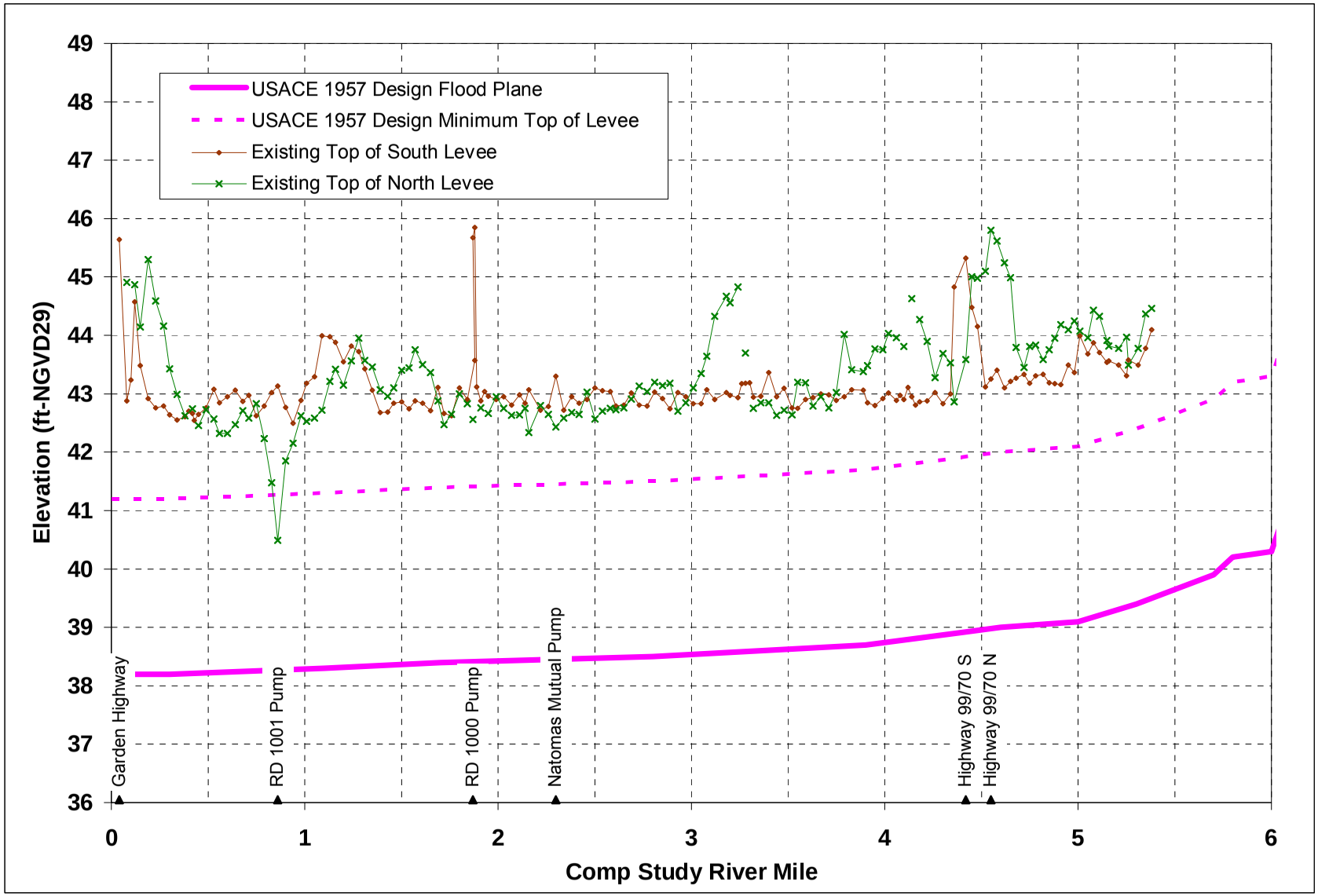

Figure 6. Water Surface Profile – USACE 1957 Design Profile, Natomas Cross Canal

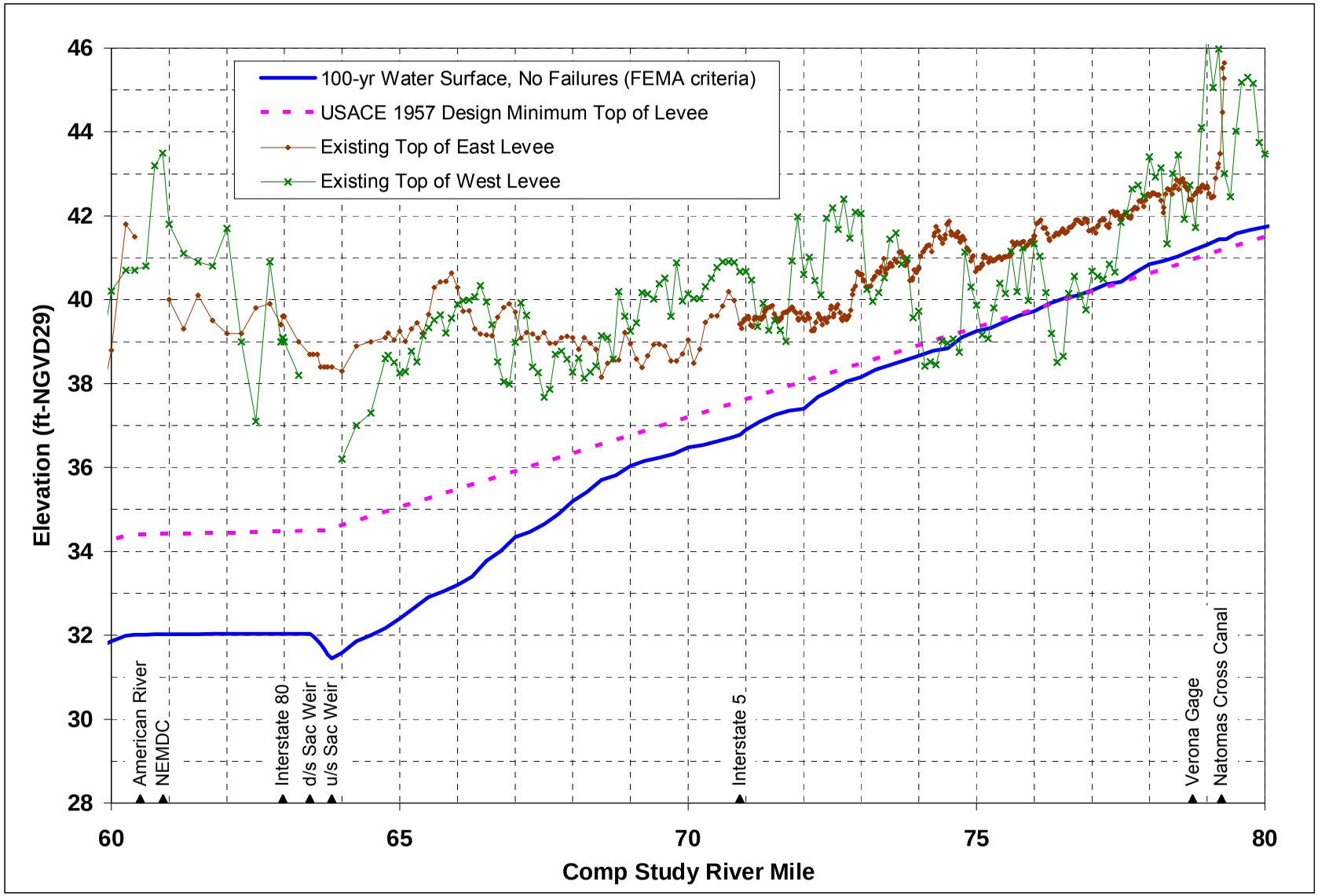

Figure 7. Water Surface Profile – 100-year, Sacramento River Natomas Reach

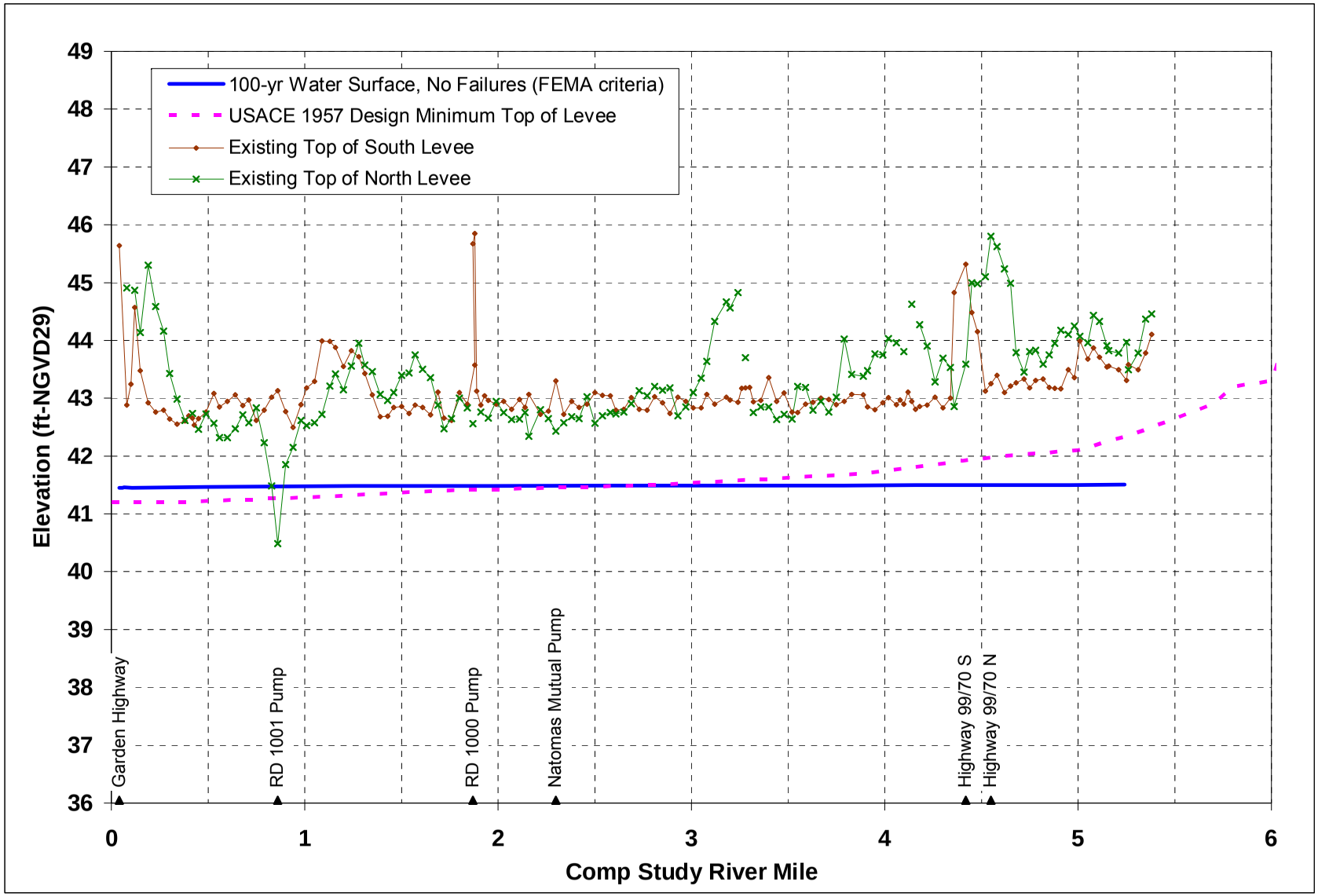

Figure 8. Water Surface Profile – 100-year, Natomas Cross Canal

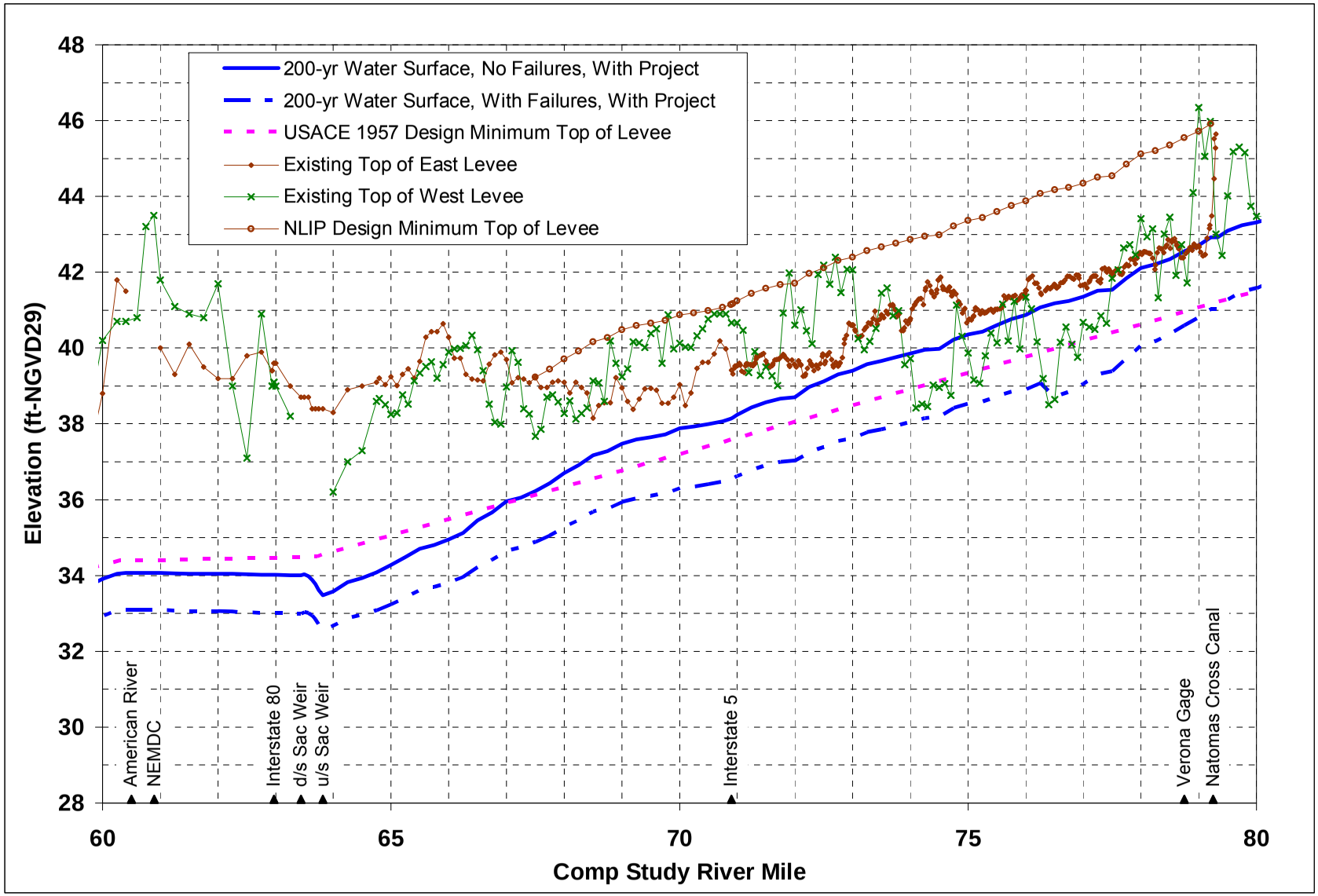

Figure 9. Water Surface Profile – 200-year, Sacramento River Natomas Reach

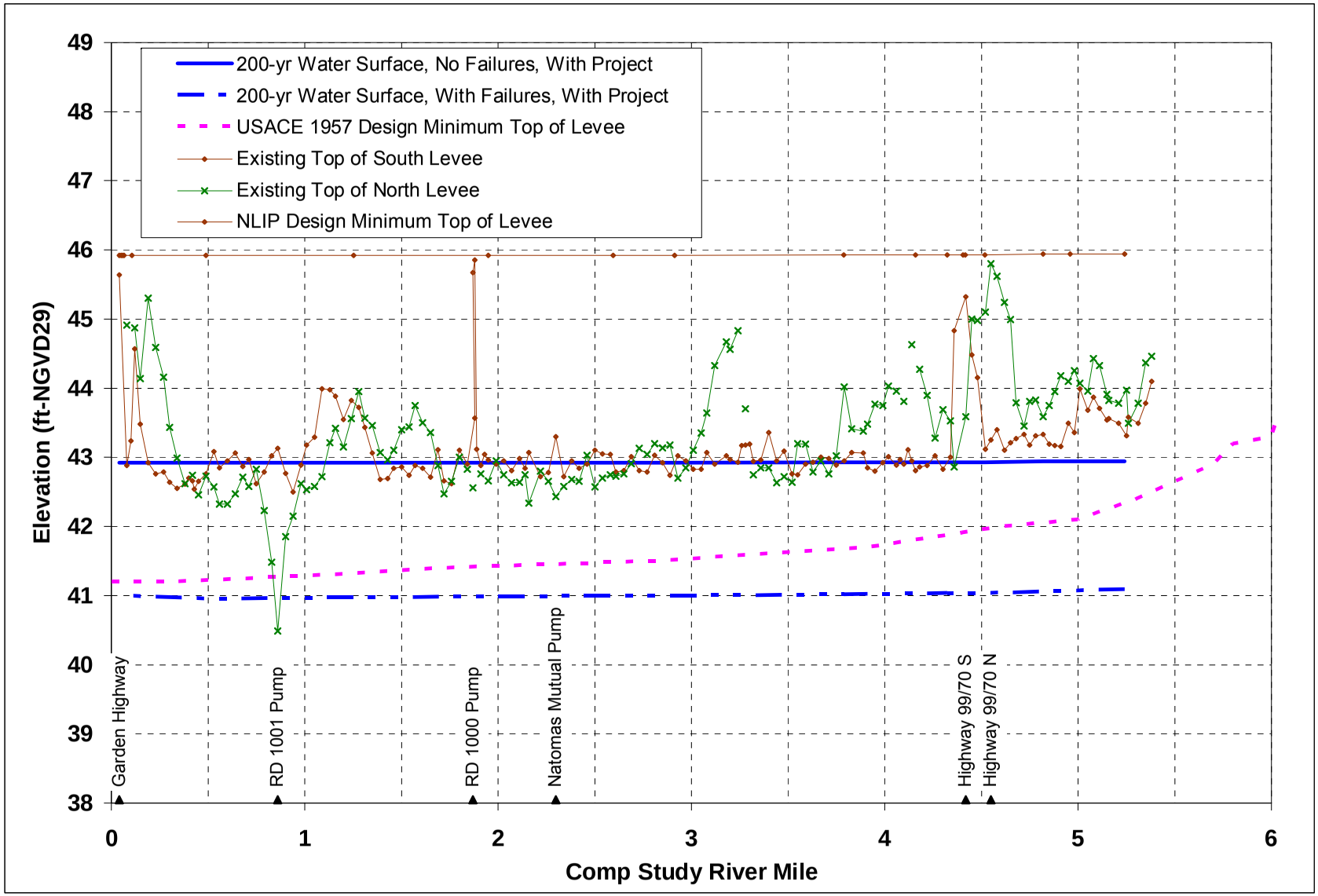

Figure 10. Water Surface Profile – 200-year, Natomas Cross Canal

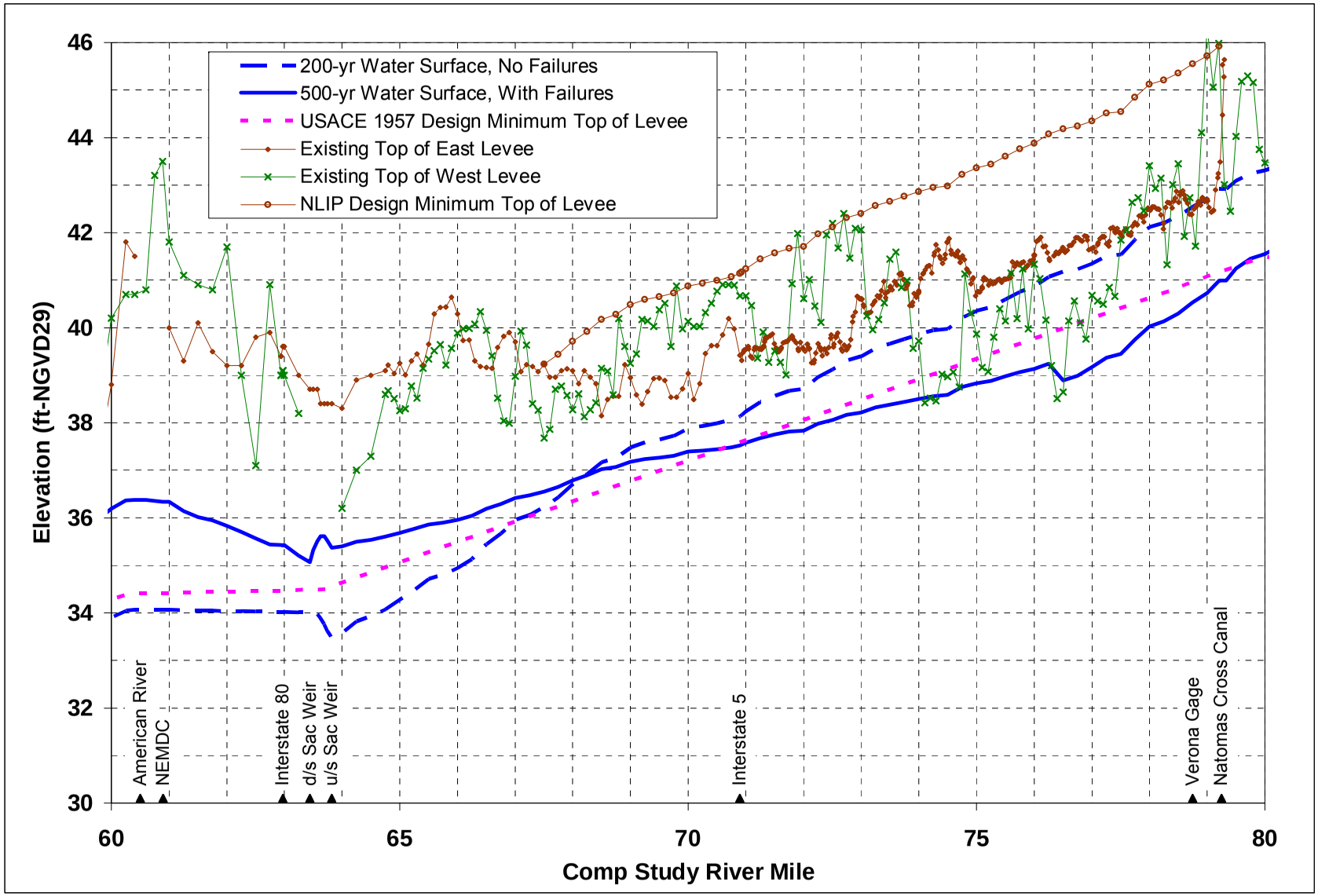

Figure 11. Water Surface Profile – 500-year, Sacramento River Natomas Reach

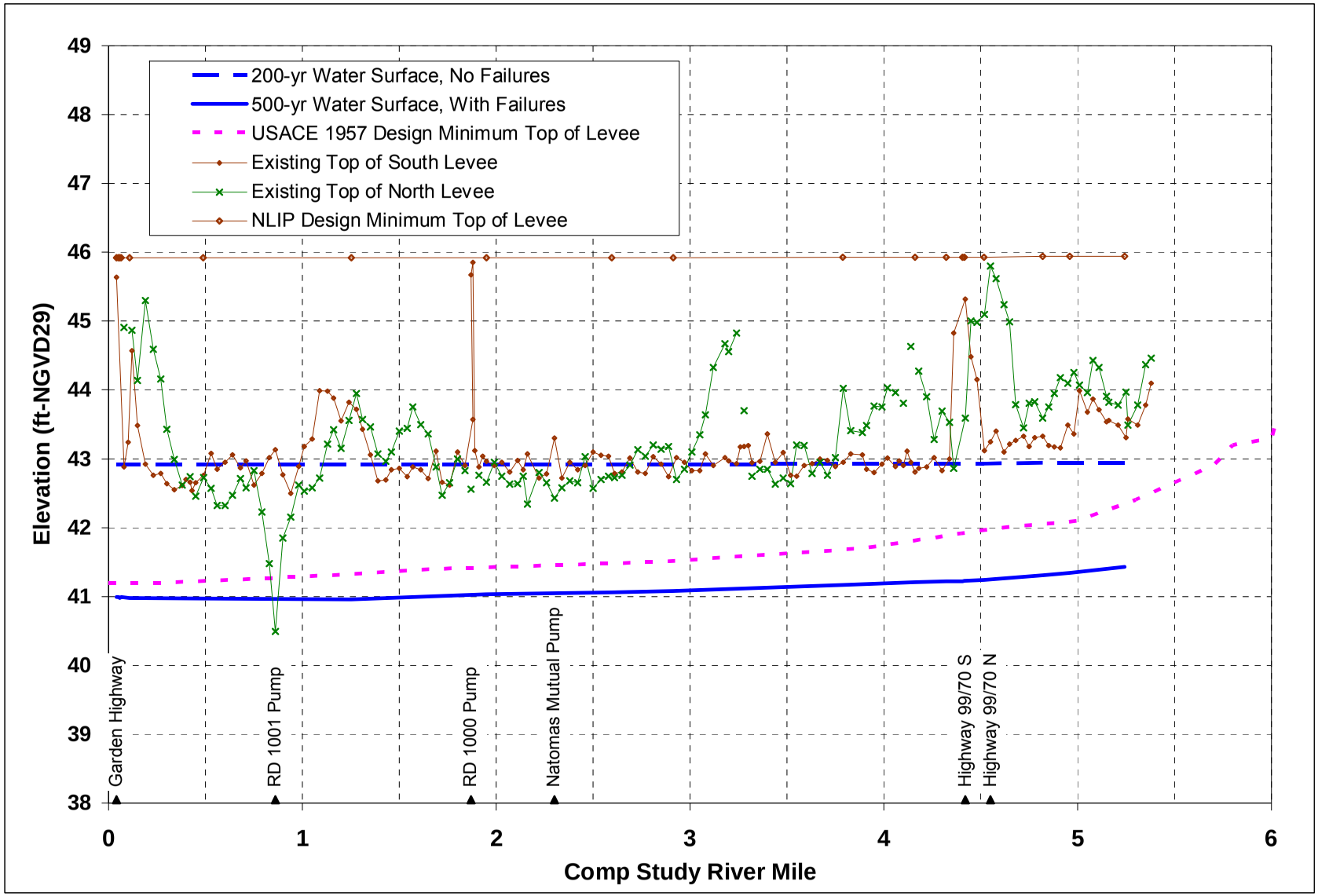

Figure 12. Water Surface Profile – 500-year, Natomas Cross Canal

APPENDIX B

Air Quality Modeling Results

GGS/Elkhorn Canal Relocation *Work to occur during 2008 calendar year would be compressed into 3 month time frame; work to occur during 2009 calendar year is assumed to be phased over 6 months

***assumes all activity to occur in Sacramento County**

	ROG	NOX	PM10	Unit	Quantity	Unit	ROG	NOX	PM10	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor	
Clearing, Grubbing, Stripping, Grading					4000.0	yd3 (export)					10.0	285.7	2857.1	190.5	15.0	days	
Mobile Sources					*(assumes 10 miles to material disposal site)							*(assumes haul load = 14 yd3)					
Bulldozer(s)	3.63	21.55	1.12	lb/day	4.0		217.7	1293.0	66.9	lb/yr						0.00220462	lb/gram
Water Truck(s)	3.60	13.98	0.72	lb/day	2.0		108.1	419.3	21.6	lb/yr							
Loader(s)	0.92	7.01	0.38	lb/day	4.0		55.3	420.6	22.8	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	20.0	employees	5.6	14.6	1.1	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	4.0	trucks			806.8	lb/yr							
Material Handling											Tons/yd3 (gravel/sand)	Tons/day					
Truck Loading at Canal	-	-	0.04	lb/ton					202.9	lb/yr	1.25	333.33					
Truck Unloading at Off-site Disposal	-	-	0.005	lb/ton			-	-	26.3	lb/yr	1.25	333.33					
Total							**386.6**	**2147.4**	**1148.3**	**lb/yr**						2000	lb/ton
Total							**25.8**	**143.2**	**76.6**	**lb/day**							
Utility Relocations					0.0	yd3					0.0	0.0	0.0	0.0	30.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Bulldozer(s)	3.63	21.55	1.12	lb/day	2.0		217.7	1293.0	66.9	lb/yr							
Excavator(s)	1.84	6.47	0.34	lb/day	2.0		110.4	388.1	20.5	lb/yr							
Other Equipment	2.08	9.43	0.52	lb/day	1.0		31.2	141.4	7.8	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	20.0	employees	11.1	29.1	2.1	lb/yr				40.0	per employee	0.00220462	lb/gram
Total							**370.4**	**1851.5**	**97.4**	**lb/yr**						2000	lb/ton
Total							**12.3**	**61.7**	**3.2**	**lb/day**							
Water Control Facility Construction					0.0	yd3					0.0	0.0	0.0	20.0	45.0	days	
Mobile Sources												*assumes haul load = 14 yd3					
Backhoe(s)	1.84	6.47	0.34	lb/day	2.0		165.6	582.1	30.8	lb/yr							
Other Equipment	2.08	9.43	0.52	lb/day	4.0		1029.9	4665.5	257.5	lb/yr							
Flatbed Truck(s)	0.70	8.63	0.27	g/mile	2.0		2.8	34.2	1.1	lb/yr	*assumes flat-bed trucks travel 20 miles/day on paved roads					0.00220462	lb/gram
Employee Trips	0.21	0.55	0.04	g/mile	20.0	employees	16.7	43.7	3.2	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	2.0	trucks			254.1	lb/yr							
Total							**1215.0**	**5325.4**	**546.6**	**lb/yr**						2000	lb/ton
Total							**27.0**	**118.3**	**12.1**	**lb/day**							
Embankment/Access Road Construction					15000.0	yd3					10.0	1071.4	10714.3	1071.4	55.0	days	
Mobile Sources					(borrow)							*assumes haul load = 14 yd3	*10 days to complete hauling				
Water Truck(s)	3.60	13.98	0.72	lb/day	2.0		396.2	1537.4	79.2	lb/yr							
Bulldozer(s)	3.63	21.55	1.12	lb/day	2.0		399.1	2370.4	122.7	lb/yr							
Roller(s)	0.59	4.47	0.24	lb/day	4.0		129.1	982.8	53.2	lb/yr							
Grader(s)	1.20	9.73	0.53	lb/day	2.0		131.9	1070.3	58.2	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	10.0		16.5	203.8	6.4	lb/yr						0.00220462	lb/gram
Employee Trips	0.21	0.55	0.04	g/mile	20.0	employees	20.4	53.4	3.9	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	10.0	trucks			3,025.5	lb/yr	*assumes borrow area is 10 miles round trip, on paved roads						
Total							**1093.2**	**6218.1**	**3349.0**	**lb/yr**						2000	lb/ton
Total							**19.9**	**113.1**	**60.9**	**lb/day**							
Canal Lining					2600.0	yd3					20.0	185.7	3714.3	168.8	22.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Off-Highway Trucks	3.60	13.98	0.72	lb/day	3.0		237.7	922.4	47.5	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	10.0		5.7	70.7	2.2	lb/yr	*assumes concrete delivered from an offsite source 20 miles away					0.00220462	lb/gram
Employee Trips	0.29	0.61	0.04	g/mile	20.0	employees	11.1	23.6	1.5	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	10.0	trucks			1,048.8	lb/yr							
Total							**254.6**	**1016.7**	**1100.1**	**lb/yr**						2000	lb/ton
Total							**11.6**	**46.2**	**50.0**	**lb/day**							
Irrigation Interconnections					0.0	yd3					0.0	0.0	0.0	0.0	12.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Water Truck(s)	3.60	13.98	0.72	lb/day	1.0		43.2	167.7	8.6	lb/yr							
Grader(s)	1.20	9.73	0.53	lb/day	1.0		14.4	116.8	6.3	lb/yr							
Excavator(s)	1.84	6.47	0.34	lb/day	2.0		44.2	155.2	8.2	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	20.0	employees	4.4	11.6	0.8	lb/yr				40.0	per employee	0.00220462	lb/gram
Total							**106.2**	**451.3**	**24.0**	**lb/yr**						2000	lb/ton
Total							**8.9**	**37.6**	**2.0**	**lb/day**							
Pump Discharge Pipe Extension					0.0	yd3					0.0	0.0	0.0	0.0	22.0	days	
Mobile Sources												*assumes haul load = 14 yd3					
Water Truck(s)	3.60	13.98	0.72	lb/day	1.0		79.2	307.5	15.8	lb/yr							
Excavator(s)	1.84	6.47	0.34	lb/day	2.0		81.0	284.6	15.0	lb/yr							
Loader(s)	0.92	7.01	0.38	lb/day	2.0		40.5	308.5	16.7	lb/yr							
Other Equipment	2.08	9.43	0.52	lb/day	3.0		137.3	622.1	34.3	lb/yr							
Crane(s)	1.44	6.16	0.34	lb/day	1.0		31.7	135.5	7.4	lb/yr						0.00220462	lb/gram
Employee Trips	0.21	0.55	0.04	g/mile	20.0	employees	8.1	21.3	1.6	lb/yr				40.0	per employee	0.00220462	lb/gram
Total							**378.0**	**1679.4**	**90.9**	**lb/yr**						2000	lb/ton
Total							**17.2**	**76.3**	**4.1**	**lb/day**							
Site Restoration/ Irrigation Canal Abandonment/ Demobilization					7000.0	yd3					20.0	500.0	10000.0	5000.0	22.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Other Equipment	2.08	9.43	0.52	lb/day	2.0		33.3	150.8	8.3	lb/yr							
Loader(s)	0.92	7.01	0.38	lb/day	2.0		14.7	112.2	6.1	lb/yr							
Off-Highway Truck(s)	3.60	13.98	0.72	lb/day	3.0		237.7	922.4	47.5	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	2.0		15.4	190.3	6.0	lb/yr	*assumes seeding material delivered from an offsite source 20 miles away					0.00220462	lb/gram
Employee Trips	1.20	9.73	0.53	g/mile	20.0	employees	46.5	377.5	20.5	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	lb/VMT	2.0	trucks			2,823.8	lb/yr							
Total							**347.7**	**1753.2**	**2912.2**	**lb/yr**						2000	lb/ton
Total							**15.8**	**79.7**	**132.4**	**lb/day**							
2008 calendar year																	
Total from canal work							**2**	**10**	**5**	**TPY**	to occur during **2008** calendar year						
Total from canal work							**54**	**237**	**265**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently			(approximately the same level of activity as would occur during 6 months in 2009 would occur in a compressed period during 3 months in 2008)			
2009 calendar year																	
Total from canal work							**1**	**6**	**4**	**TPY**	to occur during **2009** calendar year						
Total from canal work							**27**	**118**	**180**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently						

