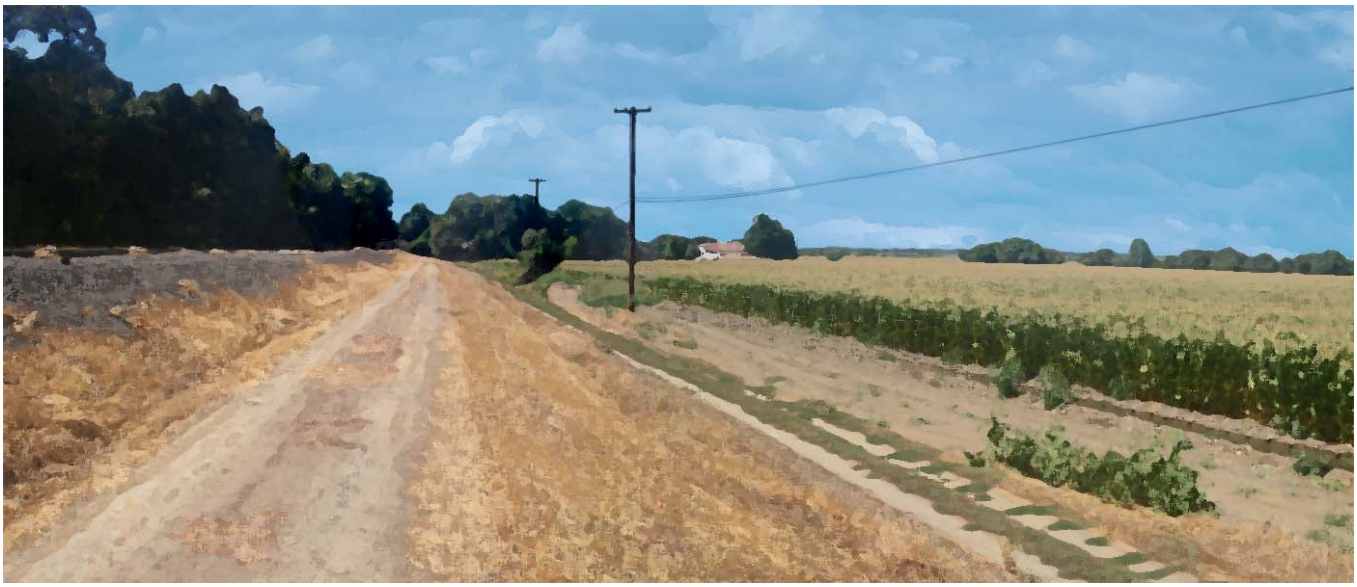
Draft Environmental Impact Report on the

Natomas Levee Improvement Program
Landside Improvements Project



State Clearinghouse # 2007062016

Prepared for:

SAFCA
Sacramento Area Flood Control Agency

September 2007

EDAW | AECOM

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Natomas Levee Improvement Program Landside Improvements Project

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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
ACHP	Advisory Council on Historic Preservation
ADT	average daily traffic
Airport	Sacramento International Airport
ALUC	airport land use commission
AQAP	air quality attainment plan
AQMD	air quality management district
ARB	California Air Resources Board
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
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
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
CRHR	California Register of Historical Resources
CTR	California Toxics Rule
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
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
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
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
GGS	giant garter snake
GGS/Drainage Canal	canal designed to provide drainage and associated giant garter snake habitat
GHG	greenhouse gas

HAP	hazardous air pollutant
hp	horsepower
HRA	health risk assessment
H:V	horizontal-to-vertical
I-	interstate highway
in/sec	inches per second
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
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
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)
MVA	megavolt ampere(s)
N	nitrogen
NA	not available
NAAQS	national ambient air quality standards
NAHC	Native American Heritage Commission
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
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)
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
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
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
SCAS	Sacramento County Airport System
SCB	soil-cement-bentonite
SEIS	supplemental environmental impact statement
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
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
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
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
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

EXECUTIVE SUMMARY

INTRODUCTION

This draft environmental impact report (DEIR) has been prepared to evaluate the significant environmental effects of the Sacramento Area Flood Control Agency's (SAFCA's) proposed Natomas Levee Improvement Program (NLIP) Landside Improvements Project. The proposed project consists of the landside components of the NLIP that are proposed for construction in 2008 through 2010, which consist of improvements to the levee system in the Natomas Basin and related landscape modifications and drainage and infrastructure improvements. The DEIR presents a project-level analysis of the 2008 construction components and a program-level analysis of the 2009–2010 elements.

This DEIR is tiered from the analysis in SAFCA's *Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area* (Local Funding EIR) (February 2007). Consistent with State CEQA Guidelines Section 15152, this second-tier EIR incorporates by reference general discussions from the Local Funding EIR as appropriate, and focuses on the significant effects on the environment that were not adequately addressed in that EIR.

This DEIR has been prepared on behalf of SAFCA in accordance with the requirements of the California Environmental Quality Act (CEQA). The DEIR provides the public and responsible and trustee agencies with information about the proposed project and its potentially significant direct, indirect, and cumulative environmental effects.

SUMMARY DESCRIPTION OF THE PROPOSED PROJECT

As stated in the Local Funding EIR, the overall project objectives of SAFCA's flood control improvement program, including the NLIP, are to:

(1) complete the projects necessary to provide 100-year flood protection for developed areas in the major floodplains of the Sacramento metropolitan area (Sacramento) as quickly as possible,

(2) provide urban-standard ("200-year") flood protection for developed areas in Sacramento's major floodplains over time, and

(3) ensure that new development in the undeveloped areas of Sacramento's major floodplains does not substantially increase the expected damage of an uncontrolled flood.

The specific objectives of the proposed project analyzed in this EIR are to:

(1) 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,

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

(3) use flood control projects to enhance habitat values by increasing 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.

To meet these project objectives, SAFCA proposes the following project activities:

- 2008 construction
  - Along the 5.3-mile Natomas Cross Canal (NCC) south levee, raise the levee to provide additional freeboard; realign the levee to provide a more stable waterside slope and to reduce the need for removal of waterside vegetation, and construct a seepage cutoff wall in the eastern 4.3 miles (approximately) of the levee to reduce the risk of levee failure due to seepage and stability concerns.
  - Along the Sacramento River east levee, construct a raised adjacent setback levee from the NCC to 1,700 feet south of the North Drainage Canal with seepage berms where required to reduce seepage potential, and install woodland plantings.
  - Construct a new canal designed to provide drainage and associated giant garter snake habitat (referred to in this EIR as the "GGS/Drainage Canal"), relocate the Elkhorn Canal between the North Drainage Canal and the Elkhorn Reservoir settling basin ("Elkhorn Reservoir"), and remove a deep culvert from under the levee near the Pumping Plant No. 2 site.
  - Recontour the land and create marsh and upland habitat at borrow locations.
- 2009 and 2010 construction
  - Along the Sacramento River east levee south of the limits of the 2008 improvements, construct an adjacent setback levee (raised where needed to provide adequate freeboard) with seepage berms, relief wells, and cutoff walls as required, and install woodland plantings.
  - Raise and construct seepage berms along the Pleasant Grove Creek Canal (PGCC) west levee.
  - Construct a new GGS/Drainage Canal between Elkhorn Reservoir and the West Drainage Canal, improve the West Drainage Canal, relocate the Riverside Canal and the Elkhorn Canal downstream of Elkhorn Reservoir, and reconstruct the Reclamation District 1000 Pumping Plant No. 2.
  - Recontour the land and create marsh and upland habitat at borrow locations.
  - Remove encroachments from the water 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 and U.S. Army Corps of Engineers design criteria, and address Federal Emergency Management Agency requirements for the State Route 99/70 bridge crossing of the NCC.

MAJOR CONCLUSIONS OF THE ENVIRONMENTAL ANALYSIS

SUMMARY OF IMPACTS AND MITIGATION MEASURES

The proposed project could result in significant environmental effects on several resources. The majority of the impacts would be temporary, construction-related effects that would be less than significant or would be reduced to less-than-significant levels through mitigation.

Table ES-1, included at the end of this Executive Summary, summarizes the proposed project's environmental impacts, the level of significance of each impact before mitigation, recommended mitigation measures, and the level of significance of each impact after mitigation.

SIGNIFICANT AND UNAVOIDABLE IMPACTS

The proposed project would result in the following significant and unavoidable impacts:

- Conversion of important farmland to nonagricultural uses (direct and cumulative)
- Potential construction impacts on known prehistoric resources, discovery of human remains during construction, and damage to or destruction of previously undiscovered cultural resources (direct and cumulative)
- Temporary increase in traffic on local roadways during construction (direct)
- Effects on air quality with respect to short-term construction emissions: temporary emissions of ROG, NO_X, and PM_{10} (direct and cumulative), and incremental contributions to greenhouse gas emissions (cumulative)
- 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 traffic noise levels from hauling activity (direct and cumulative)
- Changes in scenic vistas, scenic resources, and existing visual character of the project area (direct and cumulative)

Where feasible mitigation exists, it has been included to reduce these impacts; however, the mitigation would not be sufficient to reduce the impacts to a less-than-significant level.

AREAS OF CONTROVERSY AND ISSUES TO BE RESOLVED

AREAS OF CONTROVERSY

SAFCA has met with interested resource agencies, stakeholders, and landowners to discuss and resolve any potential areas of controversy associated with the proposed project. Based on these discussions, there are no known areas of controversy associated with the proposed project.

ISSUES TO BE RESOLVED

SAFCA will need to determine whether to approve the proposed project or project alternatives for implementation. The decision will be based on numerous factors besides potential environmental impacts, including the type of financing available, permitting requirements, and implementation schedule.

Regardless of whether the proposed project or alternatives are selected for implementation, detailed design of project features and planning of construction will need to be coordinated with mitigation requirements so that significant impacts are avoided or minimized where practicable. The methods for achieving required mitigation will need to be determined during detailed project design.

PUBLIC INVOLVEMENT AND NEXT STEPS

This DEIR will be used by the SAFCA Board when considering approval of the proposed project.

In accordance with CEQA review requirements, this DEIR is being distributed for public and agency review and comment for a 45-day period, which ends on October 29, 2007. SAFCA will hold one or more public meetings during the comment period—including a meeting to be held during the regular October 18, 2007, meeting of the SAFCA Board—at which it will receive input from agencies and the public on the DEIR. In addition, written

comments from the public, reviewing agencies, and stakeholders will be accepted throughout the public comment period.

Following consideration of these comments, SAFCA will prepare written responses to comments on environmental issues, and prepare a final EIR (FEIR) that will describe the disposition of any significant environmental issues raised in the comments on the DEIR. Written responses must be provided to public agencies on comments made by those agencies at least 10 days before the EIR can be certified. Following this 10-day period, the SAFCA Board will consider certifying the FEIR if it is determined to be in compliance with CEQA, and will rely on the certified FEIR when considering project approval.

In accordance with the requirements of CEQA, if the SAFCA Board decides to approve the proposed project analyzed in this EIR, it will make written findings with respect to each significant environmental effect identified in the EIR. In addition, if the SAFCA Board decides to approve the project but determines that it would have unavoidable environmental effects, the Board will adopt a "Statement of Overriding Considerations" that explains why the benefits of the project outweigh its significant effects on the environment, based on information in the EIR and other information in the project record.

At the time of project approval, the SAFCA Board must also adopt a reporting or monitoring program for those measures that it has adopted and incorporated into the project in order to mitigate or avoid significant effects on the environment. Following project approval, a notice of determination documenting the decision will be issued.

Table ES-1
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Agriculture and Land Use			
Impact 3.2-a. Conflicts with Land Use Plans and Policies	Less than significant	No mitigation is required	Less than significant
Impact 3.2-b. Conversion of Important Farmland to Nonagricultural Uses	Significant	Mitigation Measure 3.2-b: Minimize Important Farmland Conversion to the Extent Practicable and Feasible	Significant and unavoidable
Geology and Soils			
Impact 3.3-a. Potential Temporary, Short-Term Construction-Related Erosion	Significant	Mitigation Measure 3.3-a: 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	Less than significant
Hydrology and Hydraulics			
Impact 3.4-a. Hydraulic Effects of the Proposed Levee Improvements	Less than significant	No mitigation is required	Less than significant
Impact 3.4-b. Alteration of Local Drainage	Significant	Mitigation Measure 3.4-b: Coordinate with Landowners and Drainage Infrastructure Operators, Prepare Drainage Studies as Needed, and Remediate Impacts through Project Design	Less than significant
Water Quality			
Impact 3.5-a. Temporary Effects on Water Quality from Stormwater Runoff, Erosion, and Spills Associated with Construction	Significant	Mitigation Measure 3.5-a: Implement Standard BMPs, Prepare and Implement a SWPPP, and Comply NPDES Permit Conditions	Less than significant
Impact 3.5-b. Effects on Water Quality from Groundwater Discharged by Relief Wells	Significant	Mitigation Measure 3.5-b: Conduct Groundwater Quality Tests, Notify the Central Valley Regional Water Quality Control Board (RWQCB), and Comply with the RWQCB's Waste Discharge Authorization and NPDES Permit	Less than significant
Fisheries and Aquatic Resources			
Impact 3.6-a. Loss of Fish Habitat Through Increased Sedimentation and Turbidity or Releases of Contaminants	Significant	Mitigation Measure 3.6-a: Implement Standard BMPs, Prepare and Implement a SWPPP, and Comply with NPDES Permit Conditions	Less than significant

Table ES-1
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 3.6-b. Loss of Shaded Riverine Aquatic (SRA) Habitat Associated with Levee Improvement Activities	Significant	Mitigation Measure 3.6-b: Restore, Replace, or Rehabilitate Loss of Degraded SRA Habitat Function and Comply with Section 1602 Permit Conditions	Less than significant
Terrestrial Biological Resources			
Impact 3.7-a. Loss of Sensitive Habitats	Significant	Mitigation Measure 3.7-a: Minimize Effects on Sensitive Habitats, Develop a Habitat Management Plan to Ensure Compensation for Unavoidable Adverse Effects, and Comply with Section 404, Section 401, and Section 1602 Permit Processes	Less than significant
Impact 3.7-b. Disturbance and Loss of Special-Status Plant Habitat	Significant	Mitigation Measure 3.7-b: Conduct Focused Surveys for Special-Status Plants, Minimize Effects, Transplant Unavoidable Individual Plants, and Develop Management Plant for Transplanted Populations	Less than significant
Impact 3.7-c. Loss of Potential Habitat for Valley Elderberry Longhorn Beetles	Significant	Mitigation Measure 3.7-c: Minimize Effects on Valley Elderberry Longhorn Beetle, Conduct Focused Surveys, Develop a Management Plan to Ensure Adequate Compensation for Unavoidable Adverse Effects, and Obtain Incidental Take Authorization	Less than significant
Impact 3.7-d. Disturbance and Loss of Giant Garter Snake Habitat	Significant	Mitigation Measure 3.7-d: Minimize the Potential for Direct Loss of Giant Garter Snake Individuals, Develop a Management Plan in Consultation with the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (DFG), and Obtain Incidental Take Authorization	Less than significant
Impact 3.7-e. Disturbance and Loss of Northwestern Pond Turtle Habitat	Significant	Mitigation Measure 3.7-e: Conduct Focused Surveys for Northwestern Pond Turtle and Relocate Turtles	Less than significant
Impact 3.7-f. Loss of Swainson's Hawk Habitat and Potential Disturbance of Nests	Significant	Mitigation Measure 3.7-f: Minimize Potential Impacts on Swainson's Hawk, Monitor Active Nests during Construction, Develop a Management Plan in Consultation with DFG, and Obtain Incidental Take Authorization	Less than significant
Impact 3.7-g. Loss and Potential Disturbance of Habitat for Other Special-Status Birds	Significant	Mitigation Measure 3.7-g: Minimize Potential Impacts on Burrowing Owls and Other Special-Status Bird Species, Monitor Active Nests during Construction, and Relocate Owls as Needed	Less than significant
Impact 3.7-h. Loss and/or Disturbance of Wildlife Corridors	Significant	Mitigation Measure 3.7-h: Implement Mitigation Measure 3.7-d	Less than significant

Table ES-1
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 3.7-i. Consistency with the Natomas Basin Habitat Conservation Plan (NBHCP)	Significant	Mitigation Measure 3.7-i: Ensure that Compliance with Mitigation Requirements of Established NBHCP Reserves is Not Adversely Affected and Implement Mitigation Measures 3.7-a through 3.7-g	Less than significant
Cultural Resources			
Impact 3.8-a. Changes to Elements of Reclamation District (RD) 1000	Significant	Mitigation Measure 3.8-b: Document Alterations Made to Any RD 1000 Contributing Resources and Distribute the Information to the Appropriate Repositories	Less than significant
Impact 3.8-b. Construction Impacts on Other Known Historic-Era Resources	Less than significant	No mitigation is required	Less than significant
Impact 3.8-c. Potential Construction Impacts on Known Prehistoric Resources	Significant	Mitigation Measure 3.8-c(1): Avoid Ground Disturbance Near Known Prehistoric Archaeological Sites CA-Sac-485/H and the Barney Mound to the Extent Feasible, and Conduct Resource Documentation and Data Recovery at CA-Sac-485/H as Needed Mitigation Measure 3.8-c(2): Avoid Ground Disturbance near Known Prehistoric Archaeological Sites CA-Sac-15/H , CA-Sac-16/H, CA-Sac-160/H, CA-Sac-164, and CA-Sac-485/H to the Extent Feasible, and Conduct Resource Documentation and Data Recovery as Needed	Significant and unavoidable
Impact 3.8-d. Damage to or Destruction of Previously Undiscovered Cultural Resources	Significant	Mitigation Measure 3.8-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 Conduct Resource Documentation and Data Recovery as Needed	Significant and unavoidable
Impact 3.8-e. Discovery of Human Remains during Construction	Significant	Mitigation Measure 3.8-e: Halt Work Within 50 Feet of the Find, Notify the County Coroner and Most Likely Descendant, and Implement Appropriate Treatment of Remains	Significant and unavoidable
Paleontological Resources			
Impact 3.9-a. Disturbance of Unknown Unique Paleontological Resources during Earthmoving Activities	Significant	Mitigation Measure 3.9-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	Less than significant

Table ES-1
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Transportation and Circulation			
Impact 3.10-a. Temporary Increase in Traffic on Local Roadways during Construction	Significant	Mitigation Measure 3.10-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 3.10-b. Temporary Increase in Traffic Hazards on Local Roadways during Construction	Significant	Mitigation Measure 3.10-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
Impact 3.10-c. Temporary Effect on Emergency Service Response Times and Access during Construction	Significant	Mitigation Measure 3.10-c: Notify Emergency Service Providers about Project Construction and Maintain Emergency Access or Coordinate Detours with Providers	Less than significant
Air Quality			
Impact 3.11-a. Temporary Emissions of ROG, NO_X, and PM_{10} during Construction	Significant	Mitigation Measure 3.11-a: Implement District-Recommended Control Measures to Minimize Temporary Emissions of ROG, NO_X, and PM_{10} during Construction	Significant and unavoidable
Impact 3.11-b. Long-Term Changes in Emissions of ROG, NO_X, and PM_{10} Associated with Project Implementation	Less than significant	No mitigation is required	Less than significant
Impact 3.11-c. Exposure of Sensitive Receptors to Toxic Air Emissions	Less than significant	No mitigation is required	Less than significant
Noise			
Impact 3.12-a. Generation of Short-Term Construction Noise	Significant	Mitigation Measure 3.12-a: Implement Noise-Reducing Construction Practices, Prepare a Noise Control Plan, and Monitor and Record Construction Noise Near Sensitive Receptors	Significant and unavoidable
Impact 3.12-b. Exposure of Sensitive Receptors to or Generation of Excessive Groundborne Vibration or Noise	Significant	Mitigation Measure 3.12-b: Implement Measures to Avoid Construction-Related Vibration Effects	Significant and unavoidable
Impact 3.12-c. Exposure of Residents to Increased Traffic Noise Levels from Hauling Activity	Significant	Mitigation Measure 3.12-c: Implement Noise-Reduction Measures to Reduce the Effects of Haul Truck Traffic Noise	Significant and unavoidable

Table ES-1
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 3.12-d. Long-Term Increases in Noise	Less than significant	No mitigation is required	Less than significant
Impact 3.12-e. Exposure of Construction Workers to Excessive Noise Levels from Airport Operations	Less than significant	No mitigation is required	Less than significant
Recreation			
Impact 3.13-a. Temporary Changes in Recreational Opportunities during Project Construction Activities	Less than Significant	No mitigation is required	Less than significant
Impact 3.13-b. Permanent Encroachment on Parkland along Garden Highway	Significant	Mitigation Measure 3.13-b: Compensate the City of Sacramento for Encroachments that Cause Permanent Loss of the Recreational Use of Affected Recreational Facilities	Less than significant
Visual Resources			
Impact 3.14-a. Changes in Scenic Vistas, Scenic Resources, and Existing Visual Character of the Project Area	Significant	No mitigation is available	Significant and unavoidable
Impact 3.14-b. Changes in Light and Glare	Less than significant	No mitigation is required	Less than significant
Utilities and Service Systems			
Impact 3.15-a. Potential Temporary Disruption of Irrigation Supply	Significant	Mitigation Measure 3.15-a: Coordinate with Irrigation Water Supply Users Before and During All Irrigation Infrastructure Modifications and Minimize Interruptions of Supply	Less than significant
Impact 3.15-b. Potential Disruption of Utility Service during Construction	Significant	Mitigation Measure 3.15-b: Verify Utility Locations, Coordinate with Utility Providers, Prepare a Response Plan, and Conduct Worker Training with Respect to Accidental Utility Damage	Less than significant
Impact 3.15-c. Increases in Solid Waste Generation	Less than significant	No mitigation is required	Less than significant

Table ES-1
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Hazards and Hazardous Materials			
Impact 3.16-a. Spills of Hazardous Materials during Construction	Less than significant	No mitigation is required	Less than significant
Impact 3.16-b. Exposure to Hazardous Materials Encountered at Project Sites	Significant	Mitigation Measure 3.16-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 3.16-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 3.16-c. Temporary Aircraft Safety Hazards Resulting from Project Construction Activities within or near the Airport Critical Zone	Significant	Mitigation Measure 3.16-c: Coordinate Work in the Critical Zone with Airport Operations and Restrict Night Lighting within and near the Runway Approaches	Less than significant
Impact 3.16-d. Potential to Result in Higher Frequency of Collisions between Aircraft and Wildlife at Sacramento International Airport	Significant	Mitigation Measure 3.16-d: Implement Measures to Avoid Substantial Increases in Hazardous Wildlife within the Critical Zone or Wildlife Collisions with Aircraft	Less than significant
Impact 3.16-e. Interference with an Adopted Emergency Evacuation Plan	Significant	Mitigation Measure 3.16-e: Notify State and Local Emergency Management Agencies about Project Construction and Coordinate State Route (SR) 99 Detours with These Agencies to Ensure That Any Need for Emergency Use Is Not Significantly Impaired	Less than significant
Impact 3.16-f. Exposure to Wildland Fires	Significant	Mitigation Measure 3.16-f: Prepare and Implement a Fire Management Plan to Minimize Potential for Wildland Fires	Less than significant

1 INTRODUCTION

1.1 PURPOSE OF THIS DOCUMENT

The 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 that it proposes to carry out or approve that may have a significant direct or indirect effect on the environment. The Sacramento Area Flood Control Agency (SAFCA) is proposing the Natomas Levee Improvement Program (NLIP) Landside Improvements Project, which would consist of improvements to the levee system in the Natomas Basin and related landscape modifications and drainage and infrastructure improvements. SAFCA has determined that the proposed project may have significant effects on the environment. As the lead agency for complying with CEQA, SAFCA has directed the preparation of an EIR to analyze these potentially significant effects.

An EIR is an informational document that is intended to inform public agency decision makers and the general public of the significant adverse environmental effects of a project, identify feasible measures that would minimize those effects, and describe a reasonable range of alternatives to the project that would feasibly attain most of the basic project objectives but would avoid or substantially lessen the project's significant environmental effects. If all the significant effects of the proposed project cannot be mitigated to a less-than-significant level, CEQA requires decision makers to balance the benefits of a project against its significant unavoidable environmental effects in deciding whether to carry out the project. The purpose of an EIR is not to recommend either approval or denial of a project. As the lead agency, SAFCA will consider the information presented in the EIR, comments received on the EIR, and responses to those comments, along with other information, when determining whether to approve the proposed project. If the EIR identifies any significant environmental effect of the project as significant and unavoidable, SAFCA may still approve the project if it determines that the social, economic, legal, or other benefits outweigh the project's unavoidable adverse environmental effects.

This draft EIR (DEIR) has been prepared in accordance with the requirements of CEQA and the State CEQA Guidelines (California Code of Regulations Title 14, Section 15000 et seq.). The EIR process is described further in Section 1.9, "Public Participation and the EIR Process."

1.2 SUMMARY DESCRIPTION OF THE PROPOSED PROJECT

The proposed project consists of the following components:

- 2008 construction

  - Along the 5.3-mile Natomas Cross Canal (NCC) south levee, raise the levee to provide additional freeboard; realign the levee to provide a more stable waterside slope and to reduce the need for removal of waterside vegetation, and construct a seepage cutoff wall in the eastern 4.3 miles (approximately) of the levee to reduce the risk of levee failure due to seepage and stability concerns.

  - Along the Sacramento River east levee, construct a raised adjacent setback levee from the NCC to 1,700 feet south of the North Drainage Canal with seepage berms where required to reduce seepage potential, and install woodland plantings.

  - Construct a new canal designed to provide drainage and associated giant garter snake habitat (referred to in this EIR as the "GGS/Drainage Canal"), relocate the Elkhorn Canal between the North Drainage Canal and the Elkhorn Reservoir settling basin ("Elkhorn Reservoir"), and remove a deep culvert from under the levee near the Pumping Plant No. 2 site.

  - Recontour the land and create marsh and upland habitat at borrow locations.

- 2009 and 2010 construction

    - Along the Sacramento River east levee south of the limits of the 2008 improvements, construct an adjacent setback levee (raised where needed to provide adequate freeboard) with seepage berms, relief wells, and cutoff walls as required, and install woodland plantings.

    - Raise and construct seepage berms along the Pleasant Grove Creek Canal (PGCC) west levee.

    - Construct a new GGS/Drainage Canal between Elkhorn Reservoir and the West Drainage Canal, improve the West Drainage Canal, relocate the Riverside Canal and the Elkhorn Canal downstream of Elkhorn Reservoir, and reconstruct the Reclamation District 1000 Pumping Plant No. 2.

    - Recontour the land and create marsh and upland habitat at borrow locations.

    - Remove encroachments from the water 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 and U.S. Army Corps of Engineers (USACE) design criteria, and address Federal Emergency Management Agency (FEMA) requirements for the State Route 99/70 bridge crossing of the NCC.

1.3 TYPE OF EIR AND RELATIONSHIP TO OTHER DOCUMENTS

1.3.1 SECOND-TIER EIR

CEQA allows for the preparation of environmental documents using a multilevel approach whereby a broad-level EIR, termed a "program EIR," includes an analysis of general matters (e.g., the impacts of an entire plan, program, or policy), and subsequent project-level EIRs or negative declarations include analyses of the project-specific effects of projects within the program (State CEQA Guidelines Section 15168). State CEQA Guidelines Section 15152 describes the process of tiering, in which CEQA documents that follow a program EIR incorporate by reference and rely on the general discussions, programwide analyses, and program-level mitigation measures from the broader EIR, and focus on the site-specific impacts of the individual projects that implement the plan, program, or policy.

SAFCA's *Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area* (Local Funding EIR) (February 2007) broadly examined the significant environmental effects that could result from creating an assessment district and a development fee program—specifically, the report examined the physical effects associated with the program of flood control improvements and related environmental mitigation and habitat enhancements that the local funding mechanisms would be used to finance. These improvements include the NLIP. This EIR analyzes the landside components of the NLIP that are proposed for construction in 2008 through 2010, and is tiered from the analysis in the Local Funding EIR. Consistent with State CEQA Guidelines Section 15152, this second-tier EIR incorporates by reference general discussions from the Local Funding EIR as appropriate, and focuses on the significant effects on the environment that were not adequately addressed in that EIR.

1.3.2 COMBINED PROGRAM AND PROJECT EIR

This second-tier EIR is a combined program EIR and project EIR. The 2008 NLIP construction components that are summarized above in Section 1.2 are described in detail and analyzed at a project level in this document. The 2009 and 2010 construction components summarized in Section 1.2 are described more generally and are analyzed in this EIR at a general, program level. The CEQA documentation in this EIR will provide SAFCA with the environmental information needed to support its decision whether to approve detailed design and construction of the 2008 components and to support policy-level choices regarding the physical configuration of the 2009 and

2010 components. The 2009 and 2010 components would then be analyzed at a project level of detail in one or more additional CEQA documents.

1.3.3 RELATIONSHIP TO THE NLIP BANK PROTECTION EIR

At this time, SAFCA is also proposing to implement bank protection measures to control erosion at nine sites along the east bank of the Sacramento River bordering the Natomas Basin. The bank protection improvements are evaluated as a separate project in a separate EIR, *Draft Environmental Impact Report on Natomas Levee Improvement Program Bank Protection Project* (Bank Protection EIR), prepared concurrently with this EIR. Neither the bank protection project analyzed in the Bank Protection EIR nor the levee improvement project analyzed in this EIR is dependent on the construction of the other project; each can be built without regard to the timing or scope of the other project. The cumulative impact analysis in Chapter 4 of this EIR considers the combined effects of the two projects, along with the effects of other past, present, and probable future projects.

1.4 SCOPE OF THE ANALYSIS

CEQA (PRC Section 21002.1) and the State CEQA Guidelines (Section 15143) allow a lead agency to focus the discussion in the EIR on the potential environmental effects of a proposed project that the lead agency has determined may be significant. Lead agencies may limit discussion of other effects to a brief explanation as to why those effects would not be significant. During scoping with the public and governmental agencies for the Local Funding EIR, and based on review of available information, it was determined that formation of the proposed funding mechanisms and subsequent implementation of the projects that receive local financing through these funding mechanisms (including the NLIP) would not result in significant environmental effects related to mineral resources or population and housing. For the following reasons stated in the Local Funding EIR (page 1-4 of Volume I of that EIR), these resource topics are not discussed further in this EIR:

- Mineral Resources—Analyses of effects on mineral resources under CEQA generally focus on whether a project would hinder the extraction and use of known mineral commodities. No known mineral resources were identified in the project area. Therefore, no potentially significant effects on known mineral resources are anticipated as a result of construction activities associated with the flood control improvement program or potential hydraulic changes within the flood conveyance system.

- Population and Housing—The flood control program would take place incrementally over several years and would not require the construction of new housing to accommodate workers or involve the displacement of a substantial number of people or residences. Three residences and outbuildings at the eastern end of the NCC south levee may need to be removed/relocated as part of the NCC south levee improvements in 2008, and three residences and several other buildings would have to removed as part of the levee improvements that would be constructed in 2008 on the Sacramento River east levee. Additional residences would need to be removed in Sacramento River east levee Reaches 4B–20A to accommodate Sacramento River east levee improvements in 2009–2010. All relocations of residents would be conducted in compliance with federal and state relocation law. Appropriate compensation would be provided to displaced landowners and tenants, and residents would be relocated to comparable replacement housing. No new construction would be required to achieve the relocation of residences. The physical impacts of removing structures are addressed in relevant sections of the EIR

The removal of soil from agricultural lands for use in construction is discussed in Section 3.2 of this EIR, "Agriculture and Land Use." The use of soil and aggregate resources for levee improvements, precluding their use for other purposes, is also discussed in Section 5.3 of this EIR, "Significant Irreversible Environmental Impacts." The relationship of the potential program of flood control improvements, including the NLIP, to population growth is discussed in Section 5.1 of this EIR, "Growth-Inducing Effects."

This EIR analyzes potential impacts on the following resource areas:

- agriculture and land use,
- geology and paleontological resources,
- hydrology and hydraulics,
- water quality,
- fisheries and aquatic resources,
- terrestrial biological resources,
- cultural resources,
- transportation and circulation,
- air quality,
- noise,
- recreation,
- visual resources,
- utilities and service systems, and
- hazards and hazardous materials.

1.5 INTENDED USES OF THE EIR AND AGENCY ROLES AND RESPONSIBILITIES

SAFCA is the CEQA lead agency for the proposed project and has primary authority for approval of the project. This EIR will be used by SAFCA and CEQA responsible agencies to fulfill the requirements of CEQA. It also may be used as an informational document by federal agencies that could have permitting or approval authority (including partial funding) for aspects of the project, and it may be used by other local and state agencies, including CEQA trustee agencies, that may have an interest in resources that could be affected by the project.

A CEQA responsible agency is a state agency, board, or commission or any local or regional agency, other than the lead agency, that has discretionary approval power over a project. Responsible agencies must actively participate in the lead agency's CEQA process and review the lead agency's CEQA document. This EIR will be used by responsible agencies to ensure that they have met the requirements of CEQA before deciding whether to approve or permit project elements over which they have authority.