*These calculations represent worst-case emissions from construction activities associated with the Elkhorn Canal Relocation

Sacramento East Levee Improvements Alt 1, 1-20a

***84% of reaches 1-4b occurs in Sutter County, 16% of 1-4b and 100% of 5a-20a occurs in Sacramento County**

	ROG	NOX	PM10	Unit	Quantity	Unit	ROG	NOX	PM10	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor	
[1]Clearing, Grubbing, Stripping, Grading (concurrent with [2,3])					0.0	yd3					0.0	0.0	4.3	4.3	27.0	days	
Mobile Sources												*assumes haul load = 14 yd3		*assumes haul trucks drive length of levee each day			
Haul Truck(s)	0.70	8.63	0.27	g/mile	5.0		0.0	0.4	0.0	lb/yr						0.00220462	lb/gram
Water Truck(s)	3.60	13.98	0.72	lb/day	1.0		97.3	377.4	19.5	lb/yr							
Scraper(s)	3.64	15.96	0.85	lb/day	2.0		196.7	862.1	45.9	lb/yr							
Loader(s)	0.92	7.01	0.38	lb/day	4.0		99.5	757.2	41.0	lb/yr							
Grader(s)	1.20	9.73	0.53	lb/day	2.0		64.7	525.4	28.6	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	30.0	78.6	5.7	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	5.0	trucks			6.1	lb/yr							
Total							**488.2**	**2601.0**	**146.7**	**lb/yr**						2000	lb/ton
Total							**18.1**	**96.3**	**5.4**	**lb/day**							
[2]Relocate Canal and Tree Removal (concurrent with [1,3])					0.0	yd3					0.0	0.0	4.3	4.3	48.0	days	
Mobile Sources												*assumes haul load = 14 yd3		*assumes haul trucks drive length of levee each day			
Excavator(s)	1.84	6.47	0.34	lb/day	2.0		176.7	620.9	32.8	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	2.0		0.0	0.2	0.0	lb/yr						0.00220462	lb/gram
Loader(s)	0.92	7.01	0.38	lb/day	1.0		44.2	336.5	18.2	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	53.3	139.7	10.2	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	4.0	trucks			4.9	lb/yr							
Total							**274.2**	**1097.3**	**598.3**	**lb/yr**						2000	lb/ton
Total							**5.7**	**22.9**	**12.5**	**lb/day**							
[3]Excavate Stability Berm/Inspection Trech (concurrent with [1,2])				Reusable Onsite Fill	285500.0	yd3					0.1	20392.9	2039.3	72.8	28.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Excavator(s)	1.84	6.47	0.34	lb/day	4.0		206.1	724.4	38.3	lb/yr							
Scraper(s)	3.64	15.96	0.85	lb/day	20.0		2039.6	8940.2	475.9	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	4.0		3.1	38.8	1.2	lb/yr						0.00220462	lb/gram
Bulldozers	3.63	21.55	1.12	lb/day	3.0		304.8	1810.1	93.7	lb/yr							
Grader(s)	1.20	9.73	0.53	lb/day	3.0		100.7	817.3	44.4	lb/yr							
Water Truck(s)	3.60	13.98	0.72	lb/day	2.0		201.7	782.7	40.3	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	31.1	81.5	5.9	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	8.0	trucks			575.8	lb/yr							
Material Handling											Tons/yd3 (gravel/sand)	Tons/day					
Aggregate Storage Piles	-	-	0.002	lb/ton					570.5	lb/yr	1.25	12745.54					
							-	-									
Total							**2887.1**	**13195.0**	**1846.1**	**lb/yr**						2000	lb/ton
Total							**103.1**	**471.2**	**65.9**	**lb/day**							
[4]Borrow Excavation, Haul and Place Adjacent Levee Raise, Cutoff Wall, & Seepage Berms (concurrent with [5,6])				Brookfield Fill	3958500.0	yd3					5.0	282750.0	1413750.0	13090.3	108.0	days	
				Commercial Fill	60333.3	yd3					30.0	4309.5	129285.7	1197.1	108.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Water Truck(s)	3.60	13.98	0.72	lb/day	5.0		1945.2	7547.3	389.0	lb/yr							
Scraper(s)	3.64	15.96	0.85	lb/day	15.0		5900.2	25862.7	1376.7	lb/yr							
Loader(s)	0.92	7.01	0.38	lb/day	4.0		398.0	3028.7	163.9	lb/yr							
Bulldozers	3.63	21.55	1.12	lb/day	4.0		1567.3	9309.3	481.9	lb/yr							
Other Equipment	2.08	9.43	0.52	lb/day	6.0		1348.2	6107.5	337.1	lb/yr							
Grader(s)	1.20	9.73	0.53	lb/day	6.0		776.7	6305.1	342.7	lb/yr							
Excavator(s)	1.84	6.47	0.34	lb/day	4.0		795.1	2794.0	147.7	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	90.0		2381.3	29357.6	918.5	lb/yr						0.00220462	lb/gram
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	120.0	314.3	22.9	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	90.0	trucks	-	-	1,385,202.8	lb/yr	*assumes that all material hauling is along unpaved haul routes						
Travel on paved roads			0.28	lb/VMT	0.0	trucks			-	lb/yr							
Material Handling											Tons/yd3 (gravel/sand)	Tons/day					
Material loading at borrow			0.04	lb/ton					203,905.1	lb/yr	1.25	46514.27					
Material unloading at levee			0.005	lb/ton					26,373.6	lb/yr	1.25	46514.27					
Bulldozing	-	-	0.41	lb/hr	12.0	hrs/day			532.28	lb/yr							
Total							**15231.9**	**90626.5**	**1620194.0**	**lb/yr**						2000	lb/ton
Total							**141.0**	**839.1**	**15001.8**	**lb/day**							
[5]Reconstruct Garden Hwy/Install Surface Drainage (concurrent with [4,6])					0.0	yd3					10.0	0.0	10.0	10.0	27.0	days	
Mobile Sources												*assumes haul load = 14 yd3		*assumes haul trucks drive 10 miles each day			
Backhoe(s)	0.67	4.54	0.38	lb/day	2.0		36.3	245.4	20.5	lb/yr							
Other Equipment	2.08	9.43	0.52	lb/day	2.0		112.4	509.0	28.1	lb/yr							
Roller(s)	0.59	4.47	0.24	lb/day	2.0		31.7	241.2	13.1	lb/yr							
Paver(s)	0.93	7.08	0.38	lb/day	2.0		50.2	382.2	20.7	lb/yr							
Concrete Truck(s)	3.60	13.98	0.72	lb/day	3.0		291.8	1132.1	58.4	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	8.0		0.1	1.5	0.0	lb/yr						0.00220462	lb/gram
Employee Trips	0.29	0.61	0.04	g/mile	60.0	employees	40.9	86.9	5.4	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	8.0	trucks			22.6	lb/yr							
Total							**563.3**	**2598.2**	**110.4**	**lb/yr**						2000	lb/ton
Total							**20.9**	**96.2**	**4.1**	**lb/day**							
[6]Construct Relief Wells/Berm/Drainage Canal (concurrent with [4,5])					0.0	yd3					0.0	0.0	0.0	0.0	30.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Off-Highway Truck(s)	3.60	13.98	0.72	lb/day	5.0		540.3	2096.5	108.1	lb/yr							
Drill Rig(s)	2.87	5.75	0.43	lb/day	3.0		258.6	517.3	38.8	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	33.3	87.3	6.3	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	5.0	trucks	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	lb/VMT	0.0	trucks			-	lb/yr							
Total							**832.3**	**2701.0**	**153.2**	**lb/yr**						2000	lb/ton
Total							**27.7**	**90.0**	**5.1**	**lb/day**							
[7]Site Restoration/Demobilization					0.0	yd3					0.1	0.0	0.0	0.0	34.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Off-Highway Truck(s)	3.60	13.98	0.72	lb/day	6.0		734.8	2851.2	147.0	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	3.0		0.0	0.0	0.0	lb/yr						0.00220462	lb/gram
Employee Trips	1.20	9.73	0.53	g/mile	60.0	employees	215.6	1750.4	95.1	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	lb/VMT	0.0	trucks			-	lb/yr							
Total							**950.5**	**4601.6**	**242.1**	**lb/yr**						2000	lb/ton
Total							**28.0**	**135.3**	**7.1**	**lb/day**							
2009 calendar year																	
Total from East Levee Project						**100%**	**10.6**	**58.7**	**811.6**	**TPY**	to occur during 2009 calendar year						
Total from East Levee Project						**100%**	**189.6**	**1025.4**	**15011.0**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently						
Emissions to occur in Sutter County						**39%**	**4.1**	**22.8**	**315.7**	**TPY**	to occur during 2009 calendar year						
Emissions to occur in Sacramento County						**61%**	**6.5**	**35.8**	**495.1**	**TPY**	to occur during 2009 calendar year						
Emissions to occur in Sutter County						**39%**	**74.0**	**399.9**	**5854.3**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently						
Emissions to occur in Sacramento County						**61%**	**115.7**	**625.5**	**9156.7**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently						

*These calculations represent worst-case emissions from construction activities associated with Sacramento East Levee work