The proposed improvements would require permits and authorizations from, or coordination with, numerous federal, state, and local agencies. The following is a list of the agencies that may have responsibility or jurisdiction over the implementation of aspects of the project and the permits or authorizations that may apply to the project:

- USACE: permitting under Section 404 of the Clean Water Act, Section 10 of the Rivers and Harbors Act, and Section 14 of the Rivers and Harbors Act. Compliance with Sections 404 and 10 is required for fill of jurisdictional waters of the United States and navigable waters of the United States, respectively. Section 14 (33 USC 408), which is referred to hereinafter as Section 408, involves approval of federal project levee modifications.

- U.S. Fish and Wildlife Service: Endangered Species Act (ESA) consultation and incidental take authorization.

- National Marine Fisheries Service: ESA consultation and incidental take authorization or concurrence with conclusion of no effect.

- California Reclamation Board (The Reclamation Board) and local reclamation districts: levee and floodway encroachment permits.

- California Department of Fish and Game (DFG): compliance with the California Endangered Species Act and Fish and Game Code Section 1602 (Streambed Alteration).
- Central Valley Regional Water Quality Control Board: National Pollutant Discharge Elimination System permitting under Clean Water Act Section 402, and certification under Clean Water Act Section 401.
- California State Office of Historic Preservation: National Historic Preservation Act Section 106 compliance in relation to federal project authorizations.
- California Department of Transportation: Encroachment permit and/or transportation management plan.
- Sutter and Sacramento Counties: permits for compliance with the State's Surface Mining and Reclamation Act, and other possible construction authorizations/encroachment permits.
- Feather River Air Quality Management District (AQMD) and Sacramento Metropolitan AQMD: review of effects on air quality and authority to construct/permit to operate.
- City of Sacramento: possible construction authorizations/encroachment permits.

A trustee agency is a state agency that has jurisdiction by law over natural resources that are held in trust for the people of the State of California. DFG, as the trustee agency for fish and wildlife resources, has jurisdiction over resources potentially affected by the proposed project.

1.6 DOCUMENTS INCORPORATED BY REFERENCE

In accordance with the State CEQA Guidelines, the Local Funding EIR is incorporated by reference into this EIR, and relevant portions are summarized in this document. The Local Funding EIR is included in electronic format as an attachment to this EIR and is also available for inspection in printed form at the SAFCA offices at 1007 7th Street, 7th Floor, Sacramento, California, during normal business hours.

1.7 EIR ORGANIZATION

This DEIR is organized as follows:

- "Executive Summary" summarizes the proposed project, significant environmental effects that would result from project implementation, and mitigation measures proposed to reduce or eliminate those impacts.
- Chapter 1, "Introduction," describes the purpose of this EIR, its relationship to other NLIP EIRs, its scope, and the organization of the DEIR.
- Chapter 2, "Project Description," describes the project objectives, location, and components.
- Chapter 3, "Environmental Setting, Impacts, and Mitigation," describes, by environmental issue area, the existing environmental setting; discusses the potential environmental impacts of the proposed project; and identifies feasible mitigation measures to avoid or substantially lessen significant environmental effects.
- Chapter 4, "Cumulative Impacts," discusses the cumulative impacts that would result from the proposed project in combination with past, current, and probable future projects that could affect the same resources.
- Chapter 5, "Other CEQA-Required Sections," fulfills the CEQA requirements for discussion of the project's growth-inducing impacts, significant and unavoidable impacts, and significant irreversible environmental changes.

- Chapter 6, "Alternatives," describes the alternatives to the proposed project and analyzes their significant environmental effects in comparison to the proposed project.

- Chapter 7, "References," contains a comprehensive listing of the sources of information used in the preparation of the EIR, including agencies or individuals consulted.

- Chapter 8, "List of Preparers," identifies the preparers of this DEIR.

- Appendices:

  - Appendix A, "Notice of Preparation and Scoping Comments";

  - Appendix B, "Hydraulic Modeling Results";

  - Appendix C, "Air Quality Modeling Results"; and

  - Appendix D, "Noise Modeling Results."

1.8 STANDARD TERMINOLOGY

The following are definitions for standard terms as used in this EIR:

Project alternatives—Alternative ways of feasibly attaining most of the basic project objectives that also would avoid or substantially lessen any significant effects of the proposed project. CEQA requires that an EIR describe and evaluate a "reasonable range" of project alternatives. See Chapter 6, "Alternatives."

100-year flood protection—Project design standard that is intended to provide protection against a flood with a 1% chance of occurrence in a given year so as to meet the minimum requirements of the National Flood Insurance Program as determined by FEMA.

Urban-standard ("200-year") flood protection—Project design standard that is intended to provide protection against the most severe floods that are considered reasonably foreseeable based on existing hydrological records. For the Sacramento metropolitan area, these design floods are comparable in size to the "200-year" floods (i.e., those with a 0.5% chance of occurrence in a given year) centered on the lower Sacramento and American Rivers as identified in the Sacramento and San Joaquin River Basins Comprehensive Study completed by the USACE and The Reclamation Board in 2002 (USACE and The Reclamation Board 2002).

Sacramento—Metropolitan area comprising the City of Sacramento and portions of Sutter County and Sacramento County within SAFCA's jurisdiction.

Reach—A segment of a river or tributary where specific improvements are proposed to occur.

Levels of impact significance:

- No impact—No change from existing conditions.

- Less-than-significant impact—A physical effect on the environment that does not exceed the defined significance thresholds.

- Significant impact—A substantial or potentially substantial adverse change in any of the physical conditions within the area affected by the project, as demonstrated by exceeding the defined significance thresholds without the implementation of feasible mitigation or alternatives. Where available, feasible mitigation is identified that would eliminate or reduce a significant impact to a less-than-significant level.

- Significant and unavoidable impact—A significant environmental effect that exceeds the defined thresholds of significance and that cannot be reduced to a less-than-significant level through the implementation of feasible mitigation measures or alternatives.

1.9 PUBLIC PARTICIPATION AND THE EIR PROCESS

On June 4, 2007, SAFCA issued a notice of preparation (NOP) of a 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. The NOP and copies of the scoping comments provided to SAFCA are included in Appendix A.

In accordance with CEQA review requirements, this DEIR is being distributed for public and agency review and comment for a 45-day period, which ends on October 29, 2007. This distribution ensures that interested parties have an opportunity to express their views regarding the significant environmental effects of the project, and to ensure that information pertinent to permits and approvals is provided to the decision makers for SAFCA and the CEQA responsible agencies. This document is available for review by the public during normal business hours at the SAFCA office at 1007 7th Street, 7th Floor, Sacramento, California.

SAFCA will hold one or more public meetings during the comment period—including a meeting to be held during the regular October 18, 2007, meeting of the SAFCA Board—at which it will receive input from agencies and the public on the DEIR. In addition, written comments from the public, reviewing agencies, and stakeholders will be accepted throughout the public comment period. Comments must be received by SAFCA by 5:00 p.m. on October 29, 2007, at the following address, fax number, or e-mail address:

Attn: John Bassett/NLIP Landside DEIR Comments
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814
Fax number: (916) 874-8289
E-mail address: BassettJ@SacCounty.net

If comments are provided via e-mail, please *include the project title in the subject line, attach comments in MS Word format, and include the commenter's U.S. Postal Service mailing address.*

Following consideration of these comments, SAFCA will prepare written responses to comments on environmental issues, and prepare a final EIR (FEIR) that will describe the disposition of any significant environmental issues raised in the comments on the DEIR. Written responses must be provided to public agencies on comments made by those agencies at least 10 days before the EIR can be certified. Following this 10-day period, the SAFCA Board will consider certifying the FEIR if it is determined to be in compliance with CEQA, and will rely on the certified FEIR when considering project approval.

In accordance with the requirements of CEQA, if the SAFCA Board decides to approve the proposed project analyzed in this EIR, it will make one or more of the following written findings with respect to each significant environmental effect identified in the EIR:

- Changes or alterations have been incorporated into the project that mitigate or avoid the significant effects on the environment.

- Such changes or alterations are within the responsibility and jurisdiction of another public agency and have been adopted, or can and should be adopted, by such other agency.

- Specific economic, legal, social, technological, or other considerations render the mitigation measures or project alternatives identified in the FEIR infeasible.

In addition, if the SAFCA Board decides to approve the project but determines that it would have significant unavoidable environmental effects, the Board will adopt a "Statement of Overriding Considerations" that explains why the benefits of the project outweigh its significant effects on the environment, based on information in the EIR and other information in the project record.

At the time of project approval, the SAFCA Board must also adopt a reporting or monitoring program for those measures that it has adopted and incorporated into the project to mitigate or avoid significant effects on the environment. The reporting or monitoring program must be designed to ensure compliance during project implementation.

Following project approval, a notice of determination documenting the decision will be issued.

2 PROJECT DESCRIPTION

This chapter describes the proposed project in the following four sections:

- Section 2.1, "Project Need, Objectives, and Plan Formulation," explains the project background and project purpose and need, lists the project objectives, and describes the project plan formulation process.
- Section 2.2, "Existing Project Facilities and Potential Borrow Sites," describes the existing flood control and major irrigation infrastructure facilities that would be modified as part of the proposed project, and describes the potential sources of borrow material for construction.
- Section 2.3, "Description of the Proposed Project," provides details on construction and management of the project elements.
- Section 2.4, "Ability of the Proposed Project to Meet the Project Objectives," summarizes the ways in which the proposed project would meet the project objectives.

Please note: *All exhibits for Chapter 2 are included at the end of the Chapter 2 text.*

2.1 PROJECT NEED, OBJECTIVES, AND PLAN FORMULATION

2.1.1 PROJECT BACKGROUND AND NEED

The proposed project is a major portion of the Natomas Levee Improvement Program (NLIP), a component of the flood control improvements analyzed in SAFCA's *Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area* (Local Funding EIR) (February 2007), from which this EIR is tiered. The NLIP 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 (Exhibit 2-1). The Natomas Basin is generally 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 Natomas East Main Drainage Canal (NEMDC)/Steelhead Creek on the east (Exhibit 2-2).

SAFCA's intent is to provide the Natomas Basin with 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. Achievement of these aims would significantly reduce the risk of an uncontrolled flood in the Natomas Basin that would result in a catastrophic loss of property (estimated at $7 billion) and a prolonged interruption of commercial activity, including the operation of Sacramento International Airport (Airport) and closure of Interstate 5 (I-5) and State Route (SR) 99/70. Flooding is particularly hazardous in a heavily urbanized basin like Natomas because of the depths that floodwaters can reach—more than 10 feet in some areas, as shown in Exhibit 2-3.

2.1.1.1 DEFICIENCIES OF THE NATOMAS LEVEE SYSTEM

Refer to Chapter 2 of the Local Funding EIR (which is included as an attachment to this EIR) for general information about the flood risk to Sacramento, SAFCA's role in flood control, and the history of regional flood control improvements. Refer to Chapter 3 of the Local Funding EIR for an overview of the need for the NLIP. As described in that chapter, SAFCA and the U.S. Army Corps of Engineers (USACE), in cooperation with the California Department of Water Resources (DWR) and the State of California Reclamation Board (The Reclamation Board), have conducted engineering studies that show the Natomas Basin to be vulnerable to uncontrolled flooding as a result of levee overtopping, levee seepage that could threaten levee stability, and riverbank erosion. The USACE determined in 2006 that the Natomas Basin has less than a 100-year level of

protection against levee failure. This led to a proposal for remapping of the Natomas Basin floodplain by the Federal Emergency Management Agency (FEMA), which will show the basin within the 100-year floodplain.

Approximately 26 miles of the levees surrounding the Natomas Basin require one or more forms of remediation to address the potential for failure in a 100-year or "200-year" flood event. SAFCA is designing the NLIP in coordination with the federal and state flood control project sponsors, the USACE and The Reclamation Board, to address the deficiencies in the Natomas levee system with a focus on achieving a 100-year level of protection by 2010. This will require improving the following conditions along the NCC south levee, the Sacramento River east levee, and the PGCC west levee:

- Inadequate freeboard—The NCC south levee, portions of the Sacramento River east levee, and the PGCC west levee are not high enough to provide at least 3 feet of freeboard above the 100-year water surface elevation, and several reaches do not provide 3 feet of freeboard above the "200-year" design water surface elevation (Exhibit 2-4).

- Underseepage and through-seepage vulnerability—Most of these same reaches do not meet recently adopted federal criteria for safely containing underseepage and through-seepage when the water surface in the adjacent channel reaches the 100-year elevation or, in some cases, the "200-year" elevation (Exhibit 2-5).

- Erosion—Because of ongoing erosion, several sites along the Sacramento River east levee do not meet current federal criteria for waterside levee stability and integrity (Exhibit 2-6). One area along the NCC south levee may also require erosion protection.

The proposed project analyzed in this EIR encompasses the "landside components" of the NLIP improvements of the NCC south levee, Sacramento River east levee, and PGCC west levee: addressing freeboard deficiencies through levee raises; addressing seepage potential using a combination of seepage berms, cutoff walls, and relief wells; and acquiring additional right-of-way to construct the improvements and to prevent encroachment into the flood control system. These improvements would include recontouring the levee slopes where necessary to provide a 3:1 horizontal-to-vertical (3H:1V) waterside slope and a 3H:1V (preferred) or 2H:1V (maximum) landside slope.

Erosion sites are addressed in a separate proposed project that SAFCA is analyzing in a separate EIR, as explained in Section 1.3.3, "Relationship to the NLIP Bank Protection EIR."

2.1.1.2 LEVEE ENCROACHMENTS AND THE ADJACENT SETBACK LEVEE CONCEPT

Since 2006, when SAFCA completed its Natomas Levee Evaluation Study, the USACE has issued a draft white paper outlining national procedures for managing "encroachments" in the footprint of federal project levees. These procedures, which are still under development, indicate that any vegetation that has stems greater than 2 inches in diameter and any structures, such as utility lines, fences, and other appurtenances, must be removed from the footprint of the levee. The USACE defines the footprint of the levee as the levee crown, the waterside and landside levee slopes, and the area within 15 feet of the waterside and landside toes of the levee. Of the levees around the Natomas Basin, the Sacramento River east levee in particular has significant encroachments in the form of both trees and structures, such as fences and gates, that support the residential land uses on the water side of the levee. These encroachments can affect levee integrity, hinder inspections, and prevent maintenance access. They will all have to be removed if this policy is strictly enforced.

The USACE has indicated that it may allow flexibility in the application of the vegetation-removal policy in California, based on consideration of endangered species habitat requirements and site-specific conditions. However, there is substantial disagreement among experts about the relative risks and benefits of woody vegetation on California levees, and it will likely be difficult to achieve consensus on the details of policy implementation. Substantial removal of structural encroachments and large woody vegetation from the levee

slopes and at the levee toes is likely to be required for USACE acceptance that the Natomas system meets FEMA criteria for the 100-year level of protection. Removal would trigger significant mitigation requirements that could be difficult to complete and potential disputes with landowners over the legal implications of removing appurtenant structures. Removal would likely take several years to achieve because of environmental and legal issues.

As an alternative to the potential for substantial removal of vegetation and structural encroachments along the Sacramento River east levee, SAFCA is proposing to construct an "adjacent setback levee," consisting of a new levee crown and embankment adjoining the land side of the existing levee. Construction of an adjacent setback levee would shift the jurisdictional levee landward, thereby providing more flexibility with respect to the management of structures and vegetation on the waterside slope. Exhibit 2-7 depicts the adjacent setback levee concept. The adjacent setback levee would be constructed to provide the required freeboard and would include seepage remediation where required.

2.1.1.3 MEETING MULTIPLE FEDERAL MANDATES IN THE NATOMAS BASIN

In addition to the USACE's flood control mandate, the federal government has significant aviation safety and habitat protection mandates in the Natomas Basin, as represented by the Federal Aviation Administration (FAA) and the U.S. Fish and Wildlife Service (USFWS), respectively. The Airport experiences a high rate of aircraft bird strikes, which pose a substantial hazard to flight safety, and has been directed by 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.

USFWS, with the California Department of Fish and Game (DFG), oversees the protection of the special-status wildlife species in the Natomas Basin. A major component of this protection is the Natomas Basin Habitat Conservation Plan (NBHCP), an agreement between these resource agencies, the City of Sacramento, and Sutter County that provides a framework for the protection of 22 special-status species. Sacramento County is not a participant in the NBHCP, and is therefore not subject to its provisions.

To avoid potential conflicts between the federal mandates, SAFCA intends to design and construct the NLIP in a manner that would also serve to reduce wildlife hazards in the vicinity of the Airport while preserving and enhancing the critical habitat values upon which the Natomas Basin species of concern to USFWS and DFG depend, as described in the NBHCP. The primary species of concern are giant garter snake and Swainson's hawk. In addition, the NLIP improvements would be undertaken in a manner that avoids impacts on, and preferably improves, aviation safety as it interfaces with flood control features and operations.

2.1.2 PROJECT OBJECTIVES

As stated in the Local Funding EIR, the overall project objectives of SAFCA's flood control improvement program, including the NLIP, are to:

(1) complete the projects necessary to provide 100-year flood protection for developed areas in the major floodplains of the Sacramento metropolitan area (Sacramento) as quickly as possible,

(2) provide urban-standard ("200-year") flood protection for developed areas in Sacramento's major floodplains over time, and

(3) ensure that new development in the undeveloped areas of Sacramento's major floodplains does not substantially increase the expected damage of an uncontrolled flood.

The specific objectives of the proposed project analyzed in this EIR are to:

(1) 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,

(2) 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

(3) use flood control projects to enhance habitat values by increasing 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.

2.1.3 PROJECT PLAN FORMULATION

2.1.3.1 PLAN FORMULATION PROCESS

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

(1) identification of the deficiencies in the Natomas levee system that must be addressed to provide "200-year" flood protection,

(2) identification of the deficiencies that must be addressed to provide at least 100-year flood protection as quickly as possible,

(3) identification of feasible remedial measures to address the deficiencies,

(4) determination of the likely environmental impacts of the remedial measures,

(5) development of a reasonable range of flood control alternatives around the remedial measures, and

(6) addition of measures to ensure that each alternative would improve aviation safety and enhance habitat values.

Additional information on the formulation of the proposed project and alternatives is provided in Chapter 6, "Alternatives."

2.1.3.2 PLANNING OF PROJECT ELEMENTS TO MEET MULTIPLE OBJECTIVES

Recognizing the importance of securing maximum federal support for the flood control project, SAFCA has explored implementation approaches that also advance the achievement of federal aviation and wildlife protection objectives where complementary opportunities exist. Accordingly, the proposed project includes the following elements:

(1) The project would include construction of a new drainage canal (referred to in this document as the "GGS/Drainage Canal") designed to provide giant garter snake habitat and some irrigation infrastructure west of the Airport. Construction of these facilities would allow for dewatering of the ditch running along the western portion of the Airport runway system, a recognized flight safety hazard, by offsetting the effects on drainage and irrigation needs and giant garter snake habitat.

(2) The project would combine SAFCA's need for levee embankment and berm material with the Sacramento County Airport System's (SCAS's) need to modify the condition and management of Airport bufferlands so as to reduce wildlife hazards affecting Airport operations, and in a manner that enhances the connectivity of areas managed specifically for their habitat value.

The proposed improvements to the Sacramento River east levee would require constructing an enlarged levee embankment (adjacent setback levee) with extensive seepage berms on the land side of the levee (Exhibit 2-8). Expanding the landside levee footprint necessitates redesigning and relocating the irrigation and drainage infrastructure currently located along the landside toe of the levee. Approximately 4.4 million cubic yards of soil material would be needed for construction of the levee embankment, berms, and relocated canals along the Sacramento River east levee. About 600,000 cubic yards would be obtained through excavation of the new GGS/Drainage Canal between Reclamation District (RD) 1000's existing North Drainage Canal north of the Airport and its existing West Drainage Canal southwest of the Airport (Exhibit 2-8).

The new GGS/Drainage Canal would be designed and managed to provide a dispersal corridor for giant garter snake that would link emerging blocks of managed giant garter snake habitat in the vicinity of Prichard Lake north of the Airport and around Fisherman's Lake south of the Airport. The new canal would intercept much of the drainage and irrigation flows that are currently routed through the Airport West Ditch, which runs parallel to the west runway. Provision of the proposed new GGS/Drainage Canal, along with rearrangement of local irrigation facilities, would remove most of the flows from the Airport West Ditch and eliminate hazards currently associated with this feature—specifically, the attraction of wildlife (especially birds) that pose both an aircraft strike hazard in the runway area and a physical obstruction hazard to aircraft that may leave the runway during adverse takeoff or landing situations.

The new GGS/Drainage Canal would also generally improve stormwater drainage on lands in the western portion of the Natomas Basin, including Airport bufferlands. It would thus reduce standing water on lands near the Airport Operations Area and the aviation hazards associated with the resulting attraction to wildlife.

SAFCA would obtain the balance of the fill material it needs for the improvements along the Sacramento River east levee from parcels in the Airport bufferlands, land planned for habitat development by The Natomas Basin Conservancy (TNBC), and nearby privately owned agricultural land (Exhibit 2-8). Borrow operations would consist of (1) shallow excavation and grading of lands to preserve the current agricultural condition (cropland) or a similar condition (managed grassland) suitable for providing foraging habitat for the Swainson's hawk, and (2) deeper excavation and reclamation of lands to a "managed marsh" condition similar to existing preserves throughout the area that TNBC, as plan operator for the NBHCP, owns and manages for giant garter snake habitat.

In some areas, the adjacent setback levee and seepage berms along the land side of the Sacramento River east levee would extend into mature stands of trees. The project design would include accommodations to retain some of these trees through the use of relief well arrays for 20–30 years (the assumed useful life of the relief wells) where practicable (see "Use of Relief Wells to Avoid Removal of Structures and Trees along Sacramento River East Levee Reaches 4B–20A" in Section 2.3.2.4). The proposed project includes planting a substantial number of trees (totaling approximately 150 acres, shown conceptually in Exhibit 2-8) to offset the near-term losses and additional losses expected to result from future expansions of the levee footprint and seepage berms (see Section 4.2.4.2 in Chapter 4, "Cumulative Impacts"). Where trees would be planted in corridors, shallow excavation of the land in the corridors may be undertaken before trees are planted; this practice could provide additional borrow for construction while placing the plantings closer to groundwater and thus providing better conditions for more rapid tree growth.

2.2 EXISTING PROJECT FACILITIES AND POTENTIAL BORROW SITES

All project construction activities would take place within the Natomas Basin, except for the development of a borrow site on RD 1001 land northeast of the basin. Exhibit 2-8 shows the locations of the planned improvements and potential borrow sources. The following subsections describe the existing flood control facilities, their general setting, and adjacent irrigation infrastructure and the potential borrow sources for the proposed project.

2.2.1 FLOOD CONTROL AND IRRIGATION FACILITIES

2.2.1.1 NATOMAS CROSS CANAL SOUTH LEVEE

The NCC is a 5.3-mile-long channel that carries water from several tributary watersheds in western Placer County and eastern 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, and NCC all contribute to raised water elevations that can affect the NCC levees. For engineering purposes, the levee is divided into seven reaches, as shown in Exhibits 2-8 and 2-9. Much of the south levee contains an existing stability berm with an internal drainage system. Levee slopes are approximately 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.

Exhibit 2-9 shows the area around the NCC south levee.

Farms and rural residences are located on both sides of the NCC, with rice the primary crop under cultivation. The Lucich North and Frazer Habitat Preserves, maintained by TNBC, lie south of the NCC south levee from the eastern end of Reach 2 through the western end of Reach 6. A few residences are situated 700–1,000 feet north of the NCC south levee in Reach 1, and a few residences are situated 50–200 feet south and west of the levee along Reach 6. At Reach 7, a residence and several ranch buildings are situated within 25 feet of the levee's landside toe. Other nearby land uses include the Verona Village Resort, a small trailer campground, marina, restaurant, and store on the west side of Garden Highway, approximately 660 feet southwest of the west end of the NCC levee at the north end of Reach 1 of the Sacramento River east levee.

A drainage canal, referred to as the Vestal Drain, runs parallel to the NCC south levee through much of Reach 2, approximately 100 feet from the landside levee toe. There is a private irrigation pump and irrigation canal at the landside levee toe in Reach 1. Natomas Central Mutual Water Company's (NMWC's) Bennett Pumping Plant and RD 1000's Pumping Plant No. 4 are located in Reach 2, and the NMWC Northern Pumping Plant is located in Reach 3. NMWC's North Main Canal runs parallel to the levee through Reaches 4 and 5, approximately 100 feet from the landside levee toe.

2.2.1.2 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 planning purposes, the levee is divided into 20 reaches, as shown in Exhibits 2-8 and 2-10. 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 1–12). Cutoff walls were previously constructed through the levee in Reaches 12– 20.

Exhibit 2-10 shows the features along the Sacramento River east levee.

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 TNBC parcels. 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. Sacramento County's Elkhorn Boat Access is located in Reach 9. More than 150 residences and numerous private boat docks are located between the lower part of Reach 2 and the lower part of Reach 18; as mentioned previously, many fences, gates, and other appurtenances associated with these properties are located on the levee itself. On the water side of the levee in Reaches 19 and 20 are a mix of residences, private boat docks, businesses, and Sand Cove Park. Discovery Park is just southeast of Reach 20.

Several irrigation canals, pipelines, wells, and pump stations exist along the Sacramento River east levee. The Elkhorn Main Irrigation Canal (Elkhorn Canal) and the Riverside Main Irrigation Canal (Riverside Canal) are key agricultural irrigation canals in the NMWC system. The Elkhorn Canal runs parallel to the Sacramento River east levee from the North Drainage Canal in Reach 4B through Reach 8 and into the start of Reach 9 (1,250 feet south of Elkhorn Boulevard); this canal and is supplied by the Prichard and Elkhorn Pumping Plants on the Sacramento River. The Riverside Canal extends from just north of Reach 13 to the middle of Reach 19 and is supplied by the Riverside Pumping Plant, on the Sacramento River just north of Radio Road. Several lateral canals connect to the Elkhorn and Riverside Canals. The existing Elkhorn and Riverside Canals are highline canals that use gravity flow to deliver water for irrigation by maintaining water levels above the surrounding ground levels. These canals have earthen embankments with side slopes that are nearly vertical, requiring regular maintenance.

In addition to the NMWC irrigation systems, there are several landowner-operated systems along the levee. These facilities are located primarily in Reaches 1–4A and 9–12, in areas not currently served by the NMWC systems. The areas are serviced by either well pumps on the land side or river pumps, which discharge into buried pipelines, small irrigation ditches, or directly onto fields. The distribution systems run along the landside toe of the levee to supply fields that slope away from the levee. There are approximately nine small pumping plants that provide water from the river and approximately 10 groundwater well pumps.

Several drainage pumping plants are operated by RD 1000 along the Sacramento River east levee. These facilities pump drain water from the main drainage canal system into the river. They include Pumping Plant No. 2, located in Reach 4B; Pumping Plant No. 3, located in Reach 13; and Pumping Plant No. 1, located between Reach 19B and Reach 20. 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.

2.2.1.3 PLEASANT GROVE CREEK CANAL WEST LEVEE

The PGCC west levee extends southerly from the east end of the NCC south levee to the north end of the NEMDC/Steelhead Creek levee near the Sankey Road crossing (Exhibit 2-9). 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. SAFCA constructed steel sheetpile walls capped by concrete pavement sections at Howsley, Fifield, and Sankey Roads in 1996 to provide hardened sections at these roadway crossings where freeboard was inadequate. The Fifield Road/Natomas Road intersection was 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 RD 1000 drainage system. A private canal extends parallel to the PGCC west levee for about 1,500 feet at the landside levee toe.

Exhibit 2-9 shows the area around the PGCC west levee.

Farms and scattered rural residences are located on both sides of the PGCC. A few residences are located within 500–1,200 feet of the west levee along Fifield Road. A manufacturing facility and a railroad siding are located just past the end of the PGCC at Sankey Road.

2.2.2 BORROW SITES

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 following excavation for this use, as described in Section 2.3.4.3. 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 as the borrow activities are completed.

The improvements to the NCC south levee, proposed for construction in 2008, would be completed using borrow from a site owned by RD 1001 about 5 miles northeast of the Natomas Basin along Pacific Avenue, just east of the RD 1001 borrow site used for SAFCA's 2007 NCC South Levee Phase 1 Improvements project. The site was in rice cultivation in summer 2007. 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. This site likely would be used also for the proposed PGCC west levee construction in 2009–2010. It is expected that the site would be reclaimed in sections as borrow operations move through the parcel sequentially over time.

Several other properties have been identified as likely sources of soil borrow, mainly for use in the improvements to the Sacramento River east levee. The identification of these potential borrow sites 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 (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 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 reduce wildlife attraction and associated hazards to aviation safety.

- Private parcels historically used for rice cultivation were selected 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 (b) the retention of land in rice production under public agency or habitat management agency ownership.

- Preference was given to sites adjacent to parcels already managed to provide special-status species habitat (TNBC parcels 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 preferred borrow sources for the 2008 and 2009–2010 flood control and irrigation infrastructure improvements along the Sacramento River east levee, and redundant sources that may be pursued if negotiations regarding the preferred sources are unsuccessful or additional quantities are found to be needed during construction (Exhibit 2-8):

- Bolen South and Nestor Preserves (2008 preferred): A 56-acre portion of TNBC's 102-acre Bolen South Preserve west of Powerline Road and just south of Sankey Road and an 80-acre portion of TNBC's 230-acre Nestor Preserve east of Powerline Road and north of Powerline Road. These sites, planned by TNBC for habitat creation in 2008, could provide soil for construction in the upper reaches of the Sacramento River east levee and the upper portion of the relocated Elkhorn Canal. SAFCA would undertake the creation of marsh and upland habitat in coordination with TNBC.

- Vestal and/or Spangler property (2008 preferred): Privately owned farmland near the NCC. These two properties are situated west and east, respectively, of Powerline Road and north of Sankey Road, adjacent to existing TNBC properties, and are currently in rice cultivation. Soil from the sites could be used for construction in the upper reaches of the Sacramento River east levee, the NCC south levee, or the PGCC west levee. After the removal of borrow soil, managed marsh would be created to provide giant garter snake habitat on the portion of the property that is excavated, with the remainder retained in rice production under public agency or habitat management agency ownership.

- Airport bufferlands north of the Airport complex (2008 potential, 2009 preferred, 2010 potential): Sacramento County property north of Elverta Road and west of Powerline Road. These lands could provide soil for use along the middle reaches of the Sacramento River east levee, most likely in 2009. They could also provide material for construction in the upper reaches of the levee in 2008 or in the lower reaches of the levee in 2010, 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 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.

- Brookfield property (2008 potential, 2010 potential): Located west of the PGCC at Fifield Road, this private property is currently in rice cultivation and is intended by the owner to serve as a mitigation site for future development. Material from this property could be used along the upper reaches of the Sacramento River east levee in 2008 or on the PGCC west levee in 2010. After the removal of borrow material, it is expected that the land would be converted to marsh habitat.

- Airport bufferlands south of the Airport complex (2009–2010 potential): Sacramento County property south of I-5 and west of Powerline Road. Soil borrow from part of this property may be suitable for use along the middle and lower reaches of the Sacramento River east levee. After the removal of borrow material, the land would be converted to grassland, with the southernmost portion possibly suitable for woodland planting.

2.3 DESCRIPTION OF THE PROPOSED PROJECT

2.3.1 OVERVIEW OF THE PROPOSED PROJECT ELEMENTS

The elements of the proposed project are described in this section in four broad, overlapping categories:

- levee raising and seepage remediation,
- improvements to major irrigation and drainage infrastructure,
- habitat development and management, and
- additional actions to meet FEMA requirements: encroachment management and bridge crossing modifications.

Additionally, right-of-way would be acquired within the footprint of the proposed features, at borrow sites, and to prevent encroachment and provide for maintenance access along the land side of the flood control facilities.

Table 2-1 summarizes the major elements of the proposed project and lists the sections of this chapter where they are discussed in detail. As explained in Section 1.3.2, "Combined Program and Project EIR," the proposed project includes 2008 construction components, which are described and analyzed in this EIR at a project level of detail, and 2009–2010 elements, which are described and analyzed at a general, program level of detail.