Sacramento East Levee Improvements Alt 1, 1-4b

***84% of reaches 1-4b occurs in Sutter County, 16% of 1-4b**

	ROG	NOX	PM10	Unit	Quantity	Unit	ROG	NOX	PM10	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor	
[1]Clearing, Grubbing, Stripping, Grading (concurrent with [2,3])					0.0	yd3					0.0	0.0	4.3	4.3	27.0	days	
Mobile Sources												*assumes haul load = 14 yd3		*assumes haul trucks drive length of levee each day			
Haul Truck(s)	0.70	8.63	0.27	g/mile	5.0		0.0	0.4	0.0	lb/yr						0.00220462	lb/gram
Water Truck(s)	3.60	13.98	0.72	lb/day	1.0		97.3	377.4	19.5	lb/yr							
Scraper(s)	3.64	15.96	0.85	lb/day	2.0		196.7	862.1	45.9	lb/yr							
Loader(s)	0.92	7.01	0.38	lb/day	4.0		99.5	757.2	41.0	lb/yr							
Grader(s)	1.20	9.73	0.53	lb/day	2.0		64.7	525.4	28.6	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	30.0	78.6	5.7	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	5.0	trucks			6.1	lb/yr							
Total							**488.2**	**2601.0**	**146.7**	**lb/yr**						2000	lb/ton
Total							**18.1**	**96.3**	**5.4**	**lb/day**							
[2]Relocate Canal and Tree Removal (concurrent with [1,3])					0.0	yd3					0.0	0.0	4.3	4.3	48.0	days	
Mobile Sources												*assumes haul load = 14 yd3		*assumes haul trucks drive length of levee each day			
Excavator(s)	1.84	6.47	0.34	lb/day	2.0		176.7	620.9	32.8	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	2.0		0.0	0.2	0.0	lb/yr						0.00220462	lb/gram
Loader(s)	0.92	7.01	0.38	lb/day	1.0		44.2	336.5	18.2	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	53.3	139.7	10.2	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	4.0	trucks			4.9	lb/yr							
Total							**274.2**	**1097.3**	**598.3**	**lb/yr**						2000	lb/ton
Total							**5.7**	**22.9**	**12.5**	**lb/day**							
[3]Excavate Stability Berm/Inspection Trech (concurrent with [1,2])				Reusable Onsite Fill	111000.0	yd3					0.1	7928.6	792.9	28.3	28.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Excavator(s)	1.84	6.47	0.34	lb/day	4.0		206.1	724.4	38.3	lb/yr							
Scraper(s)	3.64	15.96	0.85	lb/day	20.0		2039.6	8940.2	475.9	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	4.0		1.2	15.1	0.5	lb/yr						0.00220462	lb/gram
Bulldozers	3.63	21.55	1.12	lb/day	3.0		304.8	1810.1	93.7	lb/yr							
Grader(s)	1.20	9.73	0.53	lb/day	3.0		100.7	817.3	44.4	lb/yr							
Water Truck(s)	3.60	13.98	0.72	lb/day	2.0		201.7	782.7	40.3	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	31.1	81.5	5.9	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	8.0	trucks			223.9	lb/yr							
Material Handling											Tons/yd3 (gravel/sand)	Tons/day					
Aggregate Storage Piles	-	-	0.002	lb/ton					221.8	lb/yr	1.25	4955.36					
							-	-									
Total							**2885.2**	**13171.3**	**1144.7**	**lb/yr**						2000	lb/ton
Total							**103.0**	**470.4**	**40.9**	**lb/day**							
[4]Borrow Excavation, Haul and Place Adjacent Levee Raise, Cutoff Wall, & Seepage Berms (concurrent with [5,6])				Brookfield Fill	1922000.0	yd3					5.0	137285.7	686428.6	6355.8	108.0	days	
				Commercial Fill	38333.3	yd3					30.0	2738.1	82142.9	760.6	108.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Water Truck(s)	3.60	13.98	0.72	lb/day	5.0		1945.2	7547.3	389.0	lb/yr							
Scraper(s)	3.64	15.96	0.85	lb/day	15.0		5900.2	25862.7	1376.7	lb/yr							
Loader(s)	0.92	7.01	0.38	lb/day	4.0		398.0	3028.7	163.9	lb/yr							
Bulldozers	3.63	21.55	1.12	lb/day	4.0		1567.3	9309.3	481.9	lb/yr							
Other Equipment	2.08	9.43	0.52	lb/day	6.0		1348.2	6107.5	337.1	lb/yr							
Grader(s)	1.20	9.73	0.53	lb/day	6.0		776.7	6305.1	342.7	lb/yr							
Excavator(s)	1.84	6.47	0.34	lb/day	4.0		795.1	2794.0	147.7	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	90.0		1186.1	14622.8	457.5	lb/yr						0.00220462	lb/gram
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	120.0	314.3	22.9	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	90.0	trucks	-	-	689,956.4	lb/yr	*assumes that all material hauling is along unpaved haul routes						
Travel on paved roads			0.28	lb/VMT	0.0	trucks			-	lb/yr							
Material Handling											Tons/yd3 (gravel/sand)	Tons/day					
Material loading at borrow			0.04	lb/ton					99,462.2	lb/yr	1.25	22689.04					
Material unloading at levee			0.005	lb/ton					12,864.7	lb/yr	1.25	22689.04					
Bulldozing	-	-	0.41	lb/hr	12.0	hrs/day			532.28	lb/yr							
Total							**14036.8**	**75891.6**	**806534.7**	**lb/yr**						2000	lb/ton
Total							**130.0**	**702.7**	**7467.9**	**lb/day**							
[5]Reconstruct Garden Hwy/Install Surface Drainage (concurrent with [4,6])					0.0	yd3					10.0	0.0	10.0	10.0	27.0	days	
Mobile Sources												*assumes haul load = 14 yd3		*assumes haul trucks drive 10 miles each day			
Backhoe(s)	0.67	4.54	0.38	lb/day	2.0		36.3	245.4	20.5	lb/yr							
Other Equipment	2.08	9.43	0.52	lb/day	2.0		112.4	509.0	28.1	lb/yr							
Roller(s)	0.59	4.47	0.24	lb/day	2.0		31.7	241.2	13.1	lb/yr							
Paver(s)	0.93	7.08	0.38	lb/day	2.0		50.2	382.2	20.7	lb/yr							
Concrete Truck(s)	3.60	13.98	0.72	lb/day	3.0		291.8	1132.1	58.4	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	8.0		0.1	1.5	0.0	lb/yr						0.00220462	lb/gram
Employee Trips	0.29	0.61	0.04	g/mile	60.0	employees	40.9	86.9	5.4	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	8.0	trucks			22.6	lb/yr							
Total							**563.3**	**2598.2**	**110.4**	**lb/yr**						2000	lb/ton
Total							**20.9**	**96.2**	**4.1**	**lb/day**							
[6]Construct Relief Wells/Berm/Drainage Canal (concurrent with [4,5])					0.0	yd3					0.0	0.0	0.0	0.0	30.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Off-Highway Truck(s)	3.60	13.98	0.72	lb/day	5.0		540.3	2096.5	108.1	lb/yr							
Drill Rig(s)	2.87	5.75	0.43	lb/day	3.0		258.6	517.3	38.8	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	33.3	87.3	6.3	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	5.0	trucks	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	lb/VMT	0.0	trucks			-	lb/yr							
Total							**832.3**	**2701.0**	**153.2**	**lb/yr**						2000	lb/ton
Total							**27.7**	**90.0**	**5.1**	**lb/day**							
[7]Site Restoration/Demobilization					0.0	yd3					0.1	0.0	0.0	0.0	34.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Off-Highway Truck(s)	3.60	13.98	0.72	lb/day	6.0		734.8	2851.2	147.0	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	3.0		0.0	0.0	0.0	lb/yr						0.00220462	lb/gram
Employee Trips	1.20	9.73	0.53	g/mile	60.0	employees	215.6	1750.4	95.1	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	lb/VMT	0.0	trucks			-	lb/yr							
Total							**950.5**	**4601.6**	**242.1**	**lb/yr**						2000	lb/ton
Total							**28.0**	**135.3**	**7.1**	**lb/day**							
2009 calendar year																	
Total from East Levee Project						**100%**	**10.0**	**51.3**	**404.5**	**TPY**	to occur during 2009 calendar year						
Total from East Levee Project						**100%**	**178.6**	**889.0**	**7477.1**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently						
Emissions to occur in Sutter County						**84%**	**8.4**	**43.1**	**339.8**	**TPY**	to occur during 2009 calendar year						
Emissions to occur in Sacramento County						**16%**	**1.6**	**8.2**	**64.7**	**TPY**	to occur during 2009 calendar year						
Emissions to occur in Sutter County						**84%**	**150.0**	**746.7**	**6280.8**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently						
Emissions to occur in Sacramento County						**16%**	**28.6**	**142.2**	**1196.3**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently						

*These calculations represent worst-case emissions from construction activities associated with Sacramento East Levee work

Sacramento East Levee Improvements Alt 2, 1-20a

***84% of reaches 1-4b occurs in Sutter County, 16% of 1-4b and 100% of 5a-20a occurs in Sacramento County**

	ROG	NOX	PM10	Unit	Quantity	Unit	ROG	NOX	PM10	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor	
[1]Clearing, Grubbing, Stripping, Grading (concurrent with [2,3])					0.0	yd3					0.0	0.0	4.3	4.3	27.0	days	
Mobile Sources												*assumes haul load = 14 yd3		*assumes haul trucks drive length of levee each day			
Haul Truck(s)	0.70	8.63	0.27	g/mile	5.0		0.0	0.4	0.0	lb/yr						0.00220462	lb/gram
Water Truck(s)	3.60	13.98	0.72	lb/day	1.0		97.3	377.4	19.5	lb/yr							
Scraper(s)	3.64	15.96	0.85	lb/day	2.0		196.7	862.1	45.9	lb/yr							
Loader(s)	0.92	7.01	0.38	lb/day	4.0		99.5	757.2	41.0	lb/yr							
Grader(s)	1.20	9.73	0.53	lb/day	2.0		64.7	525.4	28.6	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	30.0	78.6	5.7	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	5.0	trucks			6.1	lb/yr							
Total							**488.2**	**2601.0**	**146.7**	**lb/yr**						2000	lb/ton
Total							**18.1**	**96.3**	**5.4**	**lb/day**							
[2]Relocate Canal and Tree Removal (concurrent with [1,3])					0.0	yd3					0.0	0.0	4.3	4.3	48.0	days	
Mobile Sources												*assumes haul load = 14 yd3		*assumes haul trucks drive length of levee each day			
Excavator(s)	1.84	6.47	0.34	lb/day	2.0		176.7	620.9	32.8	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	2.0		0.0	0.2	0.0	lb/yr						0.00220462	lb/gram
Loader(s)	0.92	7.01	0.38	lb/day	1.0		44.2	336.5	18.2	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	53.3	139.7	10.2	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	4.0	trucks			4.9	lb/yr							
Total							**274.2**	**1097.3**	**598.3**	**lb/yr**						2000	lb/ton
Total							**5.7**	**22.9**	**12.5**	**lb/day**							
[3]Excavate Stability Berm/Inspection Trech (concurrent with [1,2])				Reusable Onsite Fill	264000.0	yd3					0.1	18857.1	1885.7	67.3	28.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Excavator(s)	1.84	6.47	0.34	lb/day	4.0		206.1	724.4	38.3	lb/yr							
Scraper(s)	3.64	15.96	0.85	lb/day	20.0		2039.6	8940.2	475.9	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	4.0		2.9	35.9	1.1	lb/yr						0.00220462	lb/gram
Bulldozers	3.63	21.55	1.12	lb/day	3.0		304.8	1810.1	93.7	lb/yr							
Grader(s)	1.20	9.73	0.53	lb/day	3.0		100.7	817.3	44.4	lb/yr							
Water Truck(s)	3.60	13.98	0.72	lb/day	2.0		201.7	782.7	40.3	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	31.1	81.5	5.9	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	8.0	trucks			532.5	lb/yr							
Material Handling											Tons/yd3 (gravel/sand)	Tons/day					
Aggregate Storage Piles	-	-	0.002	lb/ton					527.5	lb/yr	1.25	11785.71					
							-	-									
Total							**2886.9**	**13192.1**	**1759.7**	**lb/yr**						2000	lb/ton
Total							**103.1**	**471.1**	**62.8**	**lb/day**							
[4]Borrow Excavation, Haul and Place Adjacent Levee Raise, Cutoff Wall, & Seepage Berms (concurrent with [5,6])				Brookfield Fill	2762000.0	yd3					5.0	197285.7	986428.6	9133.6	108.0	days	
				Commercial Fill	176043.8	yd3					30.0	12574.6	377236.7	3492.9	108.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Water Truck(s)	3.60	13.98	0.72	lb/day	5.0		1945.2	7547.3	389.0	lb/yr							
Scraper(s)	3.64	15.96	0.85	lb/day	15.0		5900.2	25862.7	1376.7	lb/yr							
Loader(s)	0.92	7.01	0.38	lb/day	4.0		398.0	3028.7	163.9	lb/yr							
Bulldozers	3.63	21.55	1.12	lb/day	4.0		1567.3	9309.3	481.9	lb/yr							
Other Equipment	2.08	9.43	0.52	lb/day	6.0		1348.2	6107.5	337.1	lb/yr							
Grader(s)	1.20	9.73	0.53	lb/day	6.0		776.7	6305.1	342.7	lb/yr							
Excavator(s)	1.84	6.47	0.34	lb/day	4.0		795.1	2794.0	147.7	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	90.0		2104.5	25945.0	811.7	lb/yr						0.00220462	lb/gram
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	120.0	314.3	22.9	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	90.0	trucks	-	-	1,224,179.7	lb/yr	*assumes that all material hauling is along unpaved haul routes						
Travel on paved roads			0.28	lb/VMT	0.0	trucks			-	lb/yr							
Material Handling											Tons/yd3 (gravel/sand)	Tons/day					
Material loading at borrow			0.04	lb/ton					149,068.7	lb/yr	1.25	34005.14					
Material unloading at levee			0.005	lb/ton					19,280.9	lb/yr	1.25	34005.14					
Bulldozing	-	-	0.41	lb/hr	12.0	hrs/day			532.28	lb/yr							
Total							**14955.1**	**87213.8**	**1397135.0**	**lb/yr**						2000	lb/ton
Total							**138.5**	**807.5**	**12936.4**	**lb/day**							
[5]Reconstruct Garden Hwy/Install Surface Drainage (concurrent with [4,6])					0.0	yd3					10.0	0.0	10.0	10.0	27.0	days	
Mobile Sources												*assumes haul load = 14 yd3		*assumes haul trucks drive 10 miles each day			
Backhoe(s)	0.67	4.54	0.38	lb/day	2.0		36.3	245.4	20.5	lb/yr							
Other Equipment	2.08	9.43	0.52	lb/day	2.0		112.4	509.0	28.1	lb/yr							
Roller(s)	0.59	4.47	0.24	lb/day	2.0		31.7	241.2	13.1	lb/yr							
Paver(s)	0.93	7.08	0.38	lb/day	2.0		50.2	382.2	20.7	lb/yr							
Concrete Truck(s)	3.60	13.98	0.72	lb/day	3.0		291.8	1132.1	58.4	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	8.0		0.1	1.5	0.0	lb/yr						0.00220462	lb/gram
Employee Trips	0.29	0.61	0.04	g/mile	60.0	employees	40.9	86.9	5.4	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	8.0	trucks			22.6	lb/yr							
Total							**563.3**	**2598.2**	**110.4**	**lb/yr**						2000	lb/ton
Total							**20.9**	**96.2**	**4.1**	**lb/day**							
[6]Construct Relief Wells/Berm/Drainage Canal (concurrent with [4,5])					0.0	yd3					0.0	0.0	0.0	0.0	30.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Off-Highway Truck(s)	3.60	13.98	0.72	lb/day	5.0		540.3	2096.5	108.1	lb/yr							
Drill Rig(s)	2.87	5.75	0.43	lb/day	3.0		258.6	517.3	38.8	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	33.3	87.3	6.3	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	5.0	trucks	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	lb/VMT	0.0	trucks			-	lb/yr							
Total							**832.3**	**2701.0**	**153.2**	**lb/yr**						2000	lb/ton
Total							**27.7**	**90.0**	**5.1**	**lb/day**							
[7]Site Restoration/Demobilization					0.0	yd3					0.1	0.0	0.0	0.0	34.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Off-Highway Truck(s)	3.60	13.98	0.72	lb/day	6.0		734.8	2851.2	147.0	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	3.0		0.0	0.0	0.0	lb/yr						0.00220462	lb/gram
Employee Trips	1.20	9.73	0.53	g/mile	60.0	employees	215.6	1750.4	95.1	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	lb/VMT	0.0	trucks			-	lb/yr							
Total							**950.5**	**4601.6**	**242.1**	**lb/yr**						2000	lb/ton
Total							**28.0**	**135.3**	**7.1**	**lb/day**							
2009 calendar year																	
Total from East Levee Project						**100%**	**10.5**	**57.0**	**700.1**	**TPY**	to occur during 2009 calendar year						
Total from East Levee Project						**100%**	**187.1**	**993.8**	**12945.6**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently						
Emissions to occur in Sutter County						**58%**	**6.1**	**33.2**	**407.4**	**TPY**	to occur during 2009 calendar year						
Emissions to occur in Sacramento County						**42%**	**4.4**	**23.9**	**294.0**	**TPY**	to occur during 2009 calendar year						
Emissions to occur in Sutter County						**58%**	**108.5**	**576.4**	**7508.5**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently						
Emissions to occur in Sacramento County						**42%**	**78.6**	**417.4**	**5437.2**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently						

*These calculations represent worst-case emissions from construction activities associated with Sacramento East Levee work

Sacramento East Levee Improvements Alt 2, 1-4b

***84% of reaches 1-4b occurs in Sutter County, 16% of 1-4b**

	ROG	NOX	PM10	Unit	Quantity	Unit	ROG	NOX	PM10	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor	
[1]Clearing, Grubbing, Stripping, Grading (concurrent with [2,3])					0.0	yd3					0.0	0.0	4.3	4.3	27.0	days	
Mobile Sources												*assumes haul load = 14 yd3		*assumes haul trucks drive length of levee each day			
Haul Truck(s)	0.70	8.63	0.27	g/mile	5.0		0.0	0.4	0.0	lb/yr						0.00220462	lb/gram
Water Truck(s)	3.60	13.98	0.72	lb/day	1.0		97.3	377.4	19.5	lb/yr							
Scraper(s)	3.64	15.96	0.85	lb/day	2.0		196.7	862.1	45.9	lb/yr							
Loader(s)	0.92	7.01	0.38	lb/day	4.0		99.5	757.2	41.0	lb/yr							
Grader(s)	1.20	9.73	0.53	lb/day	2.0		64.7	525.4	28.6	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	30.0	78.6	5.7	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	5.0	trucks			6.1	lb/yr							
Total							**488.2**	**2601.0**	**146.7**	**lb/yr**						2000	lb/ton
Total							**18.1**	**96.3**	**5.4**	**lb/day**							
[2]Relocate Canal and Tree Removal (concurrent with [1,3])					0.0	yd3					0.0	0.0	4.3	4.3	48.0	days	
Mobile Sources												*assumes haul load = 14 yd3		*assumes haul trucks drive length of levee each day			
Excavator(s)	1.84	6.47	0.34	lb/day	2.0		176.7	620.9	32.8	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	2.0		0.0	0.2	0.0	lb/yr						0.00220462	lb/gram
Loader(s)	0.92	7.01	0.38	lb/day	1.0		44.2	336.5	18.2	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	53.3	139.7	10.2	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	4.0	trucks			4.9	lb/yr							
Total							**274.2**	**1097.3**	**598.3**	**lb/yr**						2000	lb/ton
Total							**5.7**	**22.9**	**12.5**	**lb/day**							
[3]Excavate Stability Berm/Inspection Trech (concurrent with [1,2])				Reusable Onsite Fill	264000.0	yd3					0.1	18857.1	1885.7	67.3	28.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Excavator(s)	1.84	6.47	0.34	lb/day	4.0		206.1	724.4	38.3	lb/yr							
Scraper(s)	3.64	15.96	0.85	lb/day	20.0		2039.6	8940.2	475.9	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	4.0		2.9	35.9	1.1	lb/yr						0.00220462	lb/gram
Bulldozers	3.63	21.55	1.12	lb/day	3.0		304.8	1810.1	93.7	lb/yr							
Grader(s)	1.20	9.73	0.53	lb/day	3.0		100.7	817.3	44.4	lb/yr							
Water Truck(s)	3.60	13.98	0.72	lb/day	2.0		201.7	782.7	40.3	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	31.1	81.5	5.9	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	8.0	trucks			532.5	lb/yr							
Material Handling											Tons/yd3 (gravel/sand)	Tons/day					
Aggregate Storage Piles	-	-	0.002	lb/ton					527.5	lb/yr	1.25	11785.71					
							-	-									
Total							**2886.9**	**13192.1**	**1759.7**	**lb/yr**						2000	lb/ton
Total							**103.1**	**471.1**	**62.8**	**lb/day**							
[4]Borrow Excavation, Haul and Place Adjacent Levee Raise, Cutoff Wall, & Seepage Berms (concurrent with [5,6])				Brookfield Fill	1889000.0	yd3					5.0	134928.6	674642.9	6246.7	108.0	days	
				Commercial Fill	64902.4	yd3					30.0	4635.9	139076.5	1287.7	108.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Water Truck(s)	3.60	13.98	0.72	lb/day	5.0		1945.2	7547.3	389.0	lb/yr							
Scraper(s)	3.64	15.96	0.85	lb/day	15.0		5900.2	25862.7	1376.7	lb/yr							
Loader(s)	0.92	7.01	0.38	lb/day	4.0		398.0	3028.7	163.9	lb/yr							
Bulldozers	3.63	21.55	1.12	lb/day	4.0		1567.3	9309.3	481.9	lb/yr							
Other Equipment	2.08	9.43	0.52	lb/day	6.0		1348.2	6107.5	337.1	lb/yr							
Grader(s)	1.20	9.73	0.53	lb/day	6.0		776.7	6305.1	342.7	lb/yr							
Excavator(s)	1.84	6.47	0.34	lb/day	4.0		795.1	2794.0	147.7	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	90.0		1255.8	15481.7	484.4	lb/yr						0.00220462	lb/gram
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	120.0	314.3	22.9	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	90.0	trucks	-	-	730,486.2	lb/yr	*assumes that all material hauling is along unpaved haul routes						
Travel on paved roads			0.28	lb/VMT	0.0	trucks			-	lb/yr							
Material Handling											Tons/yd3 (gravel/sand)	Tons/day					
Material loading at borrow			0.04	lb/ton					99,135.9	lb/yr	1.25	22614.61					
Material unloading at levee			0.005	lb/ton					12,822.5	lb/yr	1.25	22614.61					
Bulldozing	-	-	0.41	lb/hr	12.0	hrs/day			532.28	lb/yr							
Total							**14106.4**	**76750.6**	**846723.0**	**lb/yr**						2000	lb/ton
Total							**130.6**	**710.7**	**7840.0**	**lb/day**							
[5]Reconstruct Garden Hwy/Install Surface Drainage (concurrent with [4,6])					0.0	yd3					10.0	0.0	10.0	10.0	27.0	days	
Mobile Sources												*assumes haul load = 14 yd3		*assumes haul trucks drive 10 miles each day			
Backhoe(s)	0.67	4.54	0.38	lb/day	2.0		36.3	245.4	20.5	lb/yr							
Other Equipment	2.08	9.43	0.52	lb/day	2.0		112.4	509.0	28.1	lb/yr							
Roller(s)	0.59	4.47	0.24	lb/day	2.0		31.7	241.2	13.1	lb/yr							
Paver(s)	0.93	7.08	0.38	lb/day	2.0		50.2	382.2	20.7	lb/yr							
Concrete Truck(s)	3.60	13.98	0.72	lb/day	3.0		291.8	1132.1	58.4	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	8.0		0.1	1.5	0.0	lb/yr						0.00220462	lb/gram
Employee Trips	0.29	0.61	0.04	g/mile	60.0	employees	40.9	86.9	5.4	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	8.0	trucks			22.6	lb/yr							
Total							**563.3**	**2598.2**	**110.4**	**lb/yr**						2000	lb/ton
Total							**20.9**	**96.2**	**4.1**	**lb/day**							
[6]Construct Relief Wells/Berm/Drainage Canal (concurrent with [4,5])					0.0	yd3					0.0	0.0	0.0	0.0	30.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Off-Highway Truck(s)	3.60	13.98	0.72	lb/day	5.0		540.3	2096.5	108.1	lb/yr							
Drill Rig(s)	2.87	5.75	0.43	lb/day	3.0		258.6	517.3	38.8	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	33.3	87.3	6.3	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	5.0	trucks	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	lb/VMT	0.0	trucks			-	lb/yr							
Total							**832.3**	**2701.0**	**153.2**	**lb/yr**						2000	lb/ton
Total							**27.7**	**90.0**	**5.1**	**lb/day**							
[7]Site Restoration/Demobilization					0.0	yd3					0.1	0.0	0.0	0.0	34.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Off-Highway Truck(s)	3.60	13.98	0.72	lb/day	6.0		734.8	2851.2	147.0	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	3.0		0.0	0.0	0.0	lb/yr						0.00220462	lb/gram
Employee Trips	1.20	9.73	0.53	g/mile	60.0	employees	215.6	1750.4	95.1	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	lb/VMT	0.0	trucks			-	lb/yr							
Total							**950.5**	**4601.6**	**242.1**	**lb/yr**						2000	lb/ton
Total							**28.0**	**135.3**	**7.1**	**lb/day**							
2009 calendar year																	
Total from East Levee Project						**100%**	**10.1**	**51.8**	**424.9**	**TPY**	to occur during 2009 calendar year						
Total from East Levee Project						**100%**	**179.2**	**896.9**	**7849.2**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently						
Emissions to occur in Sutter County						**84%**	**8.4**	**43.5**	**356.9**	**TPY**	to occur during 2009 calendar year						
Emissions to occur in Sacramento County						**16%**	**1.6**	**8.3**	**68.0**	**TPY**	to occur during 2009 calendar year						
Emissions to occur in Sutter County						**84%**	**150.5**	**753.4**	**6593.3**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently						
Emissions to occur in Sacramento County						**16%**	**28.7**	**143.5**	**1255.9**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently						