Table 2-1
Summary of the Major Elements of the Proposed Project

Project Element	Proposed Activity and Timing	Section(s) of This EIR Where Described
2008 Construction (analyzed at a project level in this EIR)		
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. (May 8–November 1, 2008) Construct a seepage cutoff wall through the levee crown in Reaches 3–7. (May 8–October 15, 2008)	2.3.2.2
Levee raising and seepage remediation: Sacramento River east levee (adjacent setback levee)	Construct a raised adjacent setback levee from the NCC to just south of the North Drainage Canal (Reaches 1–4B partial) with a 100-foot seepage berm in Reaches 2 and 3 and a 300-foot seepage berm in Reach 4B. (May 1–November 1, 2008)	2.3.2.3
Improvements to major irrigation and drainage infrastructure	Construct a new canal designed to provide drainage and associated giant garter snake habitat (referred to in this EIR as the "GGS/Drainage Canal") between the North Drainage Canal and Elkhorn Reservoir. (May 1–November 1, 2008) Relocate the Elkhorn Canal (highline irrigation canal) between the North Drainage Canal and Elkhorn Reservoir in anticipation of the filling of the existing Elkhorn Canal at the toe of the Sacramento River east levee in 2009. (May 1–November 1, 2008) Remove a deep culvert at the location of Pumping Plant No. 2. (May 1–November 1, 2008)	2.3.3.1–2.3.3.3, 2.3.4.3
Habitat creation and management	Establish vegetative habitat features in the new GGS/Drainage Canal. (Fall 2008) Recontour and create managed marsh and grassland on lands used as borrow sources. (Fall 2008 or spring 2009) Establish grassland on the adjacent setback levee slopes and seepage berms. (August 1–December 31, 2008) Install woodland plantings to offset the loss of portions of tree groves in the landside levee footprint. (Fall 2008)	2.3.4.3
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. (Before construction)	2.3.2.1

Table 2-1 Summary of the Major Elements of the Proposed Project		
Project Element	Proposed Activity and Timing	Section(s) of This EIR Where Described
2009–2010 Construction (analyzed at a program level in this EIR)		
Levee raising and seepage remediation: Sacramento River east levee (adjacent setback levee)	Construct an adjacent setback levee from just south of the North Drainage Canal to the American River north levee, raised where needed to provide adequate freeboard, with seepage berms, relief wells, and cutoff walls for seepage remediation as required (the use of 300-foot berms is still under study). (May 1–November 1, 2009, and May 1–November 1, 2010)	2.3.2.4
Levee raising and seepage remediation: PGCC west levee	Raise levee, 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). (May 1–November 1, 2010)	2.3.2.5
Improvements to major irrigation and drainage infrastructure	Construct the new GGS/Drainage Canal between Elkhorn Reservoir and the West Drainage Canal (specific alignment to be determined), and improve the West Drainage Canal to provide enhanced giant garter snake habitat. (May 1–November 1, 2009) 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. (May 1–November 1, 2009) Relocate the Riverside Canal and the Elkhorn Canal downstream of Elkhorn Reservoir (specific alignments to be determined) and fill the existing canals (May 1–November 1, 2009) Construct RD 1000 Pumping Plant No. 2 (April 1, 2009–September 1, 2010)	2.3.3.1–2.3.3.5, 2.3.4.3
Habitat creation and management	Establish habitat enhancements in the new GGS/Drainage Canal and improved West Drainage Canal (specific design features to be determined). (Fall 2009) Recontour and create marsh and managed grassland on lands used as borrow sources (specific management plans to be developed). (Fall or spring after borrow excavation in 2009 and 2010) Establish grassland on the adjacent setback levee slopes and seepage berms. (Fall after construction in 2009 and 2010) Install woodland plantings to offset the loss of portions of tree groves in the landside levee footprint (locations to be determined). (Fall 2009 and 2010)	2.3.4.3

Table 2-1 Summary of the Major Elements of the Proposed Project		
Project Element	Proposed Activity and Timing	Section(s) of This EIR Where Described
Additional actions to meet FEMA requirements: encroachment management on the Sacramento River east levee, and bridge crossing modifications at the NCC	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 (specific criteria still under discussion). (Timing to be determined) Modify the SR 99/70 crossing of the NCC as needed to meet FEMA requirements (Timing to be determined)	2.3.5
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. (Before construction)	2.3.2.1
Notes: GGS = Giant Garter Snake; NCC = Natomas Cross Canal; NFIP = National Flood Insurance Program; PGCC = Pleasant Grove Creek Canal; RD = Reclamation District; USACE = U.S. Army Corps of Engineers		

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

- seepage remediation methods for reaches indicated as requiring 300-foot seepage berms, greater definition of the locations of seepage well arrays, and identification of specific borrow sites for 2010 construction along the Sacramento River east levee;
- widths of seepage berms and potential use of cutoff walls in some locations along the PGCC west levee;
- alignments of the new GGS/Drainage Canal in the area of the Teal Bend Golf Club, the relocated Elkhorn Canal, and the Riverside Canal;
- specific design features to accommodate and enhance giant garter snake use of the GGS/Drainage Canal;
- management plans for created marshes and grasslands;
- locations of woodland plantings;
- definition of the USACE encroachment removal policy; and
- preferred method to address FEMA requirements for the SR 99/70 bridge crossing of the NCC.

2.3.2 Levee Raising and Seepage Remediation

2.3.2.1 General Methods

The following subsections provide an overview of the approaches to addressing freeboard deficiencies and seepage potential that would be used in various combinations on the NCC south levee, Sacramento River east levee, and PGCC west levee and describe the proposed extent of land acquisition for flood control facilities.

Levee Raises

All of the NCC south levee reaches, many of the Sacramento River east levee reaches, and several sections of the PGCC west levee lack the required 3 feet of freeboard above the 100-year water surface profile. To meet overall NLIP goals, SAFCA would increase the levee freeboard sufficiently in freeboard-deficient areas to meet the desired minimum of 3 feet of freeboard above the "200-year" water surface profile. The PGCC west levee at Sankey Road, however, would not be raised by SAFCA as part of the proposed project. In all reaches, the final levee configuration must 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. 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 freeboard increases would be accomplished through raises of the existing NCC and PGCC levees, or through construction of the raised adjacent setback levee adjacent to the existing Sacramento River east levee:

- Raise of existing levee (NCC south levee/PGCC west levee). For a minor raise of the levee crown elevation (typically 6 inches or less), the raise may be limited to the levee crown area, provided that 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 NLIP levee raises, however, a greater crown raise is required and/or the levee slopes must 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 requires 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. Exhibit 2-11 illustrates a levee raise and flattening of a landside levee slope from 2H:1V to 3H:1V.

- Adjacent setback levee (Sacramento River east levee). The proposed adjacent setback levee adjoining the Sacramento River east levee (Exhibit 2-7) would be constructed with a crown elevation 3 feet above the "200-year" water surface profile. In the upper reaches, 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 (Exhibit 2-12, top illustration). In the lower reaches, where the existing levee has sufficient freeboard, the adjacent setback levee would be the same height as the existing levee (Exhibit 2-12, bottom illustration).

Seepage Remediation

Underseepage problems can occur where levees are constructed on low-permeability foundation soil (silt and clay) underlain by a higher-permeability layer (sand and gravel). Excessive underseepage makes the levee 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. Exhibit 2-13 illustrates levee underseepage and through-seepage.

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

capability. Of the three remediation methods, seepage berms are generally the preferred engineering method for addressing underseepage in the project area because they are the most reliable and the most adaptable to different geotechnical conditions (e.g., seismic groundshaking or revised design criteria). Relief wells require the least amount of construction disturbance but require routine maintenance and are the least reliable as a large-scale remediation method in the project area. Cutoff walls require little construction disturbance outside the levee footprint, provided that there is sufficient room for construction equipment, but they are often more costly than seepage berms and are less adaptable to changes in engineering standards.

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, where the NCC south levee and the PGCC west levee meet. The reach where the NCC south levee and the Sacramento River east levee meet is being corrected in 2007. The use of cutoff walls in these portions of the levee system would address both through-seepage and underseepage. Therefore, with regard to seepage potential, the focus in the proposed project design is on underseepage remediation.

Underseepage Remediation with 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 (Exhibit 2-14). 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.

For the proposed project, a hybrid type of berm is being considered. This type of berm consists of a soil mass over a drain rock layer covered by a geotextile filter fabric to control the exit gradient of seepage through material underlying the levee. Water travels through the drain rock. The distance the berm extends from the levee is designed to reduce the hydraulic exit gradient of the water to acceptable levels. A seepage collection ditch likely would be constructed at the landward toe of all seepage berms.

Underseepage Remediation with 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 to provide pressure relief beneath surficial fine-grained soils (clay or silt “blanket”) (Exhibit 2-15). 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. Although during elevated river stages they 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.

Relief wells 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 berms. The proposed project includes the strategic placement of relief wells for this purpose. Exhibit 2-16 illustrates the use of relief wells to avoid the removal of a

grove of trees. However, relief wells are not considered to be as reliable as seepage berms because they can become plugged up over time, and they would be installed with the expectation that they would eventually be removed (in 20–30 years) and replaced with berms.

Underseepage Remediation with 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 to gradients specified by the USACE are determined by geotechnical analysis. Cutoff walls for underseepage 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 or a soil-bentonite mix using conventional trench methods, deep soil mixing (DSM), or trench remixing deep (TRD). Additionally, cutoff walls can be constructed either at the levee centerline or at the levee waterside toe. The available working area for construction must be about 30 feet wide. In some locations, the lack of a bench of sufficient width on the water side of the levee, the presence of vegetation, or other factors may preclude construction of a waterside cutoff wall. Because the adjacent setback levee would essentially constitute a new levee along the land side of the existing levee, a cutoff wall could be constructed beneath its waterside slope, along the landside toe of the existing levee, without requiring modification of the existing levee. This possibility is also being analyzed.

Exhibit 2-11 illustrates a typical cutoff wall through a levee centerline.

Conventional slurry 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. Bentonite slurry is pumped into the trench during trench excavation to prevent caving. The 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 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.

Exhibit 2-17 shows typical cutoff wall construction equipment and techniques.

Land Acquisition

Several of the measures described above would increase the footprint of the flood control system: levees would be widened on the land side as a result of raising, construction of an adjacent setback levee, flattening of the waterside and/or landside slopes, and construction of seepage berms. In addition, a 50-foot-wide access and maintenance corridor would be established at the landside toes of the levees or at the ends of the 100-foot seepage berms in the reaches where they are constructed. In reaches with 300-foot seepage berms, SAFCA would establish a 20-foot-wide access and maintenance corridor. The proposed improvements also include a woodland corridor to replace trees that are removed within the levee footprint and maintenance access areas, and canal

construction east of the flood control features. SAFCA also would acquire adjacent land for relocation of infrastructure from the flood control corridor and planned improvements outside the flood control corridor (e.g., GGS/Drainage Canal), with appropriate easements provided to utility owners upon completion of the work. To meet its project footprint needs, SAFCA would acquire private lands in fee and would acquire an easement interest 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.

As part of the proposed project, SAFCA would acquire additional land at the landside toe of the proposed flood control features to prevent encroachment into the flood control system and preserve the land for possible future expansion of flood control facilities, including flattening the land side of the levees to a 5H:1V slope using funding generated through future development fees (see Local Funding EIR Section 3.4.8, "Levee Integrity Program"). If such expansion were to occur, the impacts would be similar to those described in this EIR for the proposed project. However, these improvements have not been planned or designed yet, are not funded, and would not be expected to be constructed for at least 10 years.

Exhibit 2-18 and Table 2-2 identify the parcels within the footprint of the 2008 project components, including those where SAFCA proposes to acquire land through fee title, or in which SAFCA proposes to acquire an easement interest, to implement the 2008 construction elements and preserve adjacent lands. The specific project features are described in Section 2.3.2.2 for the improvements to the NCC south levee; Section 2.3.2.3 for the improvements to the Sacramento River east levee in Reaches 1–4B improvements; and Sections 2.3.3.2 and 2.3.3.3 for the Elkhorn Canal relocation and GGS/Drainage Canal construction, respectively.

Table 2-2
Land Ownership in the Proposed Project Footprint for 2008 Construction

Owner or Parcel Name in EIR Text	Assessor's Parcel Number
Private Landowners	
Brookfield property	35-080-021
Private landowner	35-080-025
Private landowner	35-080-026
Private landowner	35-050-027
Private landowner	35-050-028
Private landowner	35-050-029
Private landowner	35-050-030
Private landowner	35-070-014
Private landowner	35-070-015
Spangler property	35-130-004, 35-130-009, 35-130-010, 35-130-011, 35-130-012, 35-130-013
Vestal property	35-010-001, 35-010-008, 35-130-003, 35-130-007, 35-130-008, 35-104-001
Private landowner	35-010-005
Private landowner	35-010-006
Private landowner	35-010-009
Private landowner	35-010-002
Private landowner	35-010-023
Private landowner	35-020-018
Private landowner	35-020-019

Table 2-2 Land Ownership in the Proposed Project Footprint for 2008 Construction	
Owner or Parcel Name in EIR Text	Assessor's Parcel Number
Private landowner	35-020-020
Private landowner	35-020-017
Private landowner	35-030-002
Private landowner	35-030-008
Private landowner	35-030-012
Private landowner	35-030-013
Private landowner	35-030-006
Private landowner	35-030-007
Private landowner	35-030-016
Private landowner	35-330-013
Private landowner	201-0150-040
Private landowner	201-0150-041
Private landowner	201-0150-042
Private landowner	201-0150-020, 201-0250-041
Private landowner	201-0150-040
Private landowner	201-0250-002
The Natomas Basin Conservancy	
Nestor	35-140-035, 35-140-003, 35-140-004, 35-020-013, 35-020-014, 35-140-015
Bolen South	35-020-016
Frazer	35-070-011, 35-070-012
Lucich North	35-130-016, 35-130-017
Huffman West	35-030-019, 35-030-020, 35-030-021, 35-030-025
Atkinson	35-330-024
County of Sacramento	
County of Sacramento	35-330-014, 35-330-015, 35-330-004 201-0010-008, 201-0010-010, 201-0010-011, 201-0010-015, 201-0010-016, 201-0010-017, 201-0010-018, 201-0010-019, 201-0010-020, 201-0010-021, 201-0010-022, 201-0010-023, 201-0010-024, 201-0010-025, 201-0010-026 201-0130-011, 201-0130-012, 201-0130-032 201-0140-059, 201-0140-063, 201-0140-064, 201-0140-065, 201-0140-066, 201-0140-067 201-0150-055, 201-0150-033
Other	
Natomas Central Mutual Water Company	35-130-018, 201-0010-044, 201-0010-045, 201-0010-046, 201-0010-062, 201-0250-042
Sacramento-San Joaquin Drainage District	35-010-020
Reclamation District 1001	33-280-025

2.3.2.2 NATOMAS CROSS CANAL SOUTH LEVEE (2008 CONSTRUCTION)

General Construction Plan for Improvements to the Natomas Cross Canal South Levee

The proposed project would include raising the entire NCC south levee (Station 0+00 to Station 287+50) and would continue the construction of a seepage cutoff wall from the eastern terminus of the NCC South Levee Phase 1 Improvements (NCC Phase 1 Improvements) being constructed in 2007 to the eastern end of the NCC south levee (approximately Station 58+00 to Station 287+50). Exhibit 2-19 shows the extent of the improvements in plan view.

Volume II of the Local Funding EIR described and analyzed the NCC Phase 1 Improvements, which consist of the construction of a cutoff wall from NCC south levee Station 0+00 to Station 125+00 and Sacramento River east levee Station 0+00 to 5+00 in 2007; however, because of a shortened construction work window, the eastern extent of potential 2007 construction was subsequently limited to Station 58+00. The NCC Phase 1 Improvements, which began in August 2007 and must be completed in September 2007, are intended to complete installation of a cutoff wall for the northernmost 500 feet of the Sacramento River east levee at the NCC interface (Station 0+00 to Station 5+00) and for the NCC south levee from its intersection with the Sacramento River east levee (Station 0+00) to the NMWC Bennett Pumping Plant (Station 58+00). To the extent that installation of the Phase 1 cutoff wall does not reach Station 58+00 during the 2007 construction season, this work would be included in the 2008 construction for the proposed project. The construction activities and quantities of construction materials described in this section are based on the assumption that the Phase 1 construction will reach Station 58+00 in 2007.

Construction of the NCC south levee component of the proposed project is anticipated to begin in May 2008 and continue through November 1, 2008. The work west of SR 99/70 may need to be limited to the period ending September 30, 2008, to avoid potential disturbance of giant garter snake habitat during the species' inactive season. Completion of quality control testing, including continuous core sampling at intervals along the proposed cutoff wall, would continue beyond the November 1, 2008, completion date for levee restoration. Table 2-3 shows the estimated construction schedule. The main construction activities are described below.

Table 2-3
Proposed Construction Schedule for Improvements to the Natomas Cross Canal South Levee (2008 Construction)

Construction Activity	Start Date (2008)	Duration (days)	End Date (2008)
Mobilization	May 8	20	May 30
Clearing and grubbing/stripping	June 2	17	June 20
Levee raising—Station 0+00 to Station 58+00	June 16	87	September 30
Levee degrading—Station 58+00 to Station 287+50	June 16	78	September 17
Cutoff wall installation—Station 58+00 to Station 287+50	June 30	88	October 15
Levee reconstruction and raising—Station 58+00 to Station 287+50	July 22	84	November 1

Source: Data provided by Wood Rodgers in 2007

Cutoff Wall Construction along the Natomas Cross Canal South 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.

As described in Section 2.3.2.1 above, construction of the cutoff wall would include degrading the existing levee to a depth equal to one-third its total height (approximately 6 feet). A 70-foot-deep cutoff wall would be constructed for a total length of 22,950 lineal feet (1.5 million square feet), with the method of installation at the contractor's discretion. Given anticipated schedule constraints, a three-heading, double-shift work schedule is anticipated. 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 under "Raising of the Natomas Cross Canal South Levee."

Approximately 42,000 cubic yards of imported material may be required to provide suitable material for the cutoff wall (estimated based on the assumption that 25% of excavated material would be unsuitable for this use). The unsuitable material would need to be disposed of off-site. Table 2-4 outlines the schedule and equipment anticipated for each phase of the work.

Table 2-4
Anticipated Equipment Types and Duration of Use for
Construction of the Natomas Cross Canal South Levee Cutoff Wall (2008 Construction)

Construction Phase	Equipment Types and Number of Each Type	Duration (days)
Clearing and grubbing/stripping	Elevating scrapers (3)	20
	Water truck (1)	20
	Front-end loader (1)	20
	Haul trucks (12)	20
Levee degrading (lags clearing and grubbing/stripping by 14 days)	Bulldozers (2)	50
	Scrapers (2)	50
	Loader (1)	50
	Water truck (1)	50
Cutoff wall construction (lags levee degrading by 14 days)	Long-reach hydraulic excavators (3)	80
	Front-end loaders (3)	80
	Extended-boom pallet loaders (2)	80
	300-kW generators (3)	80
	Slurry pumps (3)	80
	Pickup trucks (10)	80
	Haul trucks (3)	80
Compaction of degraded material to support levee raising (concurrent with levee degrading)	Bulldozer (1)	50
	Water truck (1)	50
	Sheepsfoot rollers (2)	50
Borrow site excavation (concurrent with cutoff wall construction)	Excavator (1)	80
	Water truck (1)	80
	Haul trucks (5)	80
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 2007

Detailed analyses would be needed to determine the appropriate design for the improvements to the NCC south levee at SR 99/70. Cutoff walls and relief wells are both being considered for this location, which presents significant constraints because of the proximity of the Howsley Road overcrossing and interchange to the land side of the levee. SAFCA's preferred seepage remediation method is to construct the cutoff wall continuously across the highway. This would require temporary and sequential closure of the northbound and southbound lanes as the wall is constructed (see "Traffic Control for Improvements to the Natomas Cross Canal South Levee" below).

The crew size for this phase of the project during its peak activity is estimated at 45–55 people working on three fronts (i.e., at 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.

The information in Table 2-4 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 for off-site disposal. During the cutoff wall construction 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

To obtain a minimum of 3 feet of freeboard above the "200-year" design water surface, the levee would be raised approximately 3 feet using imported material meeting USACE requirements for levee fill. To avoid impacts on the water side of the levee, the raising between Station 0+00 and Station 58+00 would begin on the existing waterside top of slope and extend landward of the existing levee approximately 30 feet. Levee raising between Station 58+00 and Station 215+00 would begin at the waterside slope at the point of levee degrade and build on the compacted levee degrade material at the landside toe. These landside levee raises are depicted in Exhibit 2-20.

Throughout Reaches 6 and 7, Sutter County infrastructure (Howsley Road and related features) and private residences are close to the NCC south levee. A portion of Howsley Road, the Morrison Canal, a roadway drainage pump station, and three residences and outbuildings would need to be relocated to accommodate the landward levee raise in Reaches 6 and 7. If hydraulic modeling shows that channel hydraulics would not be affected by a waterward raise, however, the levee would be raised waterward from approximately Station 215+00 to Station 251+00 (where Howsley Road parallels the south levee), encroaching on the NCC channel approximately 30 feet. See Exhibit 2-21 for a typical waterside levee raise.

Between Stations 251+00 and 281+00, the levee would be raised on the land side, similar to Stations 0+00 through 215+00. As the levee approaches the residence and outbuildings west of Reach 7, between Stations 281+00 and 287+00, the levee would also be raised landward; however, to minimize the landside encroachment, the waterside toe of the raised levee would be shifted waterward, beginning at the ordinary high-water mark (elevation 34.6 feet). Smooth transition distances of up to 200–500 feet would link the waterward and landward raises. If hydraulic modeling indicates that unacceptable hydraulic impacts would not result from the waterside levee raising, only two structures in Reach 7 (a residence and a semimobile trailer) would require removal or relocation.

In some locations where the levee would be raised on the land side, the existing waterside slope is currently steeper than 3H:1V. In these locations, the levee would be shifted farther landward and the waterside slope would be trimmed to a 3H:1V slope. An exception to this practice would be at locations where dense vegetation is located at the waterside toe (primarily between Station 0+00 and Station 45+00). At these locations, a waterside bench would be cut at elevation 31 or 34 feet, where the slope would transition from the existing slope to the new 3H:1V slope. Below the level of the bench, the existing slope line would be retained so that vegetation removal would be avoided; above this bench, the oversteepened slope would be trimmed back to the 3H:1V slope line.

Elevation 31 feet was selected for consistency of elevation in much of the affected levee length, with a transition to elevation 34 feet in a few locations where the vegetation is denser at a higher elevation. This cut would produce approximately 25,000 cubic yards of material, which would be used as supplemental fill for levee raising. The new landside slope also would be 3H:1V. Where the levee would be raised on the water side, all vegetation on the water side would be removed to facilitate placement of the new material to a 3H:1V slope. An 18-inch-thick riprap blanket would be placed from an elevation of 3 feet (approximately the mean summer water elevation) to the channel invert to protect the new levee embankment toe from wave erosion. The landside slope also would be stripped and the slope would be flattened to 3H:1V. Existing stability berms would be incorporated into the landside slope flattening. A minimum 20-foot-wide area along the landside toe would be raised a minimum of 1 foot above adjacent field level for maintenance access.

Approximately 400,000 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.

Table 2-5 lists the equipment and number of days it would be used for the major construction activities associated with levee raising.

Table 2-5
Anticipated Equipment Types and Duration of Use for Raising the Natomas Cross Canal South Levee (2008 Construction)

Construction Phase	Equipment Types and Number of Each Type	Duration (days)
Levee raising	Dozer (1)	85
	Water trucks (2)	85
	Sheepsfoot compactors (4)	85
	Water truck (1)	85
Borrow site excavation (concurrent with levee raising)	Excavators (5)	85
	Dozer with Ripper (1)	85
	Water truck (1)	85
	Haul trucks (30)	85
Finish grading (follows levee raising)	Motor graders (2)	10
	Water trucks (2)	10
Operating road construction (follows finish grading)	Haul trucks (5)	10
	Smooth drum rollers (2)	10
	Motor graders (2)	5

Source: Data provided by Wood Rodgers in 2007

The crew size for this phase of the project during its peak is estimated at 55–65 people working 12-hour shifts, 6 days a week, Monday through Saturday. Again, it is anticipated that equipment maintenance activities would be conducted on Sundays and would require a minimal crew.

Removal of Structures for Improvements to the Natomas Cross Canal South Levee

As noted above under "Raising of the Natomas Cross Canal South Levee," relocation of Howsley Road, the Morrison Canal, a roadway drainage pump station, and three residences and outbuildings would be required by landward levee raises in Reaches 6 and 7. If hydraulic modeling indicates that unacceptable hydraulic impacts

would not result from waterside levee raising in Reaches 6 and 7, only two structures in Reach 7 (a residence and a semimobile trailer) would require relocation as a result of the proposed levee improvements.

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" 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.

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.

Between Station 0+00 and Station 19+00 of the NCC south levee, 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 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, a low-lying area between the levee landside toe and an operating road for the Lucich North Habitat Preserve would be filled to raise the grade of the operating road at the landside 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 in-place borrow quantity is 485,000 cubic yards. Adding a 20% swell factor for haul, the total hauling is 580,000 cubic yards. The truck counts for hauling this material are included in Tables 2-4 and 2-5 above.

The RD 1001 borrow site described in Section 2.2.2 would be permitted and used for the NCC levee improvements. The potential haul routes from the RD 1001 site are shown in Exhibit 2-22.

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 the California Department of Transportation 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 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, as described in Section 2.3.4.3 below.

2.3.2.3 Sacramento River East Levee Reaches 1–4B (2008 Construction)

General Construction Plan for Improvements to Sacramento River East Levee Reaches 1–4B

The 2008 construction plan for the Sacramento River east levee would include improvements from the northern end of Reach 1 at the NCC south levee through a portion of Reach 4B (approximately Station 0+00 to Station 214+00). The beginning of a woodland tree grove at Station 214+00 serves as the lower limit of the 2008 work.

As discussed above (see Section 2.1.1.2, "Levee Encroachments and the Adjacent Setback Levee Concept," and Section 2.3.2.1, "General Methods"), 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 adjacent to 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 landside slope. It would be constructed of compacted random fill material from borrow sources and from the excavation of the existing landside stability berm. Exhibit 2-12 (top illustration) shows these dimensions in cross section.

In Reach 1, where no seepage berm is proposed, the maintenance corridor on the land side of the levee would be elevated and sloped to ensure access for inspection and maintenance of the levee when the adjacent fields are

irrigated or the adjacent land is saturated from rainfall. In the other reaches, where seepage berms are proposed, the berms would provide an elevated corridor above the nearby agricultural fields.

Table 2-6 summarizes the proposed improvements by reach. Exhibit 2-23 shows the project features in these reaches in plan view, including the extent of the adjacent setback levee, berms, and permanent right-of-way/maintenance access; also shown are the areas around existing roadway intersections that would need to be raised and potential woodland planting locations.

Table 2-6
Proposed Improvements to the Sacramento River East Levee in Reaches 1–4B (with Adjacent Setback Levee) (2008 Construction)

Reach	Beginning Station	Ending Station	Length (feet)	Average Raise Height (feet)	Underseepage Remediation
1	00+00	48+00	4,800	2.36	None
2	48+00	100+00	5,200	2.32	100-foot seepage berm
3	100+00	110+00	1,000	2.43	100-foot seepage berm
4A	110+00	208+00	9,800	2.30	100-foot seepage berm
4B	208+00	214+00	600	2.35	300-foot seepage berm

Source: Data provided by HDR in 2007

For 2008 construction of improvements to the Sacramento River east levee, 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 are anticipated to be constructed between May 1, 2008, and November 1, 2008. Some related activities, such as utility relocations and removal or relocations of residential or agricultural structures, may be conducted before May 1, and site restoration and demobilization would extend through November.

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 the adjacent levee alignment and existing dirt roads used for access to the work areas; soil borrow areas; and paved roads, including Powerline, Sankey, and Riego Roads.

Construction Sequence for Improvements to Sacramento River East Levee Reaches 1–4B

Table 2-7 provides a summary of the major construction activities, their potential schedule and durations, and the anticipated work shifts needed to complete them. The duration of each sequence is given in actual construction days. The construction sequence can be divided into four different headings in order to avoid 24-hour construction days. The activities are described in the following subsections. The actual construction sequence would be determined by the construction contractor and may vary from the sequence described below. The crew size during its peak is estimated at 60 people per shift working 12-hour shifts. The total number of required shifts can be found in Table 2-7.

Table 2-7
Overview of Construction Sequence for Proposed Improvements to the Sacramento River East Levee in Reaches 1–4B (2008 Construction)

Construction Activity	Estimated Start Date (2008)	Estimated End Date (2008)	Estimated Duration (days)	Number of Headings	Anticipated Number of 12-Hour Shifts
Power pole relocation		Before May 1	–	–	–
Mobilization	May 1	June 1	27	1	1
Site preparation (tree removal, clearing, grubbing, stripping)	June 1	July 1	25	2	50
Relocation of canal and removal of landside structures and other facilities	May 1	May 28	24	2	48
Excavation of stability berm and inspection trench	July 1	July 15	14	4	48
Construction of adjacent levee raise and seepage berms	July 15	October 16	80	4	320
Reconstruction of Garden Highway at intersections	September 1	October 1	27	2	54
Installation of surface drainage outlets across Garden Highway	September 1	October 1	27	2	54
Site restoration and demobilization	November 1	November 30	26	2	52

Source: Data provided by HDR in 2007

Power Pole Relocation

Power poles that currently exist on the landside slope of the levee and at the levee toe would need to be relocated and/or rerouted to accommodate the widened levee footprint. Poles could be relocated to the water side of the existing levee embankment (on the opposite side of the Garden Highway) or placed on special footings within the levee and berm slopes. Tree pruning would likely be required in some locations to accommodate the power poles and wires. The relocations would be conducted by the utility companies in coordination with 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 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, the seepage berm areas, and the 50-foot-wide 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 or berms would be relocated outside of the footprint to new woodland planting areas, where a substantial number of new trees would also be planted (see

Section 2.3.4.3). 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

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 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.

Removal of Landside Structures and Other Facilities

Residences and other farm structures that are within the proposed footprint of the adjacent setback levee embankment, berms, and 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. 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.

Construction of Adjacent Levee Raise and Seepage Berms

At the borrow sites, dozers would excavate the borrow material and push it into stockpiles. Front-end loaders would load haul trucks with the material for transport to the levee construction sites. At the levee construction sites, the haul trucks would dump the borrow material and motor graders would spread it evenly. Sheepsfoot rollers would be used to compact the material as water trucks ensure proper moisture control. The same sequence would be used for construction of the hybrid seepage berms. An aggregate base access road would be constructed on the crown of the new levee.

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. 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.

Installation of Surface Drainage Outlets across Garden Highway

Between the adjacent setback levee and the Garden Highway pavement, a new storm drain system 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 located approximately 200–500 feet apart, and new pipe laterals would convey the water beneath Garden Highway to the waterside slope (Exhibit 2-24). 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, as described under "Reconstruction of Garden Highway at Intersections," would be required during this phase of construction.

Site Restoration and Demobilization

Upon completion of construction activities, the levee slopes and the tops of the seepage berms would be hydroseeded. Any construction debris would be hauled to an appropriate waste facility. Equipment and materials would be removed from the site, and staging areas and any temporary access roads would be restored to preproject conditions. Demobilization would likely occur in various locations as construction proceeds along the project alignment.

Borrow Quantities and Material Hauling for Improvements to Sacramento River East Levee Reaches 1–4B

Most of the fill needed for construction would be random fill for the construction of the levee raise and the top layer of the hybrid seepage berm. Drain rock and soil material excavated from the existing stability berm and inspection trench would also be used for construction. Table 2-8 shows the quantity of each fill item needed and the expected source. The random fill quantity includes a 25% shrinkage factor to account for volume loss during placement. Table 2-8 also summarizes the number of haul trips per day and the number of 12-hour work days necessary to complete the movement and placement of fill. Assuming a 6-day-per-week work schedule, this equates to a 93-day construction window. If this window is increased, the number of truck trips per day would decrease. Haul trips for each material type were calculated conservatively estimating 15 cubic yards of material per truck. Note that for some material it may be possible to use a scrape-and-place method that would eliminate 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 2008 are shown in Exhibit 2-25. The borrow areas for 2008 construction would be converted to managed marsh habitat and potentially upland habitat, as described in Section 2.3.4.3.

Table 2-8
Quantities of Fill and Haul Trips Required for Proposed Improvements to the Sacramento River East Levee in Reaches 1–4B (2008 Construction)

Material Type	Quantity (cubic yards)	Haul Trips per Day [1]	Source (Average Round-Trip Haul Distance)
Random Fill	1,161,000	980	Vestal/Spangler—preferred major source (3 miles)
			Brookfield property—alternative major source (13 miles)
			Airport north properties—alternative major source (3 miles)
			Bolen South/Nestor—preferred additional source (3 miles)
Reusable Fill	146,000	130	Levee degrade (0.1 mile)
Drain Rock	207,000	180	Commercial source (30 miles)
Aggregate Base	8,100	10	Commercial source (30 miles)
Total	1,522,100	1,300	

Note:
[1] Conservatively assumes truck capacity of 15 cubic yards, 108-day construction window, and use of haul trucks for all material.
Source: Data provided by HDR in 2007

Construction Equipment for Improvements to Sacramento River East Levee Reaches 1–4B

Table 2-9 summarizes the types of equipment that may be used throughout the construction sequence, along with an approximation of the duration of each activity.