*These calculations represent worst-case emissions from construction activities associated with Sacramento East Levee work

Sacramento East Levee Improvements Alt 3, 1-20a

***84% of reaches 1-4b occurs in Sutter County, 16% of 1-4b and 100% of 5a-20a occurs in Sacramento County**

	ROG	NOX	PM10	Unit	Quantity	Unit	ROG	NOX	PM10	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor	
[1]Clearing, Grubbing, Stripping, Grading (concurrent with [2,3])					0.0	yd3					0.0	0.0	4.3	4.3	27.0	days	
Mobile Sources												*assumes haul load = 14 yd3		*assumes haul trucks drive length of levee each day			
Haul Truck(s)	0.70	8.63	0.27	g/mile	5.0		0.0	0.4	0.0	lb/yr						0.00220462	lb/gram
Water Truck(s)	3.60	13.98	0.72	lb/day	1.0		97.3	377.4	19.5	lb/yr							
Scraper(s)	3.64	15.96	0.85	lb/day	2.0		196.7	862.1	45.9	lb/yr							
Loader(s)	0.92	7.01	0.38	lb/day	4.0		99.5	757.2	41.0	lb/yr							
Grader(s)	1.20	9.73	0.53	lb/day	2.0		64.7	525.4	28.6	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	30.0	78.6	5.7	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	5.0	trucks			6.1	lb/yr							
Total							**488.2**	**2601.0**	**146.7**	**lb/yr**						2000	lb/ton
Total							**18.1**	**96.3**	**5.4**	**lb/day**							
[2]Relocate Canal and Tree Removal (concurrent with [1,3])					0.0	yd3					0.0	0.0	4.3	4.3	48.0	days	
Mobile Sources												*assumes haul load = 14 yd3		*assumes haul trucks drive length of levee each day			
Excavator(s)	1.84	6.47	0.34	lb/day	2.0		176.7	620.9	32.8	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	2.0		0.0	0.2	0.0	lb/yr						0.00220462	lb/gram
Loader(s)	0.92	7.01	0.38	lb/day	1.0		44.2	336.5	18.2	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	53.3	139.7	10.2	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	4.0	trucks			4.9	lb/yr							
Total							**274.2**	**1097.3**	**598.3**	**lb/yr**						2000	lb/ton
Total							**5.7**	**22.9**	**12.5**	**lb/day**							
[3]Excavate Stability Berm/Inspection Trech (concurrent with [1,2])				Reusable Onsite Fill	496500.0	yd3					0.1	35464.3	3546.4	126.7	28.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Excavator(s)	1.84	6.47	0.34	lb/day	4.0		206.1	724.4	38.3	lb/yr							
Scraper(s)	3.64	15.96	0.85	lb/day	20.0		2039.6	8940.2	475.9	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	4.0		5.5	67.5	2.1	lb/yr						0.00220462	lb/gram
Bulldozers	3.63	21.55	1.12	lb/day	3.0		304.8	1810.1	93.7	lb/yr							
Grader(s)	1.20	9.73	0.53	lb/day	3.0		100.7	817.3	44.4	lb/yr							
Water Truck(s)	3.60	13.98	0.72	lb/day	2.0		201.7	782.7	40.3	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	31.1	81.5	5.9	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	8.0	trucks			1,001.4	lb/yr							
Material Handling											Tons/yd3 (gravel/sand)	Tons/day					
Aggregate Storage Piles	-	-	0.002	lb/ton					992.1	lb/yr	1.25	22165.18					
							-	-									
Total							**2889.5**	**13223.7**	**2694.2**	**lb/yr**						2000	lb/ton
Total							**103.2**	**472.3**	**96.2**	**lb/day**							
[4]Borrow Excavation, Haul and Place Adjacent Levee Raise, Cutoff Wall, & Seepage Berms (concurrent with [5,6])				Brookfield Fill	4144500.0	yd3					5.0	296035.7	1480178.6	13705.4	108.0	days	
				Commercial Fill	48909.1	yd3					30.0	3493.5	104805.2	970.4	108.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Water Truck(s)	3.60	13.98	0.72	lb/day	5.0		1945.2	7547.3	389.0	lb/yr							
Scraper(s)	3.64	15.96	0.85	lb/day	15.0		5900.2	25862.7	1376.7	lb/yr							
Loader(s)	0.92	7.01	0.38	lb/day	4.0		398.0	3028.7	163.9	lb/yr							
Bulldozers	3.63	21.55	1.12	lb/day	4.0		1567.3	9309.3	481.9	lb/yr							
Other Equipment	2.08	9.43	0.52	lb/day	6.0		1348.2	6107.5	337.1	lb/yr							
Grader(s)	1.20	9.73	0.53	lb/day	6.0		776.7	6305.1	342.7	lb/yr							
Excavator(s)	1.84	6.47	0.34	lb/day	4.0		795.1	2794.0	147.7	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	90.0		2446.0	30155.7	943.5	lb/yr						0.00220462	lb/gram
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	120.0	314.3	22.9	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	90.0	trucks	-	-	1,422,860.1	lb/yr	*assumes that all material hauling is along unpaved haul routes						
Travel on paved roads			0.28	lb/VMT	0.0	trucks			-	lb/yr							
Material Handling											Tons/yd3 (gravel/sand)	Tons/day					
Material loading at borrow			0.04	lb/ton					212,762.6	lb/yr	1.25	48534.83					
Material unloading at levee			0.005	lb/ton					27,519.2	lb/yr	1.25	48534.83					
Bulldozing	-	-	0.41	lb/hr	12.0	hrs/day			532.28	lb/yr							
Total							**15296.7**	**91424.6**	**1667879.5**	**lb/yr**						2000	lb/ton
Total							**141.6**	**846.5**	**15443.3**	**lb/day**							
[5]Reconstruct Garden Hwy/Install Surface Drainage (concurrent with [4,6])					0.0	yd3					10.0	0.0	10.0	10.0	27.0	days	
Mobile Sources												*assumes haul load = 14 yd3		*assumes haul trucks drive 10 miles each day			
Backhoe(s)	0.67	4.54	0.38	lb/day	2.0		36.3	245.4	20.5	lb/yr							
Other Equipment	2.08	9.43	0.52	lb/day	2.0		112.4	509.0	28.1	lb/yr							
Roller(s)	0.59	4.47	0.24	lb/day	2.0		31.7	241.2	13.1	lb/yr							
Paver(s)	0.93	7.08	0.38	lb/day	2.0		50.2	382.2	20.7	lb/yr							
Concrete Truck(s)	3.60	13.98	0.72	lb/day	3.0		291.8	1132.1	58.4	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	8.0		0.1	1.5	0.0	lb/yr						0.00220462	lb/gram
Employee Trips	0.29	0.61	0.04	g/mile	60.0	employees	40.9	86.9	5.4	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	8.0	trucks			22.6	lb/yr							
Total							**563.3**	**2598.2**	**110.4**	**lb/yr**						2000	lb/ton
Total							**20.9**	**96.2**	**4.1**	**lb/day**							
[6]Construct Relief Wells/Berm/Drainage Canal (concurrent with [4,5])					0.0	yd3					0.0	0.0	0.0	0.0	30.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Off-Highway Truck(s)	3.60	13.98	0.72	lb/day	5.0		540.3	2096.5	108.1	lb/yr							
Drill Rig(s)	2.87	5.75	0.43	lb/day	3.0		258.6	517.3	38.8	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	33.3	87.3	6.3	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	5.0	trucks	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	lb/VMT	0.0	trucks			-	lb/yr							
Total							**832.3**	**2701.0**	**153.2**	**lb/yr**						2000	lb/ton
Total							**27.7**	**90.0**	**5.1**	**lb/day**							
[7]Site Restoration/Demobilization					0.0	yd3					0.1	0.0	0.0	0.0	34.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Off-Highway Truck(s)	3.60	13.98	0.72	lb/day	6.0		734.8	2851.2	147.0	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	3.0		0.0	0.0	0.0	lb/yr						0.00220462	lb/gram
Employee Trips	1.20	9.73	0.53	g/mile	60.0	employees	215.6	1750.4	95.1	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	lb/VMT	0.0	trucks			-	lb/yr							
Total							**950.5**	**4601.6**	**242.1**	**lb/yr**						2000	lb/ton
Total							**28.0**	**135.3**	**7.1**	**lb/day**							
2009 calendar year																	
Total from East Levee Project						**100%**	**10.6**	**59.1**	**835.9**	**TPY**	to occur during 2009 calendar year						
Total from East Levee Project						**100%**	**190.2**	**1032.8**	**15452.5**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently						
Emissions to occur in Sutter County						**42%**	**4.5**	**24.8**	**351.1**	**TPY**	to occur during 2009 calendar year						
Emissions to occur in Sacramento County						**58%**	**6.2**	**34.3**	**484.8**	**TPY**	to occur during 2009 calendar year						
Emissions to occur in Sutter County						**42%**	**79.9**	**433.8**	**6490.1**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently						
Emissions to occur in Sacramento County						**58%**	**110.3**	**599.0**	**8962.5**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently						

*These calculations represent worst-case emissions from construction activities associated with Sacramento East Levee work

Sacramento East Levee Improvements Alt 3, 1-4b

***84% of reaches 1-4b occurs in Sutter County, 16% of 1-4b occurs in Sacramento County**

	ROG	NOX	PM10	Unit	Quantity	Unit	ROG	NOX	PM10	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor	
[1]Clearing, Grubbing, Stripping, Grading (concurrent with [2,3])					0.0	yd3					0.0	0.0	4.3	4.3	27.0	days	
Mobile Sources												*assumes haul load = 14 yd3		*assumes haul trucks drive length of levee each day			
Haul Truck(s)	0.70	8.63	0.27	g/mile	5.0		0.0	0.4	0.0	lb/yr						0.00220462	lb/gram
Water Truck(s)	3.60	13.98	0.72	lb/day	1.0		97.3	377.4	19.5	lb/yr							
Scraper(s)	3.64	15.96	0.85	lb/day	2.0		196.7	862.1	45.9	lb/yr							
Loader(s)	0.92	7.01	0.38	lb/day	4.0		99.5	757.2	41.0	lb/yr							
Grader(s)	1.20	9.73	0.53	lb/day	2.0		64.7	525.4	28.6	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	30.0	78.6	5.7	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	5.0	trucks			6.1	lb/yr							
Total							**488.2**	**2601.0**	**146.7**	**lb/yr**						2000	lb/ton
Total							**18.1**	**96.3**	**5.4**	**lb/day**							
[2]Relocate Canal and Tree Removal (concurrent with [1,3])					0.0	yd3					0.0	0.0	4.3	4.3	48.0	days	
Mobile Sources												*assumes haul load = 14 yd3		*assumes haul trucks drive length of levee each day			
Excavator(s)	1.84	6.47	0.34	lb/day	2.0		176.7	620.9	32.8	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	2.0		0.0	0.2	0.0	lb/yr						0.00220462	lb/gram
Loader(s)	0.92	7.01	0.38	lb/day	1.0		44.2	336.5	18.2	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	53.3	139.7	10.2	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	4.0	trucks			4.9	lb/yr							
Total							**274.2**	**1097.3**	**598.3**	**lb/yr**						2000	lb/ton
Total							**5.7**	**22.9**	**12.5**	**lb/day**							
[3]Excavate Stability Berm/Inspection Trech (concurrent with [1,2])				Reusable Onsite Fill	322000.0	yd3					0.1	23000.0	2300.0	82.1	28.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Excavator(s)	1.84	6.47	0.34	lb/day	4.0		206.1	724.4	38.3	lb/yr							
Scraper(s)	3.64	15.96	0.85	lb/day	20.0		2039.6	8940.2	475.9	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	4.0		3.5	43.8	1.4	lb/yr						0.00220462	lb/gram
Bulldozers	3.63	21.55	1.12	lb/day	3.0		304.8	1810.1	93.7	lb/yr							
Grader(s)	1.20	9.73	0.53	lb/day	3.0		100.7	817.3	44.4	lb/yr							
Water Truck(s)	3.60	13.98	0.72	lb/day	2.0		201.7	782.7	40.3	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	31.1	81.5	5.9	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	8.0	trucks			649.5	lb/yr							
Material Handling											Tons/yd3 (gravel/sand)	Tons/day					
Aggregate Storage Piles	-	-	0.002	lb/ton					643.4	lb/yr	1.25	14375.00					
							-	-									
Total							**2887.5**	**13200.0**	**1992.8**	**lb/yr**						2000	lb/ton
Total							**103.1**	**471.4**	**71.2**	**lb/day**							
[4]Borrow Excavation, Haul and Place Adjacent Levee Raise, Cutoff Wall, & Seepage Berms (concurrent with [5,6])				Brookfield Fill	1983000.0	yd3					5.0	141642.9	708214.3	6557.5	108.0	days	
				Commercial Fill	26909.1	yd3					30.0	1922.1	57662.3	533.9	108.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Water Truck(s)	3.60	13.98	0.72	lb/day	5.0		1945.2	7547.3	389.0	lb/yr							
Scraper(s)	3.64	15.96	0.85	lb/day	15.0		5900.2	25862.7	1376.7	lb/yr							
Loader(s)	0.92	7.01	0.38	lb/day	4.0		398.0	3028.7	163.9	lb/yr							
Bulldozers	3.63	21.55	1.12	lb/day	4.0		1567.3	9309.3	481.9	lb/yr							
Other Equipment	2.08	9.43	0.52	lb/day	6.0		1348.2	6107.5	337.1	lb/yr							
Grader(s)	1.20	9.73	0.53	lb/day	6.0		776.7	6305.1	342.7	lb/yr							
Excavator(s)	1.84	6.47	0.34	lb/day	4.0		795.1	2794.0	147.7	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	90.0		1181.9	14571.5	455.9	lb/yr						0.00220462	lb/gram
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	120.0	314.3	22.9	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	90.0	trucks	-	-	687,537.2	lb/yr	*assumes that all material hauling is along unpaved haul routes						
Travel on paved roads			0.28	lb/VMT	0.0	trucks			-	lb/yr							
Material Handling											Tons/yd3 (gravel/sand)	Tons/day					
Material loading at borrow			0.04	lb/ton					101,977.5	lb/yr	1.25	23262.84					
Material unloading at levee			0.005	lb/ton					13,190.0	lb/yr	1.25	23262.84					
Bulldozing	-	-	0.41	lb/hr	12.0	hrs/day			532.28	lb/yr							
Total							**14032.6**	**75840.3**	**806954.7**	**lb/yr**						2000	lb/ton
Total							**129.9**	**702.2**	**7471.8**	**lb/day**							
[5]Reconstruct Garden Hwy/Install Surface Drainage (concurrent with [4,6])					0.0	yd3					10.0	0.0	10.0	10.0	27.0	days	
Mobile Sources												*assumes haul load = 14 yd3		*assumes haul trucks drive 10 miles each day			
Backhoe(s)	0.67	4.54	0.38	lb/day	2.0		36.3	245.4	20.5	lb/yr							
Other Equipment	2.08	9.43	0.52	lb/day	2.0		112.4	509.0	28.1	lb/yr							
Roller(s)	0.59	4.47	0.24	lb/day	2.0		31.7	241.2	13.1	lb/yr							
Paver(s)	0.93	7.08	0.38	lb/day	2.0		50.2	382.2	20.7	lb/yr							
Concrete Truck(s)	3.60	13.98	0.72	lb/day	3.0		291.8	1132.1	58.4	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	8.0		0.1	1.5	0.0	lb/yr						0.00220462	lb/gram
Employee Trips	0.29	0.61	0.04	g/mile	60.0	employees	40.9	86.9	5.4	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads			0.28	lb/VMT	8.0	trucks			22.6	lb/yr							
Total							**563.3**	**2598.2**	**110.4**	**lb/yr**						2000	lb/ton
Total							**20.9**	**96.2**	**4.1**	**lb/day**							
[6]Construct Relief Wells/Berm/Drainage Canal (concurrent with [4,5])					0.0	yd3					0.0	0.0	0.0	0.0	30.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Off-Highway Truck(s)	3.60	13.98	0.72	lb/day	5.0		540.3	2096.5	108.1	lb/yr							
Drill Rig(s)	2.87	5.75	0.43	lb/day	3.0		258.6	517.3	38.8	lb/yr							
Employee Trips	0.21	0.55	0.04	g/mile	60.0	employees	33.3	87.3	6.3	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	5.0	trucks	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	lb/VMT	0.0	trucks			-	lb/yr							
Total							**832.3**	**2701.0**	**153.2**	**lb/yr**						2000	lb/ton
Total							**27.7**	**90.0**	**5.1**	**lb/day**							
[7]Site Restoration/Demobilization					0.0	yd3					0.1	0.0	0.0	0.0	34.0	days	
Mobile Sources												*(assumes haul load = 14 yd3)					
Off-Highway Truck(s)	3.60	13.98	0.72	lb/day	6.0		734.8	2851.2	147.0	lb/yr							
Haul Truck(s)	0.70	8.63	0.27	g/mile	3.0		0.0	0.0	0.0	lb/yr						0.00220462	lb/gram
Employee Trips	1.20	9.73	0.53	g/mile	60.0	employees	215.6	1750.4	95.1	lb/yr				40.0	per employee	0.00220462	lb/gram
Fugitive Sources																	
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr							
Travel on paved roads	-	-	0.28	lb/VMT	0.0	trucks			-	lb/yr							
Total							**950.5**	**4601.6**	**242.1**	**lb/yr**						2000	lb/ton
Total							**28.0**	**135.3**	**7.1**	**lb/day**							
2009 calendar year																	
Total from East Levee Project						**100%**	**10.0**	**51.3**	**405.1**	**TPY**	to occur during 2009 calendar year						
Total from East Levee Project						**100%**	**178.5**	**888.5**	**7481.0**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently						
Emissions to occur in Sutter County						**84%**	**8.4**	**43.1**	**340.3**	**TPY**	to occur during 2009 calendar year						
Emissions to occur in Sacramento County						**16%**	**1.6**	**8.2**	**64.8**	**TPY**	to occur during 2009 calendar year						
Emissions to occur in Sutter County						**84%**	**150.0**	**746.3**	**6284.0**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently						
Emissions to occur in Sacramento County						**16%**	**28.6**	**142.2**	**1197.0**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently						

*These calculations represent worst-case emissions from construction activities associated with Sacramento East Levee work