Table 2-9
Anticipated Equipment Types and Duration of Use for Proposed Improvements to Sacramento River East Levee Reaches 1–4B (2008 Construction)

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 (2) Motor graders (4) Haul trucks (8)	25 25 25 25 25 25
Relocation of canal and removal of landside structures and other facilities	Excavators (4) Haul trucks (4) Front-end loaders (2)	24 24 24
Excavation of stability berm and inspection trench	Excavators (4) Scrapers (4) Haul trucks (10)	13 13 13
Construction of adjacent levee raise and seepage berms (includes borrow site activities)	Scrapers (10) Excavators (4) Front-end loaders (4) Haul trucks (15 cu. yd.) (60) Bulldozers (4) Sheepsfoot compactors (6) Motor graders (6) Water trucks (5)	80 80 80 80 80 80 80 80

Table 2-9
Anticipated Equipment Types and Duration of Use for Proposed Improvements to Sacramento River East Levee Reaches 1–4B (2008 Construction)

Construction Phase	Equipment Type and Number of Each Type	Work Days
Reconstruction of Garden Highway at two intersections	Backhoes (2) Smooth drum compactors (2) Asphalt pavers (2) Haul trucks (8)	27 27 27 27
Installation of surface drainage outlets across Garden Highway	Backhoes (2) Concrete trucks (6) Roller compactors (2) Asphalt paver (1) Haul truck (1)	27 27 27 27 27
Site restoration and demobilization	Hydroseeding trucks (2) Water trucks (2) Haul trucks (2)	26 26 26

Note: cu. yd. = cubic yards
Source: Data provided by HDR in 2007

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 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, as described in Section 2.3.4.3 below.

2.3.2.4 Sacramento River East Levee Reaches 4B–20A (2009–2010 Construction)

Program Level of Project Detail for Construction of Improvements to Sacramento River East Levee Reaches 4B–20A

As explained earlier in this EIR in Section 1.3.2, "Combined Program and Project EIR," and Section 2.3.1, "Overview of the Proposed Project Elements," the elements of the project that are proposed for construction in 2009–2010 are described and evaluated in this EIR at a programmatic level. The documentation in this EIR will provide SAFCA with the environmental information needed to support its decision whether to support policy-level choices regarding the physical configuration of the 2009 and 2010 components. The 2009 and 2010 components would then be analyzed at a project level of detail in one or more additional CEQA documents. Accordingly, the design and construction of the improvements to the Sacramento River east levee proposed for 2009–2010 construction are described in less detail than the 2008 construction elements (improvements to the NCC south levee and Sacramento River east levee Reaches 1–4B) described above.

General Construction Plan for Improvements to Sacramento River East Levee Reaches 4B–20A

The 2009–2010 improvements to the Sacramento River east levee would extend from Reach 4B (below Station 214+00) through Reach 20A (Station 925+50) (Exhibit 2-26). It is anticipated that construction of improvements to the Sacramento River east levee would encompass Reaches 4B–6A and 9B–11B in 2009 and Reaches 6B–9A and 12–20A in 2010. The construction season is assumed to be May 1–November 1 in both 2009 and 2010.

Required Freeboard Increases and Proposed Underseepage Remediation for Sacramento River East Levee Reaches 4B–20A

Levee crown raises are required to provide adequate freeboard above the 100-year design water surface elevation in Reaches 4B–10 and above the "200-year" design water surface elevation in Reaches 11A and 11B. 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 4B–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. The upper illustration in Exhibit 2-12 shows the adjacent setback levee as it would be constructed in Reaches 4B–11B, with a crown elevation above that of the existing levee; the lower illustration shows the adjacent setback levee as it would be constructed in Reaches 12–19B, with a crown elevation the same as that of the existing levee.

Underseepage remediation is required in many of the reaches from 4B through 20A. Reach 20B has sufficient freeboard for the "200-year" 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 seepage remediation measures is proposed for Reaches 4B–20A. In addition to seepage berms, as described for Reaches 1–4B, cutoff walls and relief wells are proposed for some reaches. The general plan for construction of the adjacent setback levee would be as described in Section 2.3.2.3 for Reaches 1–4B, with the addition of cutoff wall construction and relief well installation.

Table 2-10 shows the required levee crown raises and proposed underseepage remediation by reach. Exhibit 2-26 shows the anticipated footprint of the flood control facilities and the access and maintenance area. Although Table 2-10 and Exhibit 2-26 indicate 300-foot seepage berms for some reaches, the use of cutoff walls is being evaluated further for these areas.

Table 2-10
Proposed Improvements to the Sacramento River East Levee in Reaches 4B–20B (with Adjacent Setback Levee in Reaches 4B–19B) (2009–2010 Construction)

Reach	Beginning Station	Ending Station	Length (feet)	Average Raise Height (feet)	Underseepage Remediation[1] Required to Meet 100-Year Requirement[2]
4B	214+00	228+00	1,400	2.4	300-foot seepage berm with relief wells at tree groves
5A	228+00	263+00	3,500	1.5	100-foot seepage berm with relief wells at tree groves
5B	263+00	280+00	1,700	1.6	None[3]
6A	280+00	303+00	2,300	2.0	300-foot seepage berm
6B	303+00	330+00	2,700	2.0	95-foot-deep relief wells (50-foot right-of-way) Cutoff wall at pump station and reservoir
7	330+00	362+00	3,200	2.2	None
8	362+00	402+00	4,000	2.0	300-foot seepage berm with relief wells at tree groves
9A	402+00	407+00	500	1.4	None
9B	407+00	468+10	6,110	1.4	None

Table 2-10
Proposed Improvements to the Sacramento River East Levee in Reaches 4B–20B (with Adjacent Setback Levee in Reaches 4B–19B) (2009–2010 Construction)

Reach	Beginning Station	Ending Station	Length (feet)	Average Raise Height (feet)	Underseepage Remediation[1] Required to Meet 100-Year Requirement[2]
10	468+10	495+00	2,690	1.5	300-foot seepage berm with relief wells at tree groves Cutoff wall at pump station
11A	495+00	535+00	4,000	1.1	None[3]
11B	535+00	635+00	10,000	1.1	None[3]
12	635+00	667+00	3,200	0	None
13	667+00	700+00	3,300	0	30-foot-deep relief wells (50-foot right-of-way) Cutoff wall at pump station
14	700+00	732+00	3,200	0	None
15	732+00	780+00	4,800	0	100-foot seepage berm
16	780+00	832+00	5,200	0	None
17	832+00	842+00	1,000	0	100-foot seepage berm
18A	842+00	848+00	600	0	None
18B	848+00	857+00	900	0	None
19A	857+00	875+00	1,800	0	100-foot seepage berm
19B	875+00	925+00	5,000	0	None[3]
20A	925+00	925+50	50	0	Pump station cutoff wall and jet grouting
20B	925+50	960+00	3,450	0	Existing cutoff wall meets criteria

Notes:
[1] Additional analysis is under way regarding the use of cutoff walls in place of some 300-foot berms.
[2] Underseepage remediation is shown as a project component only for areas that do not meet criteria for the 100-year profile. Seepage remediation will be required in the future in additional reaches to meet the "200-year" profile. All remediation needed at this time, both raises and seepage improvements, will be designed for the "200-year" profile.
[3] Seepage remediation required for "200-year" profile.
Source: Data provided by HDR in 2007

Removal of Structures and Vegetation along Sacramento River East Levee Reaches 4B–20A

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 (see Exhibit 2-26).

Use of Relief Wells to Avoid Removal of Structures and Trees along Sacramento River East Levee Reaches 4B–20A

As described under "Underseepage Remediation with Relief Wells" in Section 2.3.2.1, the proposed project includes the strategic use of relief wells to avoid some structures and tree groves that would otherwise have to be removed for the construction of seepage berms. In an effort to decrease project costs and negative impacts on residents and the environment, seepage berms are proposed to be interrupted and relief wells used around existing homes and large tree groves where feasible. Drainage canals would be installed to collect well discharge water and transport it to existing pump stations or detention areas. Tables 2-11 and 2-12 list the locations of the

residences and woodland tree groves, respectively, that may be protected with relief wells. The locations of the indicated relief well arrays are shown in Exhibit 2-26.

Table 2-11
Potential Stationing of Relief Wells for Protection of Residences along Sacramento River East Levee Reaches 4B–20A (2009–2010 Construction)

Beginning Station	Ending Station	Length (feet)	Reach	Width of Seepage Berm (feet)
381+00	386+00	500	8	300
486+00	497+00	1100	10	300
535+00	540+00	500	11	100
665+00	670+00	500	13	300

Source: Data provided by HDR in 2007

Table 2-12
Potential Stationing of Relief Wells for Protection of Woodland Tree Groves along Sacramento River East Levee Reaches 4B–20A (2009–2010 Construction)

Beginning Station	Ending Station	Length (feet)	Reach	Width of Seepage Berm (feet)
214+00	218+50	450	4B	300
226+00	232+00	600	4B	300
300+00	303+00	300	6	300
399+00	401+00	200	8	300
485+00	498+00	1300	10	300
538+00	542+00	400	11	100
555+00	560+00	500	11	100
617+00	621+00	400	11	100
686+00	693+00	700	13	300

Source: Data provided by HDR in 2007

Relief wells would provide the necessary seepage remediation in the near term; however, they require routine maintenance and are expected to have a useful life of 20–30 years. After this period, it is expected that the relief wells, trees, and structures would be removed and the berms would be completed. The timing of removal of the relief wells and completion of the berms has not been determined, and this activity is not currently being planned or designed; it is described as a potentially foreseeable future action in Chapter 4, "Cumulative Impacts." (See Section 2.3.4.3, "Habitat Creation and Management," for a description of the planting and maintenance of trees to offset losses that would result from construction of the adjacent setback levee and berms and probable future losses upon removal of the relief wells.) Depending on right-of-way negotiations with the owners of the residential structures, the structures could be purchased and removed in the near term during the 2009 and 2010 construction.

Material Quantities and Borrow Sources for Improvements to Sacramento River East Levee Reaches 4B–20A

Table 2-13 shows the anticipated fill quantities for the adjacent setback levee and proposed seepage remediation measures.

Table 2-13
Material Quantities Anticipated for Proposed Improvements to the Sacramento River East Levee in Reaches 4B–20A (2009–2010 Construction)

Material Type	Quantity (cubic yards)	Haul Trips per Day
Random fill	2,663,000	Approx. 1,100
Reusable fill	170,150	10–150
Drain rock	352,000	120–190
Aggregate base	22,700	20
TOTAL	3,207,850	Approx. 1,300–1,400

Source: Data provided by HDR in 2007

Borrow material is anticipated to be obtained from Airport bufferlands north and south of the Airport Operations Area and from among parcels in the Fisherman's Lake area (see Exhibit 2-8). The borrow sites would be converted to managed marsh and managed grassland under public agency or TNBC ownership after the removal of borrow material (see Section 2.3.4.3).

Miscellaneous Construction Elements for Improvements to Sacramento River East Levee Reaches 4B–20A

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.

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, as described in Section 2.3.4.3 below.

Issues Requiring Further Planning for Improvements to Sacramento River East Levee Reaches 4B–20A

Several aspects of the 2009–2010 construction elements for Sacramento River east levee Reaches 4B–20A remain to be investigated further for development of a more specific project proposal, which would be evaluated in one or more future CEQA documents. These include seepage remediation methods for reaches indicated as requiring 300-foot seepage berms, greater definition of the locations of seepage well arrays, identification of specific borrow sites for 2010 construction, and requirements for encroachment removal.

2.3.2.5 PLEASANT GROVE CREEK CANAL WEST LEVEE (2009–2010 CONSTRUCTION)

The PGCC west levee is vulnerable to seepage and stability concerns and does not have the requisite 3 feet of freeboard over the "200-year" flood elevation. The proposed project 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 2010 on this component of the NLIP. Details of the proposed improvements will be developed based on additional geotechnical studies and cost analysis, and the improvements will be evaluated further in one or more future CEQA documents. The improvements are expected to consist of the following:

- an average levee raise of 1 foot,
- 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 RD 1001 site northeast of the Natomas Basin (Exhibit 2-8). Construction of the PGCC west levee improvements would 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. Approximately 25 acres of the 120-acre RD 1001 borrow site would be used to provide the required earthen material.

The postproject site condition (grass-covered levee slopes and berms) and long-term maintenance practices would be as described in Section 2.3.4.3 below.

2.3.3 MAJOR IRRIGATION AND DRAINAGE INFRASTRUCTURE

2.3.3.1 OVERVIEW OF MAJOR DRAINAGE AND INFRASTRUCTURE MODIFICATIONS

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. 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 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. 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 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 irrigation canals, the relocated canals would be constructed and operational before construction of planned levee improvements that would conflict with 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 2009 (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. In 2009, the remainder of the Elkhorn Canal and the Riverside Canal relocations would be constructed. Therefore, the entire irrigation system could be watered and operational before the old canals are abandoned and filled as part of the 2010 levee improvements (Reaches 6B–9A and 12–20A). The GGS/Drainage Canal from the North Drainage Canal to Elkhorn Reservoir 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 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.

Finally, the proposed project would include the removal of a deep culvert beneath the levee section at the RD 1000 Pumping Plant No. 2 location and the replacement of a relocated RD 1000 Pumping Plant No. 2, which was removed from the western end of the North Drainage Canal in response to underseepage observed during extended winter storms in January 2006.

Exhibit 2-27 shows the locations of the major irrigation and drainage improvements described in this section.

2.3.3.2 RELOCATION OF THE ELKHORN AND RIVERSIDE CANALS (2008 AND 2009 CONSTRUCTION)

General Construction Plan for Relocated Canals

The Elkhorn and Riverside irrigation canals would be constructed with sufficient height to raise water levels above the levels of adjacent fields. Design water levels would be based on existing levels at service points along the alignment and the tops of embankments would provide for 1 foot of freeboard. To provide for stable banks, side slopes of 3H:1V would be used. 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.

Elkhorn Canal

Approximately 22,300 feet of the Elkhorn Canal would be relocated to accommodate the levee construction. This facility is a main irrigation canal that services NMWC's Central and Elkhorn systems from their Prichard and Elkhorn Pumping Plants on the Sacramento River. Located at the north end of the canal, the Prichard Pumping Plant has a design capacity of approximately 150 cubic feet per second (cfs). The Elkhorn Pumping Plant, located near the center of the Elkhorn Canal at Reservoir Road, has a design capacity of approximately 60 cfs. Approximately 100 field services, roadway crossings, and diversion boxes are located along the canal. The

services, roadway crossings, and diversion boxes would need to be replaced as part of the proposed project. Approximately 1 mile of the existing Elkhorn Canal is concrete lined; the remainder is earth lined.

The main irrigation canals feed a number of lateral irrigation canals and service gates for individual fields (irrigation turnouts). The canal cross section is based on maintaining water levels at each of these service points. Based on required water levels and using 1 foot of freeboard, the top of the embankment can be set. The cross-sectional area of the canal is based on the conveyance capacity required to maintain the downstream water service elevations at each service point with the allowable head provided at the pumping plants during peak flow operation. Generally, canals are operated with very flat slopes because of limited available elevation fall between the pumping plants and the service points. The canals also must have sufficient level-control structures (check structures) to maintain water levels at service points when flows are at a minimum.

The proposed alignment of the new Elkhorn Canal is based primarily on the extent of the planned levee improvements. The canal was sited as close as possible to the projected toe of the new levee (with allowance made for a future 5H:1V landside levee slope). After this initial alignment was determined, a number of site-specific factors were considered and used to refine the alignment. The final alignment minimizes conflicts with known cultural resources sites and existing trees. Based on these site-specific factors and the variations in the proposed seepage remediation methods in different reaches, the alignment is only roughly parallel to the projected levee toe.

North of Elkhorn Reservoir, the maximum bottom width of the new canal would be 20 feet. The top-of-canal embankment (approximately elevation 32+/- North American Vertical Datum 1988) would be 15 feet wide on the field side of the canal to provide a patrol road for operation and 15 feet wide on the levee side for maintenance. A right-of-way width of approximately 150 feet would be required for the canal construction north of Elkhorn Reservoir. Exhibit 2-28 shows the canal cross section through this reach.

The alignment of the Elkhorn Canal through Teal Bend Golf Club is under study. One proposed alignment is through the golf course along Walnut Road. An alternative alignment would be along the levee toe landward of the flood control facility corridor, approximately 220 feet from the existing centerline of Garden Highway based on the proposed levee improvements (Exhibit 2-27). This alignment would infringe on the existing golf course greens and fairways of at least three holes located along Garden Highway. To minimize the impacts on 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 cleaned.

South of Elkhorn Reservoir, the proposed bottom width of the canal would likely be narrower, and final design would be based on required capacity.