NCC South Levee Phase 2 Improvements - Cutoff Wall and Levee Raise							*all work would occur in 2009.													
*All work would occur in Sutter County																				
	ROG	NOX	PM10	Unit	Quantity	Unit	ROG	NOX	PM10	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor				
[1]Clearing, Grubbing, Stripping					13500.0	yd3 (export)					10.0	964.3	9642.9	482.1	20.0	days				
Mobile Sources					*(assumes 10 miles to material disposal site)							*(assumes haul load = 14 yd3)								
Haul Truck(s)	0.70	8.63	0.27	g/mile	12.0		178.6	2201.6	68.9	lb/yr						0.00220462	lb/gram			
Water Truck(s)	3.60	13.98	0.72	lb/day	1.0		72.0	279.5	14.4	lb/yr										
Scraper(s)	3.64	15.96	0.85	lb/day	3.0		218.5	957.9	51.0	lb/yr										
Loader(s)	0.92	7.01	0.38	lb/day	1.0		18.4	140.2	7.6	lb/yr										
Employee Trips	0.21	0.55	0.04	g/mile	50.0	employees	18.5	48.5	3.5	lb/yr				40.0	per employee	0.00220462	lb/gram			
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr										
Travel on paved roads			0.28	lb/VMT	12.0	trucks			2,722.9	lb/yr										
Material Handling											Tons/yd3 (gravel/sand)	Tons/day								
Truck Loading at Levee	-	-	0.04	lb/ton					685.0	lb/yr	1.25	843.75								
Truck Unloading at Off-site Disposa	-	-	0.005	lb/ton			-	-	88.6	lb/yr	1.25	843.75								
Total							**506.1**	**3627.7**	**3641.8**	**lb/yr**						2000	lb/ton			
Total							**25.3**	**181.4**	**182.1**	**lb/day**										
[2,4]Levee Degrading & Compaction (lags [1] by 14 days)					0.0	yd3					0.0	0.0	0.0	0.0	135.0	days				
Mobile Sources																				
Bulldozer(s)	3.63	21.55	1.12	lb/day	4.0		1959.1	11636.6	602.3	lb/yr										
Water Truck(s)	3.60	13.98	0.72	lb/day	2.0		972.6	3773.6	194.5	lb/yr										
Scraper(s)	3.64	15.96	0.85	lb/day	4.0		1966.7	8620.9	458.9	lb/yr										
Roller(s)	0.59	4.47	0.24	lb/day	2.0		158.5	1206.1	65.3	lb/yr										
Loader(s)	0.92	7.01	0.38	lb/day	3.0		373.1	2839.4	153.6	lb/yr										
Employee Trips	0.21	0.55	0.04	g/mile	50.0	employees	125.0	327.4	23.8	lb/yr				40.0	per employee	0.00220462	lb/gram			
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr										
Travel on paved roads			0.28	lb/VMT	0.0	trucks			-	lb/yr										
Material Handling																				
Bulldozing	-	-	0.41	lb/hr	10.0	hrs/day			554.45	lb/yr										
Total							**5555.0**	**28404.0**	**2052.9**	**lb/yr**						2000	lb/ton			
Total							**41.1**	**210.4**	**15.2**	**lb/day**										
[3,5]Cutoff Wall Construction & Borrow Site Excavation (lags [2] by 14 days)					195000.0	yd3 (borrow)					10.0	13928.6	139285.7	928.6	150.0	days				
Mobile Sources					*(assumes Brookfield borrow site; also assumes exported material is transported on return trip to borrow site)							*(assumes haul load = 14 yd3)								
Excavator(s)	1.84	6.47	0.34	lb/day	3.0		828.2	2910.5	153.8	lb/yr										
Water Truck(s)	3.60	13.98	0.72	lb/day	1.0		540.3	2096.5	108.1	lb/yr										
Other Equipment	2.08	9.43	0.52	lb/day	6.0		1872.6	8482.7	468.1	lb/yr										
Loader(s)	0.92	7.01	0.38	lb/day	3.0		414.6	3154.9	170.7	lb/yr										
Haul Truck(s)	0.70	8.63	0.27	g/mile	4.0		215.0	2650.0	82.9	lb/yr						0.00220462	lb/gram			
Pick-up Truck(s)	0.21	0.55	0.04	g/mile	10.0		0.7	1.8	0.1	lb/yr						0.00220462	lb/gram			
Employee Trips	0.21	0.55	0.04	g/mile	50.0	employees	138.9	363.8	26.5	lb/yr				40.0	per employee	0.00220462	lb/gram			
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr										
Travel on paved roads			0.28	lb/VMT	4.0	trucks			39,330.9	lb/yr										
Material Handling											Tons/yd3 (gravel/sand)	Tons/day								
Truck Loading at Borrow	-	-	0.04	lb/ton					9893.8	lb/yr	1.25	1625.00								
Truck Unloading at Levee	-	-	0.005	lb/ton			-	-	1279.7	lb/yr	1.25	1625.00								
Total							**4010.1**	**19660.1**	**51514.6**	**lb/yr**						2000	lb/ton			
Total							**26.7**	**131.1**	**343.4**	**lb/day**										
[6]Demobilization/Cleanup					0.0	yd3					0.0	0.0	0.0	0.0	14.0	days				
Mobile Sources																				
Water Truck(s)	3.60	13.98	0.72	lb/day	3.0		151.3	587.0	30.3	lb/yr										
Haul Truck(s)	0.70	8.63	0.27	g/mile	2.0		0.2	2.7	0.1	lb/yr	*(assumes haul truck drives 5.1 miles/day)					0.00220462	lb/gram			
Employee Trips	0.21	0.55	0.04	g/mile	50.0	employees	13.0	34.0	2.5	lb/yr				40.0	per employee	0.00220462	lb/gram			
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	lb/VMT	2.0	trucks	-	-	128.2	lb/yr	*(assumes haul truck drives 5.1 miles/day)									
Travel on paved roads			0.28	lb/VMT	0.0	trucks			-	lb/yr										
Total							**164.5**	**623.7**	**161.0**	**lb/yr**						2000	lb/ton			
Total							**11.7**	**44.5**	**11.5**	**lb/day**										
Levee Raise & Borrow Site Excavation					685000.0	yd3					10.0	48928.6	489285.7	3261.9	150.0	days				
Mobile Sources												*(assumes haul load = 14 yd3)								
Water Truck(s)	3.60	13.98	0.72	lb/day	3.0		1621.0	6289.4	324.2	lb/yr										
Bulldozer(s)	3.63	21.55	1.12	lb/day	2.0		1088.4	6464.8	334.6	lb/yr										
Roller(s)	0.59	4.47	0.24	lb/day	4.0		352.2	2680.3	145.0	lb/yr										
Excavator(s)	1.84	6.47	0.34	lb/day	5.0		1380.3	4850.8	256.3	lb/yr										
Haul Truck(s)	0.70	8.63	0.27	g/mile	30.0		755.1	9309.1	291.2	lb/yr						0.00220462	lb/gram			
Employee Trips	0.29	0.61	0.04	g/mile	65.0	employees	245.9	522.8	32.7	lb/yr				40.0	per employee	0.00220462	lb/gram			
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	lb/VMT	0.0	trucks	-	-	-	lb/yr										
Travel on paved roads			0.28	lb/VMT	30.0	trucks			138,162.3	lb/yr										
Material Handling											Tons/yd3 (gravel/sand)	Tons/day								
Truck Loading at Borrow	-	-	0.04	lb/ton					34755.1	lb/yr	1.25	5708.33								
Truck Unloading at Levee	-	-	0.005	lb/ton			-	-	4495.3	lb/yr	1.25	5708.33								
Total							**5442.9**	**30117.1**	**178796.9**	**lb/yr**						2000	lb/ton			
Total							**36.3**	**200.8**	**1192.0**	**lb/day**										
Finishing Grading					0.0	yd3					0.0	0.0	0.0	0.0	10.0	days				
Mobile Sources																				
Water Truck(s)	3.60	13.98	0.72	lb/day	2.0		72.0	279.5	14.4	lb/yr										
Grader(s)	1.20	9.73	0.53	lb/day	3.0		36.0	291.9	15.9	lb/yr										
Employee Trips	0.21	0.55	0.04	g/mile	55.0	employees	10.2	26.7	1.9	lb/yr				40.0	per employee	0.00220462	lb/gram			
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	lb/VMT	2.0	trucks	-	-	-	lb/yr										
Travel on paved roads	-	-	0.28	lb/VMT	0.0	trucks			-	lb/yr										
Total							**118.2**	**598.1**	**32.2**	**lb/yr**						2000	lb/ton			
Total							**11.8**	**59.8**	**3.2**	**lb/day**										
Operating Road Construction					5000.0	yd3					0.1	357.1	35.7	3.6	10.0	days				
Mobile Sources					(*assumes 2,500 cy salvaged, and 2,500 cy imported)							*(assumes haul load = 14 yd3)								
Roller(s)	0.59	4.47	0.24	lb/day	2.0		11.7	89.3	4.8	lb/yr										
Grader(s)	0.67	4.54	0.38	lb/day	2.0		6.7	45.4	3.8	lb/yr	(*assumes that graders are used for 5 days)									
Haul Truck(s)	0.70	8.63	0.27	g/mile	10.0		0.1	0.7	0.0	lb/yr						0.00220462	lb/gram			
Employee Trips	1.20	9.73	0.53	g/mile	55.0	employees	58.1	471.9	25.6	lb/yr				40.0	per employee	0.00220462	lb/gram			
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	lb/VMT	2.0	trucks	-	-	32.1	lb/yr										
Travel on paved roads	-	-	0.28	lb/VMT	0.0	trucks			10.1	lb/yr										
Material Handling											Tons/yd3 (gravel/sand)	Tons/day								
Truck Loading of salvage materia	-	-	0.04	lb/ton					253.7	lb/yr	1.25	625.00								
Truck Unloading at road installation	-	-	0.005	lb/ton			-	-	32.8	lb/yr	1.25	625.00								
Total							**76.7**	**607.4**	**362.9**	**lb/yr**						2000	lb/ton			
Total							**7.7**	**60.7**	**36.3**	**lb/day**										
Total for "2008 phase" 2009 calendar																				
Total from NCC Project							**8**	**42**	**118**	**TPY**	to occur during "2008 phase" 2009 calendar year									
Total from NCC Project							**68**	**392**	**197**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently									
*These calculations represent worst-case emissions from construction activities associated with the NCC																				

PGCC West Levee Phase Improvements - Levee Widening and Flatening							*all work would occur in 2009.													
*All work would occur in Sutter County																				
	ROG	NOX	PM10	Unit	Quantity	Unit	ROG	NOX	PM10	Unit	Distance (miles/round-trip)	# of Haul Loads	Total Miles Traveled	Total Miles Traveled/Day	Time frame	Conversion Factor				
[1]Clearing, Grubbing, Stripping					0.0	yd3 (export)					0.0	0.0	0.0	0.0	20.0	days				
Mobile Sources					*(assumes 10 miles to material disposal site)							*(assumes haul load = 14 yd3)								
Haul Truck(s)	0.70	8.63	0.27	g/mile	6.0		0.0	0.0	0.0	lb/yr						0.00220462	lb/gram			
Water Truck(s)	3.60	13.98	0.72	lb/day	1.0		72.0	279.5	14.4	lb/yr										
Scraper(s)	3.64	15.96	0.85	lb/day	2.0		145.7	638.6	34.0	lb/yr										
Loader(s)	0.92	7.01	0.38	lb/day	1.0		18.4	140.2	7.6	lb/yr										
Employee Trips	0.21	0.55	0.04	g/mile	30.0	employees	11.1	29.1	2.1	lb/yr				40.0	per employee	0.00220462	lb/gram			
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	lb/VMT	6.0	trucks	-	-	-	lb/yr										
Travel on paved roads			0.28	lb/VMT	0.0	trucks			-	lb/yr										
Material Handling											Tons/yd3 (gravel/sand)	Tons/day								
Truck Loading at Levee	-	-	0.04	lb/ton					0.0	lb/yr	1.25	0.00								
Truck Unloading at Off-site Disposa	-	-	0.005	lb/ton			-	-	0.0	lb/yr	1.25	0.00								
Total							**247.3**	**1087.4**	**58.1**	**lb/yr**						2000	lb/ton			
Total							**12.4**	**54.4**	**2.9**	**lb/day**										
[2]Levee Widening & Compaction					330000.0	yd3					1.0	23571.4	23571.4	174.6	135.0	days				
Mobile Sources																				
Bulldozer(s)	3.63	21.55	1.12	lb/day	2.0		979.6	5818.3	301.2	lb/yr										
Water Truck(s)	3.60	13.98	0.72	lb/day	1.0		486.3	1886.8	97.3	lb/yr										
Scraper(s)	3.64	15.96	0.85	lb/day	2.0		983.4	4310.4	229.5	lb/yr										
Roller(s)	0.59	4.47	0.24	lb/day	1.0		79.2	603.1	32.6	lb/yr										
Loader(s)	0.92	7.01	0.38	lb/day	2.0		248.7	1892.9	102.4	lb/yr										
Employee Trips	0.21	0.55	0.04	g/mile	30.0	employees	75.0	196.4	14.3	lb/yr				40.0	per employee	0.00220462	lb/gram			
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	lb/VMT	4.0	trucks	-	-	84,641.5	lb/yr										
Travel on paved roads			0.28	lb/VMT	0.0	trucks			-	lb/yr										
Material Handling																				
Bulldozing	-	-	0.41	lb/hr	10.0	hrs/day			554.45	lb/yr										
Total							**2852.2**	**14708.0**	**85973.2**	**lb/yr**						2000	lb/ton			
Total							**21.1**	**108.9**	**636.8**	**lb/day**										
[3]Reconstructing Landside Levee Slope & Borrow Site Excavation					85000.0	yd3 (borrow)					1.0	6071.4	6071.4	36.1	168.0	days				
Mobile Sources					*(assumes Brookfield borrow site; also assumes exported material is transported on return trip to borrow site)							*(assumes haul load = 14 yd3)								
Excavator(s)	1.84	6.47	0.34	lb/day	2.0		618.4	2173.1	114.8	lb/yr										
Water Truck(s)	3.60	13.98	0.72	lb/day	1.0		605.2	2348.0	121.0	lb/yr										
Other Equipment	2.08	9.43	0.52	lb/day	3.0		1048.6	4750.3	262.2	lb/yr										
Loader(s)	0.92	7.01	0.38	lb/day	2.0		309.5	2355.6	127.5	lb/yr										
Haul Truck(s)	0.70	8.63	0.27	g/mile	2.0		9.4	115.5	3.6	lb/yr						0.00220462	lb/gram			
Pick-up Truck(s)	0.21	0.55	0.04	g/mile	5.0		0.4	1.0	0.1	lb/yr						0.00220462	lb/gram			
Employee Trips	0.21	0.55	0.04	g/mile	30.0	employees	93.3	244.4	17.8	lb/yr				40.0	per employee	0.00220462	lb/gram			
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	lb/VMT	4.0	trucks	-	-	21,801.6	lb/yr										
Travel on paved roads			0.28	lb/VMT	0.0	trucks			1,714.4	lb/yr										
Material Handling											Tons/yd3 (gravel/sand)	Tons/day								
Truck Loading at Borrow	-	-	0.04	lb/ton					4312.7	lb/yr	1.25	632.44								
Truck Unloading at Levee	-	-	0.005	lb/ton			-	-	557.8	lb/yr	1.25	632.44								
Total							**2684.8**	**11988.1**	**29033.5**	**lb/yr**						2000	lb/ton			
Total							**16.0**	**71.4**	**172.8**	**lb/day**										
[4]Demobilization/Cleanup					0.0	yd3					0.0	0.0	0.0	0.0	14.0	days				
Mobile Sources																				
Water Truck(s)	3.60	13.98	0.72	lb/day	2.0		100.9	391.3	20.2	lb/yr										
Haul Truck(s)	0.70	8.63	0.27	g/mile	2.0		0.2	2.7	0.1	lb/yr	*(assumes haul truck drives 5.1 miles/day)					0.00220462	lb/gram			
Employee Trips	0.21	0.55	0.04	g/mile	30.0	employees	7.8	20.4	1.5	lb/yr				40.0	per employee	0.00220462	lb/gram			
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	lb/VMT	2.0	trucks	-	-	128.2	lb/yr	*(assumes haul truck drives 5.1 miles/day)									
Travel on paved roads			0.28	lb/VMT	0.0	trucks			-	lb/yr										
Total							**108.9**	**414.4**	**149.9**	**lb/yr**						2000	lb/ton			
Total							**7.8**	**29.6**	**10.7**	**lb/day**										
[5]Constructing Seepage and Stability Berm & Borrow Site					42000.0	yd3					30.0	3000.0	90000.0	600.0	150.0	days				
Mobile Sources												*(assumes haul load = 14 yd3)								
Water Truck(s)	3.60	13.98	0.72	lb/day	2.0		1080.7	4192.9	216.1	lb/yr										
Bulldozer(s)	3.63	21.55	1.12	lb/day	2.0		1088.4	6464.8	334.6	lb/yr										
Roller(s)	0.59	4.47	0.24	lb/day	2.0		176.1	1340.1	72.5	lb/yr										
Excavator(s)	1.84	6.47	0.34	lb/day	2.0		552.1	1940.3	102.5	lb/yr										
Haul Truck(s)	0.70	8.63	0.27	g/mile	15.0		138.9	1712.3	53.6	lb/yr						0.00220462	lb/gram			
Employee Trips	0.29	0.61	0.04	g/mile	35.0	employees	132.4	281.5	17.6	lb/yr				40.0	per employee	0.00220462	lb/gram			
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	lb/VMT	15.0	trucks	-	-	60,595.6	lb/yr										
Travel on paved roads			0.28	lb/VMT	0.0	trucks			25,413.8	lb/yr										
Material Handling											Tons/yd3 (gravel/sand)	Tons/day								
Truck Loading at Borrow	-	-	0.04	lb/ton					2131.0	lb/yr	1.25	350.00								
Truck Unloading at Levee	-	-	0.005	lb/ton			-	-	275.6	lb/yr	1.25	350.00								
Total							**3168.6**	**15932.0**	**89213.0**	**lb/yr**						2000	lb/ton			
Total							**21.1**	**106.2**	**594.8**	**lb/day**										
Finishing Grading					0.0	yd3					0.0	0.0	0.0	0.0	10.0	days				
Mobile Sources																				
Water Truck(s)	3.60	13.98	0.72	lb/day	1.0		36.0	139.8	7.2	lb/yr										
Grader(s)	1.20	9.73	0.53	lb/day	2.0		24.0	194.6	10.6	lb/yr										
Employee Trips	0.21	0.55	0.04	g/mile	35.0	employees	6.5	17.0	1.2	lb/yr				40.0	per employee	0.00220462	lb/gram			
Fugitive Sources																				
Travel on unpaved roads	-	-	0.90	lb/VMT	2.0	trucks	-	-	-	lb/yr										
Travel on paved roads	-	-	0.28	lb/VMT	0.0	trucks			-	lb/yr										
Total							**66.5**	**351.3**	**19.0**	**lb/yr**						2000	lb/ton			
Total							**6.6**	**35.1**	**1.9**	**lb/day**										
Total for 2009																				
Total from PGCC Project							**5**	**22**	**102**	**TPY**	to occur during "2008 phase" 2009 calendar year									
Total from PGCC Project							**37**	**163**	**640**	**Worst-case lb/day**	*assumes some phases will be conducted concurrently									
*These calculations represent worst-case emissions from construction activities associated with the PGCC																				

*PM10 emissions would likely result in or substantially contribute to a violation of the CAAQS (50 ug/m3)

Sacramento County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
Elkhorn Canal	27	118	180	1	6	4
East Levee	116	625	9157	6	36	495
TOTAL	143	744	9337	8	42	499

Sacramento County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
Elkhorn Canal	54	237	265	2	10	5
TOTAL	54.0	236.7	264.7	2.1	10.2	4.6

Sacramento County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
% Reduction	5%	20%	85%	5%	20%	85%
TOTAL	136	595	1401	7	34	75
	-	85	-	25	25	100
	-	Y	Y	N	Y	Y

Sacramento County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
% Reduction	5%	20%	85%	5%	20%	85%
TOTAL	51.3	189.3	39.7	2.0	8.2	0.7
	-	85	-	25	25	100
	-	Y	Y	N	N	N

Sacramento County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
Elkhorn Canal	27	118	180	1	6	4
East Levee	79	417	5437	4	24	294
TOTAL	106	536	5617	6	30	298

Sacramento County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
% Reduction	5%	20%	85%	5%	20%	85%
TOTAL	100	429	843	5	24	45
	-	85	-	25	25	100
	-	Y	Y	N	N	N

Sacramento County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
Elkhorn Canal	27	118	180	1	6	4
East Levee	110	599	8962	6	34	485
TOTAL	137	717	9143	7	40	489

Sacramento County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
% Reduction	5%	20%	85%	5%	20%	85%
TOTAL	130	574	1371	7	32	73
	-	85	-	25	25	100
	-	Y	Y	N	Y	Y

*PM10 emissions would likely result in or substantially contribute to a violation of the CAAQS (50 ug/m3)

Alternative 1

Unmitigated 2009 Emissions

Sutter County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
NCC	68	392	197	8	42	118
East Levee	150	747	6281	8	43	340
PGCC						
TOTAL	218	1139	6478	16	85	458

Sacramento County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
Elkhorn Canal	27	118	180	1	6	4
East Levee	29	142	1196	2	8	65
TOTAL	56	261	1376	3	14	69

Sacramento County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
Elkhorn Canal	54	237	265	2	10	5
TOTAL	54.0	236.7	264.7	2.1	10.2	4.6

Mitigated 2009 Emissions

Sutter County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
% Reduction	5%	20%	75%	5%	20%	75%
TOTAL	207	911	1620	16	68	115
Threshold	25	25	80	25	25	-
Significant?	Y	Y	Y	N	Y	-

Sacramento County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
% Reduction	5%	20%	85%	5%	20%	85%
TOTAL	53	208	206	3	11	10
Threshold	-	85	-	25	25	100
Significant?	-	Y	Y	N	Y	Y

Sacramento County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
% Reduction	5%	20%	85%	5%	20%	85%
TOTAL	51.3	189.3	39.7	2.0	8.2	0.7
Threshold	-	85	-	25	25	100
Significant?	-	Y	Y	N	N	N

Alternative 2

Unmitigated 2009 Emissions

Sutter County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
NCC	68	392	197	8	42	118
East Levee	151	753	6593	8	43	357
PGCC						
TOTAL	218	1145	6791	16	85	475

Sacramento County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
Elkhorn Canal	27	118	180	1	6	4
East Levee	29	144	1256	2	8	68
TOTAL	56	262	1436	3	14	72

Mitigated 2009 Emissions

Sutter County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
% Reduction	5%	20%	75%	5%	20%	75%
TOTAL	208	916	1698	16	68	119
Threshold	25	25	80	25	25	-
Significant?	Y	Y	Y	N	Y	-

Sacramento County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
% Reduction	5%	20%	85%	5%	20%	85%
TOTAL	53	209	215	3	12	11
Threshold	-	85	-	25	25	100
Significant?	-	Y	Y	N	N	N

Alternative 3

Unmitigated 2009 Emissions

Sutter County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
NCC	68	392	197	8	42	118
East Levee	150	746	6284	8	43	340
PGCC						
TOTAL	218	1138	6481	16	85	459

Sacramento County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
Elkhorn Canal	27	118	180	1	6	4
East Levee	29	142	1197	2	8	65
TOTAL	56	261	1377	3	14	69

Mitigated 2009 Emissions

Sutter County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
% Reduction	5%	20%	75%	5%	20%	75%
TOTAL	207	910	1620	16	68	115
Threshold	25	25	80	25	25	-
Significant?	Y	Y	Y	N	Y	-

Sacramento County	Worst-Case lb/day			Tons/year		
	ROG	NOX	PM10	ROG	NOX	PM10
% Reduction	5%	20%	85%	5%	20%	85%
TOTAL	53	208	207	3	11	10
Threshold	-	85	-	25	25	100
Significant?	-	Y	Y	N	Y	Y

TIPS FOR USE:

1. For both residential and non-residential acreage entries EXCLUDE ONLY undisturbed (not graded) Open Space.
2. Append this calculation sheet to the environmental document.
3. Unmitigated NOx (lbs/day) and duration (days) should be consistent with URBEMIS results.

Construction Emissons Mitigation Fee Calculation

PART 1: PROJECT INFORMATION

Project Name:	SAFCA - "2008 Phase" NLIP Emissions within SMAQMD's Jurisdiction		
Control/Application #:			
Single Family Dwelling Units:		*Note: Enter information only in blue bordered cells*	
Multi Family Dwelling Units:		Total Residential Acreage:	
Non-residential Square Feet:		Total Non-residential Acreage:	

PART 2: EMISSIONS INFORMATION

Year	Activity Phase	NOx (lbs/day) unmitigated	NOx (lbs/day) mitigated*	NOx over threshold (lbs/day)	duration (days)	Total significant NOx (lbs)
2009	East Levee/Elkhorn Canal	743.84	595.07	510.07	108	55087.49
	Total project Nox over threshold (lbs)		*55087.49*			
	Total project Nox over threshold (tons)		*27.54*			

PART 3: MITIGATION FEE RESULTS

TOTAL MITIGATION FEE ($14,300/TON)**	***$393,876***
Administrative Fee (5%)	***$19,694***
TOTAL MITIGATION FEE	***$413,569***

>>> *Fee is to be paid to the SMAQMD prior to any ground disturbance either in total or on a by acre basis.*

Mitigation Fee ($/acre)	**#DIV/0!**

* Assumes a construction mitigation plan which achieves a 20% reduction in NOx from on-site, off-road equipment.

** Or the $/ton of NOx cost-effectiveness value in effect at the time the fee is collected.

TIPS FOR USE:

1. For both residential and non-residential acreage entries EXCLUDE ONLY undisturbed (not graded) Open Space.
2. Append this calculation sheet to the environmental document.
3. Unmitigated NOx (lbs/day) and duration (days) should be consistent with URBEMIS results.

Construction Emissons Mitigation Fee Calculation

PART 1: PROJECT INFORMATION

Project Name:	SAFCA - "2008 Phase" NLIP Emissions within SMAQMD's Jurisdiction		
Control/Application #:			
Single Family Dwelling Units:		*Note: Enter information only in blue bordered cells*	
Multi Family Dwelling Units:		Total Residential Acreage:	
Non-residential Square Feet:		Total Non-residential Acreage:	

PART 2: EMISSIONS INFORMATION

Year	Activity Phase	NOx (lbs/day) unmitigated	NOx (lbs/day) mitigated*	NOx over threshold (lbs/day)	duration (days)	Total significant NOx (lbs)
2009	East Levee/Elkhorn Canal	535.74	428.59	343.59	108	37107.88
	Total project Nox over threshold (lbs)		*37107.88*			
	Total project Nox over threshold (tons)		*18.55*			

PART 3: MITIGATION FEE RESULTS

TOTAL MITIGATION FEE ($14,300/TON)**	***$265,321***
Administrative Fee (5%)	***$13,266***
TOTAL MITIGATION FEE	***$278,587***

>>> *Fee is to be paid to the SMAQMD prior to any ground disturbance either in total or on a by acre basis.*

Mitigation Fee ($/acre)	**#DIV/0!**

* Assumes a construction mitigation plan which achieves a 20% reduction in NOx from on-site, off-road equipment.

** Or the $/ton of NOx cost-effectiveness value in effect at the time the fee is collected.

TIPS FOR USE:

1. For both residential and non-residential acreage entries EXCLUDE ONLY undisturbed (not graded) Open Space.
2. Append this calculation sheet to the environmental document.
3. Unmitigated NOx (lbs/day) and duration (days) should be consistent with URBEMIS results.

Construction Emissons Mitigation Fee Calculation

PART 1: PROJECT INFORMATION

Project Name:	SAFCA - "2008 Phase" NLIP Emissions within SMAQMD's Jurisdiction		
Control/Application #:			
Single Family Dwelling Units:		*Note: Enter information only in blue bordered cells*	
Multi Family Dwelling Units:		Total Residential Acreage:	
Non-residential Square Feet:		Total Non-residential Acreage:	

PART 2: EMISSIONS INFORMATION

Year	Activity Phase	NOx (lbs/day) unmitigated	NOx (lbs/day) mitigated*	NOx over threshold (lbs/day)	duration (days)	Total significant NOx (lbs)
2009	East Levee/Elkhorn Canal	717.36	573.89	488.89	108	52799.97
	Total project Nox over threshold (lbs)		*52799.97*			
	Total project Nox over threshold (tons)		*26.40*			

PART 3: MITIGATION FEE RESULTS

TOTAL MITIGATION FEE ($14,300/TON)**	***$377,520***
Administrative Fee (5%)	***$18,876***
TOTAL MITIGATION FEE	***$396,396***

>>> *Fee is to be paid to the SMAQMD prior to any ground disturbance either in total or on a by acre basis.*

Mitigation Fee ($/acre)	**#DIV/0!**

* Assumes a construction mitigation plan which achieves a 20% reduction in NOx from on-site, off-road equipment.

** Or the $/ton of NOx cost-effectiveness value in effect at the time the fee is collected.

Equipment Type	Emission Rates for Year 2008			
	ROG	NOX	PM10	Unit
Employee Light-Duty Trucks	0.21	0.55	0.04	g/mile
Haul Trucks	0.70	8.63	0.27	g/mile
Backhoes	0.67	4.54	0.38	lb/day
Bore/Drill Rigs	2.87	5.75	0.43	lb/day
Concrete/Industrial Saws	1.11	7.51	0.63	lb/day
Cranes	1.44	6.16	0.34	lb/day
Crawler Tractors	1.09	10.22	0.54	lb/day
Crushing/Proc. Equipment	1.59	14.91	0.79	lb/day
Dozer	3.63	21.55	1.12	lb/day
Excavator	1.84	6.47	0.34	lb/day
Forklifts, Rough Terrain	0.78	4.59	0.35	lb/day
Grader	1.20	9.73	0.53	lb/day
Loaders, Rubber Tired	0.92	7.01	0.38	lb/day
Off-Highway Trucks	3.60	13.98	0.72	lb/day
Other Construction Equip.	2.08	9.43	0.52	lb/day
Pavers	0.93	7.08	0.38	lb/day
Paving Equipment	0.78	7.28	0.39	lb/day
Rollers	0.59	4.47	0.24	lb/day
Scrapper	3.64	15.96	0.85	lb/day
Signal Boards	0.65	2.37	0.22	lb/day
Skid Steer Loaders	0.56	2.91	0.17	lb/day
Surfacing Equipment	3.74	22.19	1.15	lb/day
Tractors	0.67	4.54	0.38	lb/day
Trenchers	0.99	5.69	0.41	lb/day
Water Trucks	0.65	7.23	0.24	g/mile
Fugitive Dust			10	lb/acre/day

Assumptions: Emission factors from the Road Construction Emissions Model, Version 5.2 (SMAQMD 2006) for 2008 which assume equipment operates 8hrs/day

Travel on Unpaved Haul Roads (Heavy Duty Trucks):		
E(lbs/VMT)=(k)(s/12)^a (W/3)^b	*AP-42 12/03, 13.2.2-4 eq 1a	
Where:	**PM10**	
k=Particle Size Multiplier:	1.5	*AP-42 12/03 Table 13.2.2-2; PM10 emissions; industrial roads
s=Silt Content:	4.3	*AP-42 12/03 Table 13.2.2-1, service road
empirical constants		
a	0.9	*AP-42 12/03 Table 13.2.2-2; PM10 emissions; industrial roads
b	0.45	*AP-42 12/03 Table 13.2.2-2; PM10 emissions; industrial roads
W=Vehicle Weight:	11.375	((2+1.25 T/cy*15 cy truck capacity) + 2)/2 (average weight of loaded and unloaded haul truck; assumed empty truck weighs 2 tons)
	1.08	lbs/VMT
E(ext)= E[(365-P)/365]	*AP-42 12/03 12.2.2-4 eq 2	
Where:		
P=# days/yr with >=0.01 in. precip	63	*AP-42 12/03 Figure 13.2.2-1 for Sacramento Co/NOAA Technical Memorandum NWS WR-272; CLIMATE OF SACRAMENTO, CALIFORNIA (June 2005)
	0.90	lbs/VMT
Travel on Paved Haul Roads (Heavy Duty Trucks):		
E(lbs/VMT)=(k) (sL/2)^.65 (W/3)^1.5 - C	*AP-42 12/03, 13.2.1-4 eq 1	
Where:	**PM10**	
k=Particle Size Multiplier (lb/VMT)	0.016	*AP-42 12/03 Table 13.2.1-1; PM10 emissions; industrial roads
sL=road surface silt loading (g/m2)	8.2	*AP-42 12/03 Table 13.2.1-4; quarry roads
W=Vehicle Weight:	11.375	((2+1.25 T/cy*15 cy truck capacity) + 2)/2 (average weight of loaded and unloaded haul truck; assumed empty truck weighs 2 tons)
C=exhaust, break, tire wear (lb/VMT)	0.00047	*AP-42 12/03 Table 13.2.1-2; PM10 emissions
	0.30	lbs/VMT
E(ext)= E[1-(P/4N)]	*AP-42 12/03 13.2.1 eq 2	
Where:		
P=# days/yr with >=0.01 in. precip	63	*AP-42 12/03 Figure 13.2.2-1 for Sacramento Co/NOAA Technical Memorandum NWS WR-272; CLIMATE OF SACRAMENTO, CALIFORNIA (June 2005)
N=number of days in averaging period	365	
	0.28	lbs/VMT

Fugitive Dust Source Emissions

	(lb/acre/day)		
Disturbance Area	60.71		
Assumptions: SMAQMD emission factor of 60.71 lbs/acre/day (SMAQMD 1994).			
Aggregate Storage Piles			
Emissions result from several distinct processes within the stockpiling cycle: 1. loading in of materials through batch or drop operations, 2. equipment traffic in storage area, 3. wind erosion of piles, 4. loadout of material through batch or drop operations (AP-42 12/03, chapt. 13.2.4).			
E(lb/ton)=(k)(0.0032)(U/5)^1.3 /(M/2)^1.4	*AP-42 12/03, 13.2.4-3 eq 1		
Where:	**PM10**		
k=Particle Size Multiplier:	0.35	*AP-42 12/03 13.2.4-3; PM10 emissions	
U=mean wind speed (mph)	8	*NOAA Western Regional Climate Center, Sacramento International Airport ASOS station, CA RAWS data from 1996-2006 (http://www.wrcc.dri.edu/htmlfiles/westwind.final.html#CALIFORNIA)	
M=moisture content (%):	2.4	*AP-42 7/98 Table 11.9-3, haul truck	
	0.002	lbs/ton	
Batch Loading at Borrow Area			
E(TSP<15 um)=(.119/(M^0.9))	*AP-42 7/98, Table 11.9-1		
Where:	**PM10**		
M=moisture content (%):	2.4	*AP-42 7/98 Table 11.9-3, haul truck	
	0.05	lb/ton	
*E(TSP<10um)=(E(TSP<15 um)*S)*	*AP-42 7/98, Table 11.9-1		
S=scaling factor	0.75	*AP-42 7/98 Table 11.9-3, haul truck	
	0.04	lb/ton	
Truck Unloading			
E(TSP<15 um)	**PM10**		
Where:	**0.007**	lb/ton	*AP-42 7/98 Table 11.9-4, end dump truck unloading (batch drop)
*E(TSP<10um)=(E(TSP<15 um)*S)*	*AP-42 7/98, Table 11.9-1		
S=scaling factor	0.75	*AP-42 7/98 Table 11.9-1, haul truck	
	0.005	lb/ton	
Bulldozing	**PM10**		
E(TSP<15 um)=(18.6(s)^1.5)/(M^1.4)	*AP-42 7/98, Table 11.9-1		
Where:			
M=moisture content (%):	7.9	*AP-42 7/98 Table 11.9-3, bulldozer	
s=silt content (%)	6.9	*AP-42 7/98 Table 11.9-3, bulldozer	
	18.67	lb/hr	
*E(TSP<10um)=(E(TSP<15 um)*S)*	*AP-42 7/98, Table 11.9-1		
S=scaling factor	0.75	*AP-42 7/98 Table 11.9-1, bulldozer	
	14.00	lb/hr	
Scraper Unloading	**PM10**		
E(TSP<15 um)	**0.04**	lb/ton	*AP-42 7/98 Table 11.9-4, scraper unloading
*E(TSP<10um)=(E(TSP<15 um)*S)*	*AP-42 7/98, Table 11.9-1		
S=scaling factor	0.75	*AP-42 7/98 Table 11.9-1, bulldozer/haul truck	
	0.03	lb/ton	

Conformity: Regionally Significant Thresholds Calculations

2006 Estimated Annual Average Emissions

SACRAMENTO COUNTY

ROG	CO	NOX	PM10	
64.4	**365.95**	**81.78**	**44.43**	ton/day
23506.00	133571.8	29849.70	16216.95	tpy
2350.60	13357.18	2984.97	1621.70	10% of total

SUTTER COUNTY

ROG	CO	NOX	PM10	
10.34	**43.06**	**20.27**	**14.45**	ton/day
3774.10	15716.90	7398.55	5274.25	tpy
377.41	1571.69	739.86	527.43	10% of total

APPENDIX C

Noise Modeling Results

Appendix C
SAFCA Levee Improvement Project
Clearing and Grubbing/Strippng
NLIP

		Resulting Cumulative Noise Level (Leq dBA)	
	Distance to Nearest Receiver in feet	**Mitigated**	**Unmitigated**
	100	63.6	79.3
	200	57.6	73.3
	300	54.0	69.7
	400	51.5	67.2
	500	49.6	65.3
	600	48.0	63.7
	700	46.7	62.4
	800	45.5	61.2
	900	44.5	60.2
	1000	43.6	59.3
	1100	42.8	58.5
	1200	42.0	57.7
	1300	41.3	57.0
	1400	40.7	56.4
	1500	40.1	55.8
	1600	39.5	55.2
	1700	39.0	54.7
	1800	38.5	54.2
Threshold*	900	44.5	60.2

Assumptions:

	Reference Noise Levels (L_{max}) @50 feet		
	Mitigated	Unmitigated	Usage Factor
Scraper	80	88	0.4
Loader	75	79	0.4
Water Truck	75	91	0.4

H_{eff} = 10	
G = 0.57	

Calculations:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
Scraper	68.3	76.3
Loader	63.3	67.3
Water Truck	63.3	79.3

Cumulative:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
	63.6	79.3

Sources:
Reference noise levels were obtained from the National Cooperative Highway Research Program, Syntesis 218, Table 3, Construction Equipment Noise Emission Levels, page 8.
The equation L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50) is found in the NCHRP, Synthesis 218, page 11 "Noise Impact Assessment."
Notes:
* The threshold specific for this Project.
G = the constant that accounts for topography and ground effects.
H_{eff} = the sum of average path heights on either side of a topographical feature. Utilized to determine the **G** factor.

Appendix C
SAFCA Levee Improvement Project
Levee Degrading
NLIP

		Resulting Cumulative Noise Level (Leq dBA)	
	Distance to Nearest Receiver in feet	**Mitigated**	**Unmitigated**
	100	63.8	79.3
	200	57.7	73.3
	300	54.2	69.7
	400	51.7	67.2
	500	49.8	65.3
	600	48.2	63.7
	700	46.9	62.4
	800	45.7	61.2
	900	44.7	60.2
	1000	43.8	59.3
	1100	42.9	58.5
	1200	42.2	57.7
	1300	41.5	57.0
	1400	40.8	56.4
	1500	40.2	55.8
	1600	39.7	55.2
	1700	39.2	54.7
	1800	38.7	54.2
Threshold*	2600	35.5	51.0

Assumptions:	**Reference Noise Levels (L_{max}) @50 feet**		
	Mitigated	Unmitigated	Usage Factor
Scraper	80	88	0.4
Loader	75	79	0.4
Water Truck	75	91	0.4
Dozer	75	80	0.4
			H_{eff} = 10
			G = 0.57

Calculations:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
Scraper	68.3	76.3
Loader	63.3	67.3
Water Truck	63.3	79.3
Dozer	63.3	68.3

Cumulative:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
	63.8	79.3

Sources:
Reference noise levels were obtained from the National Cooperative Highway Research Program, Syntesis 218, Table 3, Constuction Equipment Noise Emission Levels, page 8.
The equation L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50) is found in the NCHRP, Synthesis 218, page 11 "Noise Impact Assessment."
Notes:
* The threshold specific for this Project.
G = the constant that accounts for topography and ground effects.
H_{eff} = the sum of average path heights on either side of a topographical feature. Utilized to determine the **G** factor.

Appendix C
SAFCA Levee Improvement Project
Demolish Canal and Tree Removal
NLIP

		Resulting Cumulative Noise Level (Leq dBA)	
	Distance to Nearest Receiver in feet	**Mitigated**	**Unmitigated**
	100	72.3	79.3
	200	66.3	73.3
	300	62.7	69.7
	400	60.2	67.2
	500	58.3	65.3
	600	56.7	63.7
	700	55.4	62.4
	800	54.2	61.2
	900	53.2	60.2
	1000	52.3	59.3
	1100	51.5	58.5
	1200	50.7	57.7
	1300	50.0	57.0
	1400	49.4	56.4
	1500	48.8	55.8
	1600	48.2	55.2
	1700	47.7	54.7
	1800	47.2	54.2
Threshold*	2300	45.0	52.0

Assumptions:			
	Reference Noise Levels (L_{max}) @50 feet		
	Mitigated	Unmitigated	Usage Factor
Excavator	80	85	0.4
Loader	75	79	0.4
Haul Truck	84	91	0.4
			H_{eff} = 10
			G = 0.57

Calculations:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
Excavator	68.3	73.3
Loader	63.3	67.3
Haul Truck	72.3	79.3

Cumulative:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
	72.3	79.3

Sources:
Reference noise levels were obtained from the National Cooperative Highway Research Program, Syntesis 218, Table 3, Constuction Equipment Noise Emission Levels, page 8.
The equation L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50) is found in the NCHRP, Synthesis 218, page 11 "Noise Impact Assessment."
Notes:
* The threshold specific for this Project.
G = the constant that accounts for topography and ground effects.
H_{eff} = the sum of average path heights on either side of a topographical feature. Utilized to determine the **G** factor.

Appendix C
SAFCA Levee Improvement Project
Cutoff Wall Construction
NLIP

		Resulting Cumulative Noise Level (Leq dBA)	
	Distance to Nearest Receiver in feet	**Mitigated**	**Unmitigated**
	100	72.3	79.3
	200	66.3	73.3
	300	62.7	69.7
	400	60.2	67.2
	500	58.3	65.3
	600	56.7	63.7
	700	55.4	62.4
	800	54.2	61.2
	900	53.2	60.2
	1000	52.3	59.3
	1100	51.5	58.5
	1200	50.7	57.7
	1300	50.0	57.0
	1400	49.4	56.4
	1500	48.8	55.8
	1600	48.2	55.2
	1700	47.7	54.7
	1800	47.2	54.2
Threshold*	2300	45.0	52.0

Assumptions:			
	Reference Noise Levels (L_{max}) @50 feet		
	Mitigated	Unmitigated	Usage Factor
Generator	75	78	1
Loader	75	79	0.4
Haul Truck	84	91	0.4
Slurry Pump	75	76	0.5
Excavators	80	85	0.4
			Heff = 10
			G = 0.57

Calculations:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
Generator	67.3	70.3
Loader	63.3	67.3
Haul Truck	72.3	79.3
Slurry Pump	64.3	65.3
Excavators	68.3	73.3
Cumulative:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
	72.3	79.3

Sources:
Reference noise levels were obtained from the National Cooperative Highway Research Program, Syntesis 218, Table 3, Constuction Equipment Noise Emission Levels, page 8.
The equation L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50) is found in the NCHRP, Synthesis 218, page 11 "Noise Impact Assessment."
Notes:
* The threshold specific for this Project.
G = the constant that accounts for topography and ground effects.
H_{eff} = the sum of average path heights on either side of a topographical feature. Utilized to determine the **G** factor.

Appendix C
SAFCA Levee Improvement Project
Borrow Site Excavation
NLIP

		Resulting Cumulative Noise Level (Leq dBA)	
	Distance to Nearest Receiver in feet	**Mitigated**	**Unmitigated**
	100	72.3	79.3
	200	66.3	73.3
	300	62.7	69.7
	400	60.2	67.2
	500	58.3	65.3
	600	56.7	63.7
	700	55.4	62.4
	800	54.2	61.2
	900	53.2	60.2
	1000	52.3	59.3
	1100	51.5	58.5
	1200	50.7	57.7
	1300	50.0	57.0
	1400	49.4	56.4
	1500	48.8	55.8
	1600	48.2	55.2
	1700	47.7	54.7
	1800	47.2	54.2
Threshold*	2300	45.0	52.0

Assumptions:

	Reference Noise Levels (L_{max}) @50 feet		
	Mitigated	Unmitigated	Usage Factor
Excavators	80	85	0.4
Loader	75	79	0.4
Haul Truck	84	91	0.4

Heff = 10	
G = 0.57	

Calculations:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
Excavators	68.3	73.3
Loader	63.3	67.3
Haul Truck	72.3	79.3

Cumulative:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
	72.3	79.3

Sources:
Reference noise levels were obtained from the National Cooperative Highway Research Program, Syntesis 218, Table 3, Constuction Equipment Noise Emission Levels, page 8.
The equation L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50) is found in the NCHRP, Synthesis 218, page 11 "Noise Impact Assessment."
Notes:
* The threshold specific for this Project.
G = the constant that accounts for topography and ground effects.
$\mathbf{H_{eff}}$ = the sum of average path heights on either side of a topographical feature. Utilized to determine the **G** factor.

Appendix C
SAFCA Levee Improvement Project
Levee Raising
NLIP

	Distance to Nearest Receiver in feet	Resulting Cumulative Noise Level (Leq dBA) Mitigated	Unmitigated
	100	63.8	79.6
	200	57.7	73.6
	300	54.2	70.0
	400	51.7	67.5
	500	49.8	65.6
	600	48.2	64.0
	700	46.9	62.7
	800	45.7	61.5
	900	44.7	60.5
	1000	43.8	59.6
	1100	42.9	58.8
	1200	42.2	58.0
	1300	41.5	57.3
	1400	40.8	56.7
	1500	40.2	56.1
	1600	39.7	55.5
	1700	39.2	55.0
	1800	38.7	54.5
Threshold*	2600	35.5	51.3

Assumptions:

	Reference Noise Levels (L_{max}) @50 feet		
	Mitigated	Unmitigated	Usage Factor
Roller	74	80	0.5
Haul Truck	75	91	0.4
Water Truck	75	91	0.4
Dozer	75	80	0.4

H_{eff} = 10
G = 0.57

Calculations:	L_{eq} dBA @ 100 feet	
	Mitigated	Unmitigated
Roller	63.3	69.3
Haul Truck	63.3	79.3
Water Truck	63.3	79.3
Dozer	63.3	68.3

Cumulative:	L_{eq} dBA @ 100 feet	
	Mitigated	Unmitigated
	63.8	79.6

Sources:
Reference noise levels were obtained from the National Cooperative Highway Research Program, Syntesis 218, Table 3, Constuction Equipment Noise Emission Levels, page 8.
The equation L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50) is found in the NCHRP, Synthesis 218, page 11 "Noise Impact Assessment."
Notes:
* The threshold specific for this Project.
G = the constant that accounts for topography and ground effects.
H_{eff} = the sum of average path heights on either side of a topographical feature. Utilized to determine the **G** factor.

Appendix C
SAFCA Levee Improvement Project
Surface Drainage Outlets
NLIP

		Resulting Cumulative Noise Level (Leq dBA)	
	Distance to Nearest Receiver in feet	**Mitigated**	**Unmitigated**
	100	73.3	79.4
	200	67.3	73.3
	300	63.8	69.8
	400	61.3	67.3
	500	59.3	65.4
	600	57.8	63.8
	700	56.4	62.5
	800	55.3	61.3
	900	54.2	60.3
	1000	53.3	59.4
	1100	52.5	58.5
	1200	51.7	57.8
	1300	51.0	57.1
	1400	50.4	56.4
	1500	49.8	55.8
	1600	49.2	55.3
	1700	48.7	54.8
	1800	48.2	54.3
Threshold*	2600	45.0	51.1

Assumptions:			
	Reference Noise Levels (L_{max}) @50 feet		
	Mitigated	Unmitigated	Usage Factor
Backhoe	75	85	0.4
Paver	80	89	0.5
Haul Truck	84	91	0.4
Compactor	80	85	0.2
Concrete Truck	85	90	0.4
			H_{eff} = 10
			G = 0.57

Calculations:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
Backhoe	63.3	73.3
Paver	69.3	78.3
Haul Truck	72.3	79.3
Compactor	65.3	70.3
Concrete Truck	73.3	78.3
Cumulative:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
	73.3	79.4

Sources:
Reference noise levels were obtained from the National Cooperative Highway Research Program, Syntesis 218, Table 3, Constuction Equipment Noise Emission Levels, page 8.
The equation L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50) is found in the NCHRP, Synthesis 218, page 11 "Noise Impact Assessment."
Notes:
* The threshold specific for this Project.
G = the constant that accounts for topography and ground effects.
H_{eff} = the sum of average path heights on either side of a topographical feature. Utilized to determine the **G** factor.

Appendix C
SAFCA Levee Improvement Project
Construct Relief Wells and Drainage Canals
NLIP

		Resulting Cumulative Noise Level (Leq dBA)	
	Distance to Nearest Receiver in feet	**Mitigated**	**Unmitigated**
	100	73.3	78.3
	200	67.3	72.3
	300	63.7	68.7
	400	61.2	66.2
	500	59.3	64.3
	600	57.7	62.7
	700	56.4	61.4
	800	55.2	60.2
	900	54.2	59.2
	1000	53.3	58.3
	1100	52.5	57.5
	1200	51.7	56.7
	1300	51.0	56.0
	1400	50.4	55.4
	1500	49.8	54.8
	1600	49.2	54.2
	1700	48.7	53.7
	1800	48.2	53.2
Threshold*	2600	45.0	50.0

Assumptions:			
	Reference Noise Levels (L_{max}) @50 feet		
	Mitigated	Unmitigated	Usage Factor
Drill Rig	80	98	0.4
Roller	74	80	0.5
Support Truck	55	65	0.4
Excavator	85	90	0.2
Concrete Truck	85	90	0.4
			Heff = 10
			G = 0.57

Calculations:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
Drill Rig	68.3	86.3
Roller	63.3	69.3
Support Truck	43.3	53.3
Excavator	70.3	75.3
Concrete Truck	73.3	78.3
Cumulative:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
	73.3	78.3

Sources:
Reference noise levels were obtained from the National Cooperative Highway Research Program, Syntesis 218, Table 3, Constuction Equipment Noise Emission Levels, page 8.
The equation L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50) is found in the NCHRP, Synthesis 218, page 11 "Noise Impact Assessment."
Notes:
* The threshold specific for this Project.
G = the constant that accounts for topography and ground effects.
H_{eff} = the sum of average path heights on either side of a topographical feature. Utilized to determine the **G** factor.

Appendix C
SAFCA Levee Improvement Project
Site Restoration and Demobilization
NLIP

		Resulting Cumulative Noise Level (Leq dBA)	
	Distance to Nearest Receiver in feet	**Mitigated**	**Unmitigated**
	100	68.3	79.3
	200	62.3	73.3
	300	58.7	69.7
	400	56.2	67.2
	500	54.3	65.3
	600	52.7	63.7
	700	51.4	62.4
	800	50.2	61.2
	900	49.2	60.2
	1000	48.3	59.3
	1100	47.5	58.5
	1200	46.7	57.7
	1300	46.0	57.0
	1400	45.4	56.4
	1500	44.8	55.8
	1600	44.2	55.2
	1700	43.7	54.7
	1800	43.2	54.2
Threshold*	1050	47.9	58.9

Assumptions:			
	Reference Noise Levels (L_{max}) @50 feet		
	Mitigated	Unmitigated	Usage Factor
Water Truck	75	84	0.4
Haul Truck	75	91	0.4
Hydroseed Truck	80	88	0.4

Heff = 10	
G = 0.57	

Calculations:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
Water Truck	63.3	72.3
Haul Truck	63.3	79.3
Hydroseed Truck	68.3	76.3

Cumulative:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
	68.3	79.3

Sources:
Reference noise levels were obtained from the National Cooperative Highway Research Program, Syntesis 218, Table 3, Constuction Equipment Noise Emission Levels, page 8.
The equation L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50) is found in the NCHRP, Synthesis 218, page 11 "Noise Impact Assessment."
Notes:
* The threshold specific for this Project.
G = the constant that accounts for topography and ground effects.
H_{eff} = the sum of average path heights on either side of a topographical feature. Utilized to determine the **G** factor.

SAFCA Levee Improvement Project
NLIP
Summary of Predicted Action Noise Levels

	Action	Mitigated	Unmitigated	Distance to Noise Contours in feet 50 dBA Contour	45 dBA Contour
1	Clearing and Grubbing/Strippng	63.6	79.3	477.8	849.7
2	Levee Degrading	63.8	79.3	487.6	867.1
3	Demolish Canal and Tree Removal	72.3	79.3	1300.8	2313.2
4	Cutoff Wall Construction	72.3	79.3	1300.8	2313.2
5	Borrow Site Excavation	72.3	79.3	1300.8	2313.2
6	Levee Raising	63.8	79.6	487.6	867.1
7	Surface Drainage Outlets	73.3	79.4	1466.5	2607.8
8	Construct Relief Wells and Drainage Canals	73.3	78.3	1459.6	2595.5
9	Site Restoration and Demobilization	68.3	79.3	820.7	1459.5

Appendix C
SAFCA Canal Improvement Project
Clearing and Grubbing/Strippng
NLIP

		Resulting Cumulative Noise Level (Leq dBA)	
	Distance to Nearest Receiver in feet	**Mitigated**	**Unmitigated**
	100	63.6	79.3
	200	57.6	73.3
	300	54.0	69.7
	400	51.5	67.2
	500	49.6	65.3
	600	48.0	63.7
	700	46.7	62.4
	800	45.5	61.2
	900	44.5	60.2
	1000	43.6	59.3
	1100	42.8	58.5
	1200	42.0	57.7
	1300	41.3	57.0
	1400	40.7	56.4
	1500	40.1	55.8
	1600	39.5	55.2
	1700	39.0	54.7
	1800	38.5	54.2
Threshold*	900	44.5	60.2

Assumptions:

	Reference Noise Levels (L_{max}) @50 feet		
	Mitigated	Unmitigated	Usage Factor
Dozer	75	85	0.4
Loader	75	79	0.4
Water Truck	75	91	0.4

H_{eff} = 10	
G = 0.57	

Calculations:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
Dozer	63.3	73.3
Loader	63.3	67.3
Water Truck	63.3	79.3

Cumulative:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
	63.6	79.3

Sources:
Reference noise levels were obtained from the National Cooperative Highway Research Program, Syntesis 218, Table 3, Constuction Equipment Noise Emission Levels, page 8.
The equation L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50) is found in the NCHRP, Synthesis 218, page 11 "Noise Impact Assessment."
Notes:
* The threshold specific for this Project.
G = the constant that accounts for topography and ground effects.
H_{eff} = the sum of average path heights on either side of a topographical feature. Utilized to determine the **G** factor.

Appendix C
SAFCA Canal Improvement Project
Dewatering
NLIP

		Resulting Cumulative Noise Level (Leq dBA)	
	Distance to Nearest Receiver in feet	**Mitigated**	**Unmitigated**
	100	73.3	79.3
	200	67.3	73.3
	300	63.7	69.7
	400	61.2	67.2
	500	59.3	65.3
	600	57.7	63.7
	700	56.4	62.4
	800	55.2	61.2
	900	54.2	60.2
	1000	53.3	59.3
	1100	52.5	58.5
	1200	51.7	57.7
	1300	51.0	57.0
	1400	50.4	56.4
	1500	49.8	55.8
	1600	49.2	55.2
	1700	48.7	54.7
	1800	48.2	54.2
Threshold*	2600	45.0	51.0

Assumptions:			
	Reference Noise Levels (L_{max}) @50 feet		
	Mitigated	Unmitigated	Usage Factor
Crane	75	83	0.16
Loader	75	79	0.4
Pile Driver	95	101	0.04
Generator	75	78	1
			H_{eff} = 10
			G = 0.57

Calculations:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
Crane	59.3	67.3
Loader	63.3	67.3
Pile Driver	73.3	79.3
Generator	67.3	70.3

Cumulative:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
	73.3	79.3

Sources:
Reference noise levels were obtained from the National Cooperative Highway Research Program, Syntesis 218, Table 3, Constuction Equipment Noise Emission Levels, page 8.
The equation L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50) is found in the NCHRP, Synthesis 218, page 11 "Noise Impact Assessment."
Notes:
* The threshold specific for this Project.
G = the constant that accounts for topography and ground effects.
H_{eff} = the sum of average path heights on either side of a topographical feature. Utilized to determine the **G** factor.

Appendix C
SAFCA Canal Improvement Project
Excavation
NLIP

		Resulting Cumulative Noise Level (Leq dBA)	
	Distance to Nearest Receiver in feet	**Mitigated**	**Unmitigated**
	100	63.3	67.3
	200	57.3	61.3
	300	53.7	57.7
	400	51.2	55.2
	500	49.3	53.3
	600	47.7	51.7
	700	46.4	50.4
	800	45.2	49.2
	900	44.2	48.2
	1000	43.3	47.3
	1100	42.5	46.5
	1200	41.7	45.7
	1300	41.0	45.0
	1400	40.4	44.4
	1500	39.8	43.8
	1600	39.2	43.2
	1700	38.7	42.7
	1800	38.2	42.2
Threshold*	2300	36.0	40.0

Assumptions:

	Reference Noise Levels (L_{max}) @50 feet		
	Mitigated	Unmitigated	Usage Factor
Excavator	80	85	0.4
Loader	75	79	0.4

H_{eff} = 10	
G = 0.57	

Calculations:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
Excavator	68.3	73.3
Loader	63.3	67.3

Cumulative:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
	63.3	67.3

Sources:
Reference noise levels were obtained from the National Cooperative Highway Research Program, Syntesis 218, Table 3, Constuction Equipment Noise Emission Levels, page 8.
The equation L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50) is found in the NCHRP, Synthesis 218, page 11 "Noise Impact Assessment."
Notes:
* The threshold specific for this Project.
G = the constant that accounts for topography and ground effects.
H_{eff} = the sum of average path heights on either side of a topographical feature. Utilized to determine the **G** factor.

Appendix C
SAFCA Canal Improvement Project
Foundation Construction
NLIP

		Resulting Cumulative Noise Level (Leq dBA)	
	Distance to Nearest Receiver in feet	**Mitigated**	**Unmitigated**
	100	73.3	79.3
	200	67.3	73.3
	300	63.7	69.7
	400	61.2	67.2
	500	59.3	65.3
	600	57.7	63.7
	700	56.4	62.4
	800	55.2	61.2
	900	54.2	60.2
	1000	53.3	59.3
	1100	52.5	58.5
	1200	51.7	57.7
	1300	51.0	57.0
	1400	50.4	56.4
	1500	49.8	55.8
	1600	49.2	55.2
	1700	48.7	54.7
	1800	48.2	54.2
Threshold*	2600	45.0	51.0

Assumptions:			
	Reference Noise Levels (L_{max}) @50 feet		
	Mitigated	Unmitigated	Usage Factor
Generator	78	75	1
Loader	75	79	0.4
Pile Driver	95	101	0.04
Crane	75	83	0.16
			H_{eff} = 10
			G = 0.57

Calculations:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
Generator	70.3	67.3
Loader	63.3	67.3
Pile Driver	73.3	79.3
Crane	59.3	67.3

Cumulative:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
	73.3	79.3

Sources:
Reference noise levels were obtained from the National Cooperative Highway Research Program, Syntesis 218, Table 3, Constuction Equipment Noise Emission Levels, page 8.
The equation L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50) is found in the NCHRP, Synthesis 218, page 11 "Noise Impact Assessment."
Notes:
* The threshold specific for this Project.
G = the constant that accounts for topography and ground effects.
H_{eff} = the sum of average path heights on either side of a topographical feature. Utilized to determine the **G** factor.

Appendix C
SAFCA Canal Improvement Project
Concrete Construction
NLIP

	Distance to Nearest Receiver in feet	Resulting Cumulative Noise Level (Leq dBA) Mitigated	Unmitigated
	100	67.3	70.6
	200	61.2	64.6
	300	57.7	61.0
	400	55.2	58.5
	500	53.3	56.6
	600	51.7	55.0
	700	50.4	53.7
	800	49.2	52.5
	900	48.2	51.5
	1000	47.3	50.6
	1100	46.4	49.7
	1200	45.7	49.0
	1300	45.0	48.3
	1400	44.3	47.7
	1500	43.7	47.1
	1600	43.2	46.5
	1700	42.7	46.0
	1800	42.2	45.5
Threshold*	2300	40.0	43.3

Assumptions:

	Reference Noise Levels (L_{max}) @50 feet Mitigated	Unmitigated	Usage Factor
Boom Truck	80	85	0.4
Generator	75	78	1
Concrete Pump	75	82	0.4

Heff = 10
G = 0.57

Calculations:

	L_{eq} dBA @ 100 feet Mitigated	Unmitigated
Boom Truck	68.3	73.3
Generator	67.3	70.3
Concrete Pump	63.3	70.3

Cumulative:

L_{eq} dBA @ 100 feet Mitigated	Unmitigated
67.3	70.6

Sources:
Reference noise levels were obtained from the National Cooperative Highway Research Program, Syntesis 218, Table 3, Constuction Equipment Noise Emission Levels, page 8.
The equation L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50) is found in the NCHRP, Synthesis 218, page 11 "Noise Impact Assessment."
Notes:
* The threshold specific for this Project.
G = the constant that accounts for topography and ground effects.
$\mathbf{H_{eff}}$ = the sum of average path heights on either side of a topographical feature. Utilized to determine the **G** factor.

Appendix C
SAFCA Canal Improvement Project
Pipeline Construction
NLIP

		Resulting Cumulative Noise Level (Leq dBA)	
	Distance to Nearest Receiver in feet	**Mitigated**	**Unmitigated**
	100	65.3	79.3
	200	59.3	73.3
	300	55.7	69.7
	400	53.2	67.2
	500	51.3	65.3
	600	49.7	63.7
	700	48.4	62.4
	800	47.2	61.2
	900	46.2	60.2
	1000	45.3	59.3
	1100	44.5	58.5
	1200	43.7	57.7
	1300	43.0	57.0
	1400	42.4	56.4
	1500	41.8	55.8
	1600	41.2	55.2
	1700	40.7	54.7
	1800	40.2	54.2
Threshold*	2300	38.0	52.0

Assumptions:			
	Reference Noise Levels (L_{max}) @50 feet		
	Mitigated	Unmitigated	Usage Factor
Excavator	75	85	0.4
Welder	73	75	0.4
Water Truck	75	91	0.4
Compactor	80	85	0.2
Crane	75	83	0.16
Loader	75	79	0.4
			Heff = 10
Calculations:	**L_{eq} dBA @ 100 feet**		**G** = 0.57
	Mitigated	Unmitigated	
Excavator	63.3	73.3	
Welder	61.3	63.3	
Water Truck	63.3	79.3	
Compactor	65.3	70.3	
Crane	59.3	67.3	
Loader	63.3	67.3	
Cumulative:	**L_{eq} dBA @ 100 feet**		
	Mitigated	Unmitigated	
	65.3	79.3	

Sources:
Reference noise levels were obtained from the National Cooperative Highway Research Program, Syntesis 218, Table 3, Constuction Equipment Noise Emission Levels, page 8.
The equation L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50) is found in the NCHRP, Synthesis 218, page 11 "Noise Impact Assessment."
Notes:
* The threshold specific for this Project.
G = the constant that accounts for topography and ground effects.
H_{eff} = the sum of average path heights on either side of a topographical feature. Utilized to determine the **G** factor.

Appendix C
SAFCA Canal Improvement Project
Backfill and Finish Grading
NLIP

		Resulting Cumulative Noise Level (Leq dBA)	
	Distance to Nearest Receiver in feet	**Mitigated**	**Unmitigated**
	100	65.3	79.3
	200	59.3	73.3
	300	55.7	69.7
	400	53.2	67.2
	500	51.3	65.3
	600	49.7	63.7
	700	48.4	62.4
	800	47.2	61.2
	900	46.2	60.2
	1000	45.3	59.3
	1100	44.5	58.5
	1200	43.7	57.7
	1300	43.0	57.0
	1400	42.4	56.4
	1500	41.8	55.8
	1600	41.2	55.2
	1700	40.7	54.7
	1800	40.2	54.2
Threshold*	1050	44.9	58.9

Assumptions:			
	Reference Noise Levels (L_{max}) @50 feet		
	Mitigated	Unmitigated	Usage Factor
Loader	75	85	0.4
Dozer	74	80	0.4
Water Truck	75	91	0.4
Compactor	80	85	0.2
Grader	75	85	0.08
			H_{eff} = 10
			G = 0.57

Calculations:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
Loader	63.3	73.3
Dozer	62.3	68.3
Water Truck	63.3	79.3
Compactor	65.3	70.3
Grader	56.3	66.3
Cumulative:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
	65.3	79.3

Sources:
Reference noise levels were obtained from the National Cooperative Highway Research Program, Syntesis 218, Table 3, Constuction Equipment Noise Emission Levels, page 8.
The equation L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50) is found in the NCHRP, Synthesis 218, page 11 "Noise Impact Assessment."
Notes:
* The threshold specific for this Project.
G = the constant that accounts for topography and ground effects.
H_{eff} = the sum of average path heights on either side of a topographical feature. Utilized to determine the **G** factor.

Appendix C
SAFCA Canal Improvement Project
Electrical and Mechanical Equipment Installation
NLIP

		Resulting Cumulative Noise Level (Leq dBA)	
	Distance to Nearest Receiver in feet	**Mitigated**	**Unmitigated**
	100	59.3	67.3
	200	53.3	61.3
	300	49.8	57.8
	400	47.3	55.3
	500	45.3	53.3
	600	43.7	51.7
	700	42.4	50.4
	800	41.2	49.2
	900	40.2	48.2
	1000	39.3	47.3
	1100	38.5	46.5
	1200	37.7	45.7
	1300	37.0	45.0
	1400	36.4	44.4
	1500	35.8	43.8
	1600	35.2	43.2
	1700	34.7	42.7
	1800	34.2	42.2
Threshold*	1050	38.9	46.9

Assumptions:			
	Reference Noise Levels (L_{max}) @50 feet		
	Mitigated	Unmitigated	Usage Factor
Crane	75	83	0.16
			Heff = 10
			G = 0.57

Calculations:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
Crane	59.3	67.3

Cumulative:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
	59.3	67.3

Sources:
Reference noise levels were obtained from the National Cooperative Highway Research Program, Syntesis 218, Table 3, Constuction Equipment Noise Emission Levels, page 8.
The equation L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50) is found in the NCHRP, Synthesis 218, page 11 "Noise Impact Assessment."
Notes:
* The threshold specific for this Project.
G = the constant that accounts for topography and ground effects.
$\mathbf{H_{eff}}$ = the sum of average path heights on either side of a topographical feature. Utilized to determine the **G** factor.

Appendix C
SAFCA Canal Improvement Project
Erosion Control
NLIP

		Resulting Cumulative Noise Level (Leq dBA)	
	Distance to Nearest Receiver in feet	**Mitigated**	**Unmitigated**
	100	63.3	72.3
	200	57.3	66.3
	300	53.7	62.7
	400	51.2	60.2
	500	49.3	58.3
	600	47.7	56.7
	700	46.4	55.4
	800	45.2	54.2
	900	44.2	53.2
	1000	43.3	52.3
	1100	42.5	51.5
	1200	41.7	50.7
	1300	41.0	50.0
	1400	40.4	49.4
	1500	39.8	48.8
	1600	39.2	48.2
	1700	38.7	47.7
	1800	38.2	47.2
Threshold*	2300	36.0	45.0

Assumptions:			
	Reference Noise Levels (L_{max}) @50 feet		
	Mitigated	Unmitigated	Usage Factor
Hydroseed Truck	80	88	0.4
Water Truck	75	84	0.4
			Heff = 10
			G = 0.57

Calculations:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
Hydroseed Truck	68.3	76.3
Water Truck	63.3	72.3

Cumulative:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
	63.3	72.3

Sources:
Reference noise levels were obtained from the National Cooperative Highway Research Program, Syntesis 218, Table 3, Constuction Equipment Noise Emission Levels, page 8.
The equation L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50) is found in the NCHRP, Synthesis 218, page 11 "Noise Impact Assessment."
Notes:
* The threshold specific for this Project.
G = the constant that accounts for topography and ground effects.
H_{eff} = the sum of average path heights on either side of a topographical feature. Utilized to determine the **G** factor.

Appendix C
SAFCA Canal Improvement Project
Demobilization and Clean Up
NLIP

		Resulting Cumulative Noise Level (Leq dBA)	
	Distance to Nearest Receiver in feet	**Mitigated**	**Unmitigated**
	100	63.3	67.3
	200	57.3	61.3
	300	53.7	57.7
	400	51.2	55.2
	500	49.3	53.3
	600	47.7	51.7
	700	46.4	50.4
	800	45.2	49.2
	900	44.2	48.2
	1000	43.3	47.3
	1100	42.5	46.5
	1200	41.7	45.7
	1300	41.0	45.0
	1400	40.4	44.4
	1500	39.8	43.8
	1600	39.2	43.2
	1700	38.7	42.7
	1800	38.2	42.2
Threshold*	2300	36.0	40.0

Assumptions:

	Reference Noise Levels (L_{max}) @50 feet		
	Mitigated	Unmitigated	Usage Factor
Trucks	75	91	0.4
Loader	75	79	0.4

H_{eff} = 10	
G = 0.57	

Calculations:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
Trucks	63.3	79.3
Loader	63.3	67.3

Cumulative:	**L_{eq} dBA @ 100 feet**	
	Mitigated	Unmitigated
	63.3	67.3

Sources:
Reference noise levels were obtained from the National Cooperative Highway Research Program, Syntesis 218, Table 3, Constuction Equipment Noise Emission Levels, page 8.
The equation L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50) is found in the NCHRP, Synthesis 218, page 11 "Noise Impact Assessment."
Notes:
* The threshold specific for this Project.
G = the constant that accounts for topography and ground effects.
H_{eff} = the sum of average path heights on either side of a topographical feature. Utilized to determine the **G** factor.

SAFCA Canal Improvement Project
NLIP
Summary of Predicted Action Noise Levels

				Distance to Noise Contours in feet	
	Action	**Mitigated**	**Unmitigated**	**50 dBA Contour**	**45 dBA Contour**
1	Clearing and Grubbing/Strippng	63.6	79.3	477.8	849.7
2	Dewatering	73.3	79.3	1459.5	2595.4
3	Excavation	63.3	67.3	461.5	820.7
4	Foundation Construction	73.3	79.3	1459.5	2595.4
5	Concrete Construction	67.3	70.6	729.8	1297.7
6	Pipeline Construction	65.3	79.3	580.9	1033.1
7	Backfill and Finish Grading	65.3	79.3	580.7	1032.6
8	Electrical and Mechanical Equipment Installation	59.3	67.3	291.9	519.1
9	Erosion Control	63.3	72.3	461.5	820.7
10	Demobilization and Clean Up	63.3	67.3	461.5	820.7

Appendix C

Traffic Noise Prediction Model, (FWHA RD-77-108)

Model Input Sheet

Project Name : SAFCA
Project Number :
Modeling Condition : 2008 construction volumes
Ground Type : Soft
Metric (L_{eq}, L_{dn}, CNEL) : Leq

K Factor : 10
Traffic Desc. (Peak or ADT) : Peak

Segment	Construction Site	Segment	Traffic Vol.	Speed (Mph)	Distance to CL	% Autos	%MT	% HT	Day %	Eve %	Night %	Offset (dB)
1	Natomas Cross Canal	South Levee	50	35	50	0		100	100		0	
2	Sacramento River	East Levee	120	35	50	0		100	100		0	
3	Sacramento River	East Levee - Alt.	145	35	50	0		100	100		0	

Appendix C

Traffic Noise Prediction Model, (FWHA RD-77-108)

Predicted Noise Levels

Project Name : SAFCA
Project Number :
Modeling Condition : 2008 construction volumes
Metric (Leq, Ldn, CNEL) : Leq

		Segment	Noise Levels, dB Leq				Distance to Traffic Noise Contours, Feet				
Segment	Construction Site		Auto	MT	HT	Total	70 dB	65 dB	60 dB	55 dB	50 dB
1	Natomas Cross Canal	South Levee	0.0	0.0	65.0	65.0	23	50	107	230	496
2	Sacramento River	East Levee	0.0	0.0	68.8	68.8	41	89	192	413	890
3	Sacramento River	East Levee - Alt.	0.0	0.0	69.6	69.6	47	101	217	468	1009

APPENDIX D

Cultural Resources Programmatic Agreement

PROGRAMMATIC AGREEMENT
AMONG THE U.S. ARMY CORPS OF ENGINEERS,
THE SACRAMENTO AREA FLOOD CONTROL AGENCY, AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER

REGARDING THE ISSUANCE OF PERMISSION UNDER THE AUTHORITY OF SECTION 408 OF THE RIVERS AND HARBORS ACT OF 1899 AND SECTION 404 OF THE CLEAN WATER ACT FOR THE NATOMAS LEVEE IMPROVEMENT PROGRAM, LANDSIDE IMPROVEMENTS PROJECT

WHEREAS, the U.S. Army Corps of Engineers, Sacramento District (Corps) proposes to review an application that seeks permission for alteration of flood control structures under the authority of Section 408 of the Rivers and Harbors Act and to issue one or more permits to discharge fill to the waters of the United States under the authority of Section 404 of the Clean Water Act to the Sacramento Area Flood Control Agency (SAFCA) for the Natomas Levee Improvement Program Landside Improvements Project (Project); and

WHEREAS, The Corps has determined that the issuance of these permissions and permits constitute an undertaking per 36 CFR 800.16(y), which require compliance with Section 106 of the National Historic Preservation Act (NHPA) of 1966 as amended (16 U.S.C. 470f); and

WHEREAS, the Project includes improvements to an extensive levee system surrounding the Natomas Basin and landscape and irrigation/drainage infrastructure modifications that will be implemented in three construction phases, currently scheduled for 2008, 2009, and 2010; and

WHEREAS, the Corps has determined that this undertaking will have an adverse effect on at least one Historic Property that has been determined eligible for inclusion in the National Register of Historic Places (NRHP), CA-SAC-485/H; and

WHEREAS, because of the complex and phased nature of the improvements, the Corps has not yet determined the exact area of potential effects (APE), nor has SAFCA acquired all of the rights-of-entry, easements and ownership interests that would allow a complete inventory and determination of effects on Historic Properties; and

WHEREAS, the Natomas Basin is sensitive for buried archaeological resources that cannot be accurately located prior to construction; and such buried sites may also be Historic Properties, and therefore SAFCA and the Corps need to document a framework for managing post-review discoveries per 36 CFR Section 800.13, including evaluation of those resources, assessment of effects, and resolution of potential adverse effects; and

WHEREAS, at such time as any unevaluated cultural resource may be discovered, it may require archaeological data recovery and/or other historic preservation activities, in compliance with Section 106 of the National Historic Preservation Act, concurrent with *active* construction; and

WHEREAS, the urgency of flood control improvements require a management framework for Historic Properties that will be implemented after the execution of this agreement in an expedited manner that thus departs from the process normally used under 36 CFR Section 800 et seq., yet still fulfills the requirements of Section 106 of the NHPA; and

WHEREAS, SAFCA has been invited to participate as a signatory to this Programmatic Agreement (PA) by the Corps and the California State Historic Preservation Officer (SHPO; and

WHEREAS, the Corps has consulted The Ione Band of Miwok Indians, the Shingle Springs Band of Miwok Indians and the United Auburn Indian Community, and they have been invited to concur in this PA; and

WHEREAS, the Corps shall make the terms and conditions of this PA as part of the conditions of any permissions and permits issued by the Corps for this project; and

WHEREAS, The Central Valley Flood Protection Board has delegated all authority for SAFCA to comply with the terms of this agreement on its behalf; and

WHEREAS, the Corps has consulted with the SHPO and the Council in accordance with regulations implementing Section 106 of the NHPA;

WHEREAS, the Council has been consulted and declined to participate in this agreement;

NOW, THEREFORE, the Corps, the SHPO, and SAFCA agree that the Project shall be implemented in accordance with the following stipulations in order to take into account the effects of the undertaking on Historic Properties.

The Corps shall ensure that the following stipulations of this PA are carried out.

STIPULATIONS

I. DEFINITIONS

The terms used in this Programmatic Agreement shall be as defined in regulations implementing Section 106 of the NHPA, and as follows:

"APE (Area of Potential Effect)" means any location at which any Project development activity will be constructed; and locations of any Project-related construction staging areas, borrow areas, and materials stockpile areas; and the locations of any other Project development activities. The APE shall be defined so as to include the maximum spatial dimensions of all Project-related construction and operations rights-of-way, easements, areas which potentially may be affected by Project activities, and other properties to which SAFCA has access, whether on a temporary or permanent basis, or ownership for Project development.

"**Concurring parties**" means their concurrence indicates that they are in agreement with the terms of the PA.

"Consulting parties" means the Corps, the SHPO, and SAFCA who are signatories to this PA. Only signatories have the authority to amend or terminate this PA.

"**Cultural resources**" means any property or location that was created, modified, or used by people at least 50 years in the past. Cultural resources include but are not limited to Historic Properties and traditional cultural properties/places (i.e., NRHP listed or eligible properties as defined at 36 CFR Part 60).

"Historic Property" means a cultural resource that has been determined eligible for or is listed on the NRHP (i.e., NRHP listed or eligible properties as defined at 36 CFR Part 60), either by formal nomination and listing or by concurrence between federal agencies and the SHPO.

"Historic preservation" means any activity conducted in accordance with the NHPA and its implementing regulations to, among other things, inventory, evaluate, manage, or treat cultural resources such as buildings, structures, sites, districts, and objects eligible for, or that may be determined eligible for, listing in the NRHP according to eligibility criteria at 36 CFR Part 60.

"Project development activities" means any physical action related to the Project that has the potential to damage or otherwise alter those characteristics of Historic Properties that would make them eligible for listing in the NRHP.

II. STANDARDS

(A.) **Professional Qualifications.** All technical work required for historic preservation activities implemented pursuant to this Programmatic Agreement shall be carried out by or under the direct supervision of a person or persons meeting at a minimum the *Secretary of Interior's Professional Qualifications Standards* for archaeology or history, as appropriate (48 FR 44739). "Technical work" here means all efforts to inventory, evaluate, and perform subsequent treatment such as data recovery excavation or recordation that is required under this Programmatic Agreement. This stipulation shall not be construed to limit peer review, guidance, or editing of documents by SAFCA or SAFCA's consultants.

(B.) **Historic Preservation Standards.** Historic preservation activities carried out pursuant to this Programmatic Agreement shall meet the *Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation* (48 FR 44716-44740) as well as standards and guidelines for historic preservation activities established by the SHPO. The Corps shall ensure that all reports prepared pursuant to this Programmatic Agreement will be provided to the consulting parties and shall ensure that all such reports meet published standards of the California Office of Historic Preservation, specifically, *Preservation Planning Bulletin* Number 4(a), "Archaeological Resources Management Reports (ARMR): Recommended Contents and Format" (December 1989).

III. PROJECT DESCRIPTION

(A) **PROJECT Description.** A description of the Project is found in the Final Environmental Impact Report (November 2007). A summary of the Project's description in the environmental impact report is provided as **Attachment A** and is made a part of this Programmatic Agreement.

(B) **Existing Conditions.** An archival search and archaeological survey have been completed for all areas of the APE as currently defined to which SAFCA currently has access, and which currently are not covered by paving, built environment features, or agricultural crops. A report of the results of archival research and archaeological survey, "Cultural Resources Inventory Reports, Part 1 – Natomas Levee Improvement Program Landside Improvements Project, Sacramento and Sutter Counties, California" (October 2007) is made **Attachment B** to this Programmatic Agreement.

A number of prehistoric sites are known to be present along the banks of the Sacramento River. However,

archaeological survey of the area is of limited value because the alluvial depositional environment may obscure and bury sites, leaving no surface manifestation of those archaeological resources. For most of the length of the Project, levees have been built on the riverbanks. These levees are one focus of the Project's activity, and occupy a substantial portion of the Project's APE. Furthermore, it has not been established whether certain known sites in proximity to the Project's development activities extend under the existing levees. The existing levees both obscure ground surfaces and prevent subsurface archaeological testing within their footprints. Because of these conditions, a full assessment of archaeological sites that may be present in the APE cannot be made in advance of construction. There is no definitive information, even for sites known to be in Project's proximity, of site boundaries relative to the APE, or of the significance or integrity of any portions of such sites that may be within the APE. For these reasons, even though archaeological deposits may extend into the APE, and even though some of these deposits may qualify as Historic Properties, it is impossible to develop meaningful site-specific Historic Properties Treatment Plans (HPTP) prior to all construction, or to carry out all necessary data recovery in advance of the Corps' approvals, permitting and construction.

For these reasons, unforeseen discoveries shall be treated pursuant to the provisions of 36 CFR 800.13 (Post-review discoveries).

(C) Project Phasing and Potential Changes to the APE: Because the improvements will occur in three phases (anticipated to be 2008, 2009, and 2010), it will be necessary to define the APE for each phase. The APE for each phase shall be submitted with the cultural resources inventory reports, and shall be consulted upon as part of that document, pursuant to **Stipulation IV**, below.

After the initial concurrence, changes to the APE may be necessary as SAFCA refines its phased Project plans. In particular, the ability of SAFCA to obtain access permissions of private landowners, determination of borrow sites and ongoing negotiations with resource agencies regarding species mitigation requirements may affect final Project's design, and may expand the current APE in some areas. Any changes to the APE shall be made in accordance with subsections D and E (below) of this Stipulation III. The SHPO, Corps, and SAFCA shall consult and reach concurrence in any changes to the APE. The final APE shall account for all Project development activities for the as-built Project. SAFCA shall notify the Corps of any change in the APE and the Corps shall determine the potential for Project development activities in a revised APE to affect cultural resources, through cultural resources inventory and testing as needed.

(1) If there is the potential that cultural resources exist in the revised APE, SAFCA shall submit to the Corps:
   (a) a map of the revised APE; and
   (b) a description of Project development activities to take place in the revised APE; and
   (c) a description of the inventory, nature, location, and known or potential significance of cultural resources in the revised APE; and
   (d) a description of any archaeologically sensitive areas in the revised APE that require monitoring by an archaeologist, and Native American monitor as appropriate; and
   (e) a plan for managing cultural resources in a manner that either avoids Project-related effects to cultural resources, or which mitigates any adverse effects, and which provides for the management of unforeseen cultural resources discoveries.

(2) If no cultural resources are identified within a revised APE, SAFCA shall document such a determination, provide documentation to the Corps and keep such documentation on file at its principal offices.

After the Corps and SAFCA agree to a revised APE and if such a change has the potential to have an effect on cultural resources, the Corps shall submit the documentation to the SHPO for their review. The SHPO shall have 30 calendar days from the date of receipt of the notice of a revision to the APE to review and to provide in writing either concurrence with or objection to the definition of the revised APE, and any proposed historic preservation activities. Should the SHPO not respond in writing within 30 calendar days, the Corps and SAFCA shall proceed as though the SHPO has concurred in the revised APE, and the proposed historic preservation activities, if any.

Should the SHPO object to the definition of the revised APE or proposed historic preservation activities, the Corps, SAFCA, and the SHPO shall consult for a period not to exceed 15 calendar days following the date of the receipt of the SHPO's written objection in an effort to come to agreement on the issues to which the SHPO has objected. Should the SHPO, the Corps, and SAFCA be unable to agree on the issues to which the SHPO has objected, the consulting parties to this Programmatic Agreement shall proceed in accordance with **Stipulation VIII (Resolving Objections)**, below.

(D) **Scope of Identification Efforts in the APE:** Inventories of Historic Properties within the established or revised APE shall be completed in accordance with **Stipulation IV (Inventory of Historic Properties)** of this Programmatic Agreement. Treatment of any adverse effects to Historic Properties within the established or revised APE shall be completed in accordance with **Stipulation V (Treatment of Effects)** of this Programmatic Agreement.

(E) **Scope of the APE:** For purposes of this Programmatic Agreement, a revised APE shall be defined to meet, at a minimum, the following criteria:

(1) The APE for any segment of the Natomas levees that are being improved as part of the Project and shall include the levee segment and a corridor extending not less than 75 feet from the land side toe of the levee segment. The APE also shall include:

- The extent of all Project construction and excavation activity required to construct flood control facilities and to modify irrigation and drainage infrastructure,
- The additional right-of-way/easements obtained by SAFCA as part of the Project's features,
- All areas used for excavation of borrow material and habitat creation, and
- All construction staging areas.

(2) The APE for Project activities shall include the direct footprint of the activity and a reasonable buffer determined by consultation between SAFCA and the Corps, according to the nature of the activity, SAFCA's ownership interest, or easement, and the probability that ground-disturbing work may extend beyond the footprint of planned improvements and activities.

(3) The APE for any other type of Project development activities shall be defined by the Corps in consultation with the consulting parties.

IV. INVENTORY OF HISTORIC PROPERTIES

(A) **Identification Efforts to Date and Further Work Required:** An inventory of Historic Properties within the APE has been initiated consistent with the *Secretary of Interior's Standards and Guidelines for Archeology and Historic Preservation* (48 FR 44716–44740). The SAFCA shall submit a completed inventory and evaluation for each phase of Project work (2008, 2009, 2010) to the Corps. Such inventory shall be deemed complete by the Corps when the SHPO concurs in the NRHP eligibility recommendation for all cultural resources within the APE for that phase.

(B) **Areas of Archaeological Sensitivity:** Areas of archaeological sensitivity will be monitored in accordance with HPTPs.

(C) **Changes in the APE:** If areas are added to the Project development activities subsequent to the SHPO concurrence on the map of the APE for a specific phase, SAFCA shall complete an inventory of Historic Properties within the expanded APE. Such inventory shall be undertaken and completed consistent with the *Secretary of Interior's Standards and Guidelines for Archeology and Historic Preservation* (48 FR 44716–44740). Such inventory shall be deemed completed by the Corps at such time as the SHPO concurs in the NRHP eligibility of all cultural resources within the established and revised APE for the Project, pursuant to this Stipulation IV.

V. TREATMENT OF EFFECTS

(A) **Historic Property Treatment Plans:** If Historic Properties are identified in cultural resources inventories that would be adversely affected by the Project, SAFCA shall prepare a Historic Properties Treatment Plan (HPTP) for review and written approval by the Corps and the SHPO for those specific properties. An HPTP applicable to every Historic Property that may sustain adverse effects by the Project shall be prepared, including for those Historic Properties found during construction. An HPTP may address individual or multiple Historic Properties. An HPTP shall stipulate those actions SAFCA shall take to resolve the adverse effects of the Project on Historic Properties. SAFCA shall ensure that all provisions of an HPTP are carried out in a timely manner. Any changes to an HPTP shall be reviewed and approved by the Corps. Copies of all reports pertaining to the treatment of Historic Properties shall be submitted to the consulting parties to this Programmatic Agreement. Reports and other data pertaining to the inventory of, and treatment of effects on, Historic Properties may be distributed to concurring parties to this Programmatic Agreement and to other members of the public consistent with **Stipulation VII (Confidentiality)** of this Programmatic Agreement. Individual HPTPs may be submitted simultaneously with the cultural resources inventory report for specific Project phases. If HPTPs are submitted simultaneously with an inventory report for a Project phase or with an addendum to such report for an expanded APE or Project description, the Corps and SHPO review period for such HPTP shall run concurrently with the review period for the inventory report.

Review Schedule: The SHPO and the Corps shall have 30 calendar days to review and comment upon in writing any HPTP submitted by SAFCA. The SHPO and the Corps shall indicate in their review that they find the HPTP either acceptable or not. In the event that comments are not made by the SHPO within 30 calendar days, the Corps shall assume the SHPO has accepted the HPTP as submitted. In the event the Corps and/or the SHPO provide written comment within the 30-day period, either SAFCA shall accept the comments and revise the HPTP accordingly, or SAFCA and the Corps may object to some or all comments. Comments from the Corps or the SHPO that are not acceptable to SAFCA shall be resolved by consultation among the Corps, the SHPO, and SAFCA for a period of not more than 15 calendar days. Should the Corps, the SHPO, and SAFCA be unable

to resolve any dispute regarding the Corps or the SHPO comments, the consulting parties shall proceed in accordance with **Stipulation VIII (Resolving Objections)** of this Programmatic Agreement.

The Corps shall submit to the SHPO for review and comment any amendment, addendum, revision or other change to an HPTP. SAFCA shall proceed to make changes to an HPTP as per the procedure and schedule for the review and approval of an original HPTP. If a Historic Property is discovered within an expanded APE subsequent to an initial inventory effort for a phase, and the Corps and SAFCA agree that the Project may adversely affect the property, SAFCA shall submit an addendum to the HPTP or a new HPTP. The review schedule for this submittal follows the provisions of Stipulation V.

(B) **Commencement of Construction and Project Work:** Project development activities may commence within the APE after a Historic Properties inventory has been completed (per **Stipulations III and IV**, above), and prior to treatment of adverse effects on Historic Properties within the APE provided that:

(1) A plan to respond to inadvertent archaeological discoveries is prepared by SAFCA and approved by the Corps prior to the commencement of Project activities anywhere in the APE for that phase of the Project; and

(2) Project development activities do not encroach within 30 meters (100 ft) of the known boundaries of any Historic Property as determined from archaeological site record forms, other documentation, or as otherwise defined in consultation with the SHPO; and

(3) An archaeological monitor is present during any Project activities that are anticipated to extend either vertically or horizontally into any areas designated to be archaeologically sensitive by SAFCA in consultation with the Corps.

(C) **Final Report Documenting Implementation of the Historic Properties Treatment Plan(s):** Within one year after the completion of all work performed as part of the Project SAFCA shall submit to the Corps and SHPO a final report documenting the results of all work prepared under the HPTPs. This report shall be submitted to the Corps and SHPO for review and comments, which SAFCA shall incorporate.

VI. NATIVE AMERICAN AND OTHER PUBLIC CONSULTATION AND PUBLIC NOTICE

Members of the interested public shall be invited to consult regarding this Programmatic Agreement. Within 30 calendar days of the signing date of this Programmatic Agreement, the Corps, the SHPO, and SAFCA shall consult to compile a list of members of the interested public who shall be provided notice of this Programmatic Agreement. The opinions of local Native Americans with cultural ties to the APE and the opinions of other members of the public shall be taken into account by the consulting parties for historic preservation actions taken in accordance with this Programmatic Agreement. Native Americans and other members of the public may be invited to concur in this Programmatic Agreement. Native American monitor(s) shall be invited to assist SAFCA in the treatment of any Native American human remains and items associated with Native American burials discovered during the Project in accordance with California Public Resources Code Section 5097.98 and California Health and Safety Code Section 7050.5(b) and 7050.5(c).

VII. CONFIDENTIALITY

Confidentiality regarding the nature and location of the archaeological sites and any other cultural resources discussed in this Programmatic Agreement shall be maintained on a "need-to know" basis limited to appropriate personnel and agents of SAFCA, the Corps, and the SHPO involved in planning, reviewing and implementing this Programmatic Agreement consistent with Section 304 of the NHPA.

VIII. RESOLVING OBJECTIONS

(A.) Should any party to this Programmatic Agreement object to any action proposed or carried out pursuant to this Programmatic Agreement, the Corps shall consult with the objecting party(ies) for a period of time not to exceed *30 calendar days* to resolve the objection. If the Corps determines that the objection cannot be resolved, the Corps shall forward all documentation relevant to the dispute to the Council. Within 30 calendar days after receipt of all pertinent documentation, the Council shall either:

(1) Provide the Corps with recommendations, which the Corps shall take into account in reaching a final decision regarding the objection; or

(2) Notify the Corps that the Council will comment in accordance with the requirements of Section 106 of the NHPA, and proceed to comment. Any Council comment provided in response shall be taken into account by the Corps, pursuant to the requirements of Section 106 of the NHPA.

(3 Should the Council not exercise one of the above options within 30 days after receipt of all pertinent documentation, the Corps may assume the Council's concurrence in its proposed response to the objection.

(4) The Corps shall take into account any Council recommendation or comment provided in accordance with this stipulation with reference only to the subject of the objection; the Corps' responsibility to carry out all actions under this Programmatic Agreement that are not the subjects of the objection shall remain unchanged.

(B.) At any time during implementation of the measures stipulated in this Programmatic Agreement should an objection pertaining to the Programmatic Agreement be raised by a member of the public, the Corps or SAFCA shall notify the consulting parties to the Programmatic Agreement and take the objection into account, consulting with the objector and, should the objector so request, with any of the consulting parties to this Programmatic Agreement to address the objection.

IX. AMENDMENTS

Any consulting party to this Programmatic Agreement may propose that the Programmatic Agreement be amended, whereupon the Corps shall consult with the other consulting parties to this Programmatic Agreement to consider such amendment. Any amendment shall be executed by the consulting parties in the same manner as the original Programmatic Agreement.

If the Project has not been completed within five years of the date of the execution of this Programmatic Agreement, the consulting parties shall consult on a date not less than 90 days prior to the fifth anniversary of this Programmatic Agreement to either amend this Programmatic Agreement and acknowledge its continued applicability for the undertaking for a designated period of time, or terminate

this Programmatic Agreement and proceed to again consult regarding the undertaking in accordance with regulations implementing Section 106 of the NHPA.

All attachments to this Programmatic Agreement, and other instruments prepared pursuant to this agreement such as, but not limited to, the Project's description, initial cultural resource inventory report and maps of the APE, HPTPs, and monitoring and discovery plans may be amended without requiring amendment of this Programmatic Agreement. Such amendments will be consulted on by the concurring parties and shall be final when agreement is reached by the parties.

X. FAILURE TO CARRY OUT THE TERMS OF THE AGREEMENT

Should the Corps fail to ensure that the terms of this Programmatic Agreement are carried out, the Corps shall notify the parties to this Programmatic Agreement and again consult with the SHPO and the Council in accordance with regulations implementing Section 106 of the NHPA. The Corps shall not take any action or make any irreversible decision that would affect an Historic Property, preclude historic preservation alternatives, or foreclose any opportunities for the Council to comment on the undertaking prior to completion of the process for considering and resolving effects on Historic Properties provided in this document.

XI. SCOPE OF THE PROGRAMMATIC AGREEMENT

Execution of this Programmatic Agreement by the Corps, the SHPO, and SAFCA, and implementation of its terms, evidence that Corps has afforded the Council an opportunity to comment on the undertaking for SAFCA Natomas Levee Improvement Program Landside Improvements Project, pursuant to 16 U.S.C. 470f, and that the Corps has taken into account the effects of the undertaking on Historic Properties. This Programmatic Agreement is limited in scope to the undertaking defined herein and is entered into solely for that purpose.

CONSULTING PARTIES:

U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT

By: _____ Date: _____
Title: COL Thomas Chapman, District Engineer, Sacramento District, U.S. Army Corps of Engineers

SACRAMENTO AREA FLOOD CONTROL AGENCY

By: _____ Date: _____
Title: Stein M. Buer, Executive Director, Sacramento Area Flood Control Agency

CALIFORNIA STATE HISTORIC PRESERVATION OFFICER

By: _____ Date: _____
Title: Milford Wayne Donaldson, F.A.I.A., California State Historic Preservation Officer

CONCUR:

CENTRAL VALLEY FLOOD PROTECTION BOARD

By: _____ Date: _____
Title: Benjamin Carter, President, Central Valley Flood Protection Board

By: _____ Date: _____
Title: _____

Attachment A: Project Description Summary
Attachment B: "Cultural Resources Inventory Reports, Part 1 – Natomas Levee Improvement Program Landside Improvements Project, Sacramento and Sutter Counties, California" (report).

ATTACHMENT A

Project Description Summary

ATTACHMENT B

Cultural Resources Inventory Reports, Part 1
Natomas Levee Improvement Program Landside Improvements Project
Sacramento and Sutter Counties, California