Riverside Canal

Approximately 18,600 feet of the Riverside Canal would be relocated to accommodate the levee construction. This facility is a main irrigation canal that services NMWC's Riverside system. The supply for this canal is the Riverside Pumping Plant, a 45-cfs pumping plant on the Sacramento River just north of Radio Road. The canal flows south along the toe of the levee to approximately Bryte Bend Road. The canal south of Bryte Bend Road is abandoned. The canal north of the Riverside Pumping Plant is supplied by relifted water at RD 1000's Pumping Plant No. 3, which is equipped with a 20-cfs lift pump for NMWC. From Plant 3, the canal flows north approximately 950 feet and turns away from the levee. Approximately 80 field services, roadway crossings, and diversion boxes are located along the canal. The turnouts, roadway crossings, and diversion boxes would need to be replaced as part of this project.

Like the Elkhorn Canal alignment, the alignment of the Riverside Canal would be based primarily on the extent of the planned levee improvements. The canal would be sited as close as possible to the projected toe of the new levee (allowing for a future 5H:1V landside levee slope). After this initial alignment is determined, a number of

other factors would be considered and used to refine the alignment. One-half to 3/4 mile south of San Juan Road southward to I-80, there are a number of residences along the landside toe of the levee. To avoid bisecting these private properties, it is likely that the Riverside Canal alignment would follow the eastern property line of these parcels. The final alignment would also aim to minimize conflicts with existing trees and any other site-specific constraints that are identified during design. Based on these site-specific factors and the variation of the proposed seepage remediation methods in different reaches, the alignment would be only roughly parallel to the projected levee toe.

The proposed bottom width of the relocated Riverside Canal would be determined during final design to meet existing capacity needs.

2008 Elkhorn Canal Construction

The 2008 construction plan would include the new Elkhorn Canal from the North Drainage Canal to Elkhorn Reservoir, between Reach 4B and Reach 6B (Exhibit 2-29). 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 season (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 would be required to complete construction of the canal embankment. After the completion of construction, the new Elkhorn Canal would be put into service and the existing Elkhorn Canal would be dewatered and allowed to dry up.

The 2008 work would begin in May 2008 and continue over a 6-month period through October 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 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. Table 2-14 shows the overview of the construction schedule.

Table 2-14
2008 Construction Season Schedule for the Relocated Elkhorn Canal and the New GGS/Drainage Canal

Construction Phase	May	June	July	August	September	October
Mobilization						
Clearing and grubbing/stripping						
Grading, relocation, reconnecting turnouts, piping, etc.						
Finishing site and grading work						
Restoration						
Demobilization/cleanup						

Clearing and Grubbing/Stripping

Preparation for canal construction would entail using bulldozers/scrapers to clear and grub/strip the surface to a depth of 4–6 inches and remove low-growing vegetation and loose surface soils. Suitable materials removed during this stage could be stockpiled. Unsuitable material would be wasted and hauled off-site. The right-of-way for the canal that would need to be cleared (including GGS/Drainage Canal right-of-way) is approximately 225 feet wide. Bulldozers/scrapers and front-end loaders would be used to excavate and move material. Water trucks would be used to control dust and dump trucks would be used to haul unsuitable materials away.

This phase of construction would commence immediately after mobilization and would most likely occur in multiple sections of the Elkhorn Canal and GGS/Drainage Canal alignments simultaneously.

Utility Relocation

Utility poles in the path of the canal construction would need to be relocated before any excavation. Backhoes, cranes, and flatbed trucks would be used to excavate and move utility poles and other structures. A compactor would be used to compact and stabilize the area.

Natural gas pipelines, wells, and other gas facilities would be avoided in design of the Elkhorn Canal and GGS/Drainage Canal.

Pump Discharge Pipe Extension

Because the new Elkhorn Canal would be relocated farther from NMWC's pumping plants than the existing canal, additional pipe would need to be installed to maintain the connections between the pumping plants and the irrigation canals. In particular, discharge pipes would need to be extended at Prichard Pumping Plant and Elkhorn Pumping Plant. Pipes would be transported to the site on flatbed trucks. Excavators and backhoes would be used to dig the pipe trench and lay the sections of welded steel pipe and backfill the trench. The trench would be deep enough to provide for a minimum of 12 inches of cover. A small compactor would be used to compact the soil over the pipe. The discharge piping would be above the "200-year" water surface elevation across the levee. The construction of pipelines at the existing Prichard Pumping Plant would occur during the 2008 construction season, and at the Elkhorn Pumping Plant pipeline construction would occur during the 2009 construction season.

Water Control Facility Construction

New facilities that would be constructed include distribution boxes, gate valves, cast-in-place concrete headwalls and control structures, culverts, and a proposed concrete-lined sediment basin adjacent to Elkhorn Reservoir. Backhoes and excavators would be used to excavate material for the new facilities. Precast distribution boxes, pipes, and other appurtenances would be transported to the site on flatbed trucks. Other concrete facilities would be poured in place and concrete would be transported to the site in ready-mix and boom concrete pumper trucks. Small compactors would be used to compact fill material around the facilities.

Embankment and Access Road Construction

The existing Elkhorn Canal is a highline canal, and construction of its replacement would require little or no excavation but a large amount of borrow material. The bottom of the new Elkhorn Canal channel would be approximately at existing ground level. During construction, approximately 100,000 cubic yards of borrow material would be required to build up the embankments of the new canal, which would be approximately 4 feet above the channel bottom with 3H:1V side slopes. Bulldozers and graders would be used to move and shape the embankment material, sheepsfoot and smoothdrum rollers would be used to compact the embankment material, and water trucks would be used on-site for dust control and moisture conditioning.

Approximately 20,000 cubic yards of fill would need to be hauled on-site from a nearby borrow source for construction of the new Elkhorn Canal in 2008. The anticipated borrow source is TNBC's Nestor site, with other identified NLIP borrow sources as a backup.

Canal Lining

The bottom of the Elkhorn Canal channel would be lined with concrete to provide for maintenance between seasons while minimizing impacts on the adjacent canal banks. Ready-mix and concrete pumper trucks would be required to apply the concrete to the bottom of the channel. It is anticipated that approximately 3,000 cubic yards of concrete would be required in 2008 for the proposed Elkhorn Canal lining.

Irrigation Interconnections

This phase includes work required to interconnect the proposed Elkhorn Canal with the existing irrigation canals within the Natomas Basin. Excavators and backhoes would be used to trench any connectors and motor graders would be used to shape the embankments. A water truck would be used to control dust and provide moisture conditioning during the excavation and construction of the interconnection facilities. Canal interconnections would be performed before the abandonment of the existing Elkhorn Canal.

Erosion Control

Erosion control measures would be installed before the start of construction and would be maintained throughout the construction period to prevent sedimentation of adjacent waterways. A hydroseeding truck would be used at the end of construction to seed any disturbed area. Water trucks would be used throughout the construction period to control dust in any disturbed areas.

Irrigation Canal Abandonment

Once the newly constructed canal is completed and operable, the existing Elkhorn Canal would be abandoned. Irrigation flows would be rerouted to the new canal and the existing canal would be dewatered and abandoned. The filling of the abandoned Elkhorn Canal between Reaches 4B and 6B would take place as part of the 2009–2010 levee construction.

Portions of farm canals and other irrigation canals would be abandoned because of the relocation of the Elkhorn Canal. Such segments that are outside the footprint of the proposed levee improvements would be filled after the relocation of the Elkhorn Canal is completed. Dump trucks would be used to haul fill material to those canals, rollers would be used to compact the fill, and water trucks would be used for dust control.

Demobilization/Cleanup

This phase includes dismantling any temporary facilities, hauling away any leftover construction materials, and cleaning up the site. All disturbed areas would be reseeded and graded to drain. A front-end loader and dump trucks would used to move materials. This phase of construction would also entail general cleanup and hauling away unused and waste materials. All construction equipment would be removed.

Table 2-15 lists the estimated construction equipment requirements for each construction phase of the relocated Elkhorn Canal between the North Drainage Canal and Elkhorn Reservoir.

Table 2-16 lists the material sources, estimated quantities, estimated hauling requirements, and waste quantities and hauling requirements for the 2008 construction of the relocated Elkhorn Canal. The TNBC Nestor site would be the soil borrow source, with other identified NLIP borrow sources as a backup. The Nestor site would be converted to marsh and upland habitat after the removal of borrow.

Table 2-15
Anticipated Equipment Requirements and Duration of Use
for Construction of the Relocated Elkhorn Canal Segment in 2008

Construction Phase	Equipment Types and Number of Each Type	Work Days
Clearing and grubbing/stripping	Dozers (4)	6
	Water trucks (2)	6
	Front-end loaders (4)	6
Utility relocation	Dozers (2)	12
	Excavators (2)	12
	Compactor (1)	6
Water control facility construction	Backhoes (2)	16
	Flatbed trucks (2)	16
	Generators (2)	16
	Compactors (2)	6
Embankment and access road construction	Dozers (2)	55
	Sheepsfoot rollers (2)	55
	Water trucks (2)	55
	Smooth drum rollers (2)	3
	Motor graders (2)	55
Canal lining	Boom trucks (2)	8
	Concrete pump (1)	8
Irrigation interconnections	Excavators (2)	4
	Water truck (1)	4
	Motor grader (1)	4

Table 2-15
Anticipated Equipment Requirements and Duration of Use for Construction of the Relocated Elkhorn Canal Segment in 2008

Construction Phase	Equipment Types and Number of Each Type	Work Days
Pump discharge pipe extension	Excavators (2)	8
	Front-end loaders (2)	8
	Welders (2)	8
	Crane (1)	8
	Small compactor (1)	8
	Water truck (1)	8
Erosion control	Hydroseeding truck (1)	1
	Water truck (1)	15
Irrigation canal abandonment	Loaders (2)	8
	Compactors (2)	8
Demobilization/cleanup	Truck (1)	1
	Front-end loader (1)	1

Table 2-16
Hauling Requirements for Construction of the Relocated Elkhorn Canal Segment in 2008

Construction Phase	Material Source	Material Destination	Volume (cubic yards)	Number of Trucks[1]	Total Truck Trips per Day	Days to Complete
Clearing/grubbing	Project	Waste	4,000	10	80	4
Embankment construction	Borrow	Irrigation ditch[2]	20,000	10	100	10
Embankment construction	GGS/Drainage Canal	Irrigation ditch	See Table 2-20	–	–	–
Concrete delivery	Off-site	Project	2,600	10	40	9
Miscellaneous deliveries	Off-site	Project	NA	NA	1	16
Finish grading	Off-site	Seeding	7,000	2	2	14

Notes:
GGS = Giant Garter Snake; NA = not available
[1] Truck capacity is assumed to be 15 cubic yards.
[2] Assumes an average round trip haul of 4 miles.

2009 Construction of the Elkhorn and Riverside Canals

The 2009 construction plan would include the relocation of the remainder of the Elkhorn Canal (south of Elkhorn Reservoir) and the relocation of the Riverside Canal. The 2009 construction would include the same construction phases 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 scheduled for construction in 2010.

As noted above, during the 2009 construction season, the following activities would take place, in addition to the general canal construction activities described for the 2008 construction season:

- Elkhorn Reservoir would be dewatered and piping from the Elkhorn Pumping Plant would be extended to the new settling basin, at which time Elkhorn Reservoir would be abandoned and filled.

- The pipelines from the Elkhorn and Riverside Pumping Plants to the relocated irrigation canals would be constructed.

Table 2-17 lists the construction phases and estimated construction equipment requirements for this effort.

Table 2-17
Anticipated Equipment Requirements and Duration of Use for Construction of the Relocated Elkhorn and Riverside Canal Segments in 2009

Construction Phase	Equipment Types and Number of Each Type	Duration (days)
Clearing and grubbing/stripping	Dozers (4)	15
	Water trucks (2)	15
	Front-end loaders (4)	15
Utility relocations	Dozers (2)	30
	Excavators (2)	30
	Compactor (1)	15
Facility construction	Backhoes (2)	45
	Flatbed trucks (2)	45
	Generators (2)	45
	Compactors (2)	15
Embankment and access road construction	Dozers (2)	145
	Sheepsfoot rollers (2)	145
	Water trucks (2)	145
	Smooth drum rollers (2)	8
	Motor graders (2)	145
Canal lining	Boom trucks (2)	22
	Concrete pump (1)	22
Irrigation interconnections	Excavators (2)	12
	Water truck (1)	12
	Motor grader (1)	12
Pump discharge pipe extension	Excavators (2)	22
	Front-end loaders (2)	22
	Welders (2)	22
	Crane (1)	22
	Small compactor (1)	22
	Water truck (1)	22
Erosion control	Hydroseeding truck (1)	3
	Water truck (1)	15

Table 2-17 Anticipated Equipment Requirements and Duration of Use for Construction of the Relocated Elkhorn and Riverside Canal Segments in 2009		
Construction Phase	Equipment Types and Number of Each Type	Duration (days)
Irrigation canal abandonment	Loaders (2)	22
	Compactors (2)	22
Demobilization/cleanup	Truck (1)	3
	Front-end loader (1)	3

Table 2-18 lists the material sources, estimated quantities, estimated hauling requirements, and waste quantities and hauling requirements for the 2009 construction of the relocated Elkhorn and Riverside Canals.

Table 2-18
Hauling Requirements for Construction of the Relocated Elkhorn and Riverside Canal Segments in 2009

Construction Phase	Material Source	Material Destination	Volume (cubic yards)	Number of Trucks[1]	Total Truck Trips per Day	Days to Complete
Clearing/grubbing	Project	Waste	11,000	10	80	10
Embankment construction	GGS/Drainage Canal	Project	See Table 2-22	–	–	–
Concrete delivery	Off-site	Project	6,900	10	40	22
Miscellaneous deliveries	Off-site	Project	NA	NA	1	45
Finish grading	Off-site	Seeding	18,000	2	2	36

Notes:
GGS = Giant Garter Snake; NA = not available
[1] Truck capacity is assumed to be 15 cubic yards

2.3.3.3 NEW GGS/DRAINAGE CANAL (2008 AND 2009 CONSTRUCTION)

General Construction Plan for the GGS/Drainage Canal

The new GGS/Drainage Canal would provide connectivity of aquatic habitat between the North Drainage Canal and Fisherman's Lake to enhance giant garter snake migration within the Natomas Basin. 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 be incorporated 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.

The portion of the GGS/Drainage Canal that would be constructed in 2008 would be adjacent to the Elkhorn Canal. Thus, the alignment was based on the same factors discussed above for the Elkhorn Canal. The alignment of the GGS/Drainage Canal is shown in Exhibits 2-27 and 2-29.

The GGS/Drainage Canal would have a series of check structures along its length to maintain consistent water levels in the low-flow channel of the canal during the snake's active season (April to October). Supplemental water would be provided from NMWC's irrigation system. The low-flow channel would have a top width of approximately 50 feet and an average depth of approximately 6 feet. Vegetation within the canal would be managed by mowing and/or excavation. Canal management is described in Section 2.3.4.3.

North of Reservoir Road (Exhibit 2-30), 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. 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. One proposed alignment is through the golf course, along Walnut Road. An alternative alignment would run east along Reservoir Road north of the golf course and then south along the golf course's eastern boundary.

South of Teal Bend Golf Club and north of I-5 (Exhibit 2-31), 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. 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 GGS/Drainage Canal Construction

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 (Exhibit 2-27), 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 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.

Construction of the GGS/Drainage Canal would include the same construction phases as described above for the Elkhorn Canal, with differences highlighted below. Unlike the Elkhorn Canal, however, the GGS/Drainage Canal would not be concrete lined.

Clearing and Grubbing/Stripping

Refer to the discussion described above for the 2008 Elkhorn Canal construction.

Utility Relocation

Refer to the discussion above for the 2008 Elkhorn Canal construction.

Excavation and Trenching

The top of bank for the GGS/Drainage Canal would be approximately at existing ground level. During construction, a trench at least 6 feet deep and an average width of 55 feet would need to be excavated for the construction of the GGS/Drainage Canal. It is anticipated that approximately 85,000 cubic yards of excavated material would be stockpiled for use during construction of the Elkhorn Canal embankments.

Facility Construction

Refer to the discussion above for the 2008 Elkhorn Canal construction.

Embankment and Access Road Construction

Refer to the discussion above for the 2008 Elkhorn Canal construction.

Reclamation

Reclamation would include planting tules on the sloped banks. Backhoes would be used to prepare the planting areas and a water truck would be used to control dust.

Drainage Interconnections

This phase includes work required to interconnect the new GGS/Drainage Canal with the existing drainage canals within the Natomas Basin. Excavators would be used to trench any connectors and motor graders would be used to shape the embankments. A water truck would be used to control dust and provide moisture conditioning during the excavation and construction of the interconnection facilities.

Erosion Control

Refer to the discussion above for the 2008 Elkhorn Canal construction.

Demobilization/Cleanup

Refer to the discussion above for the 2008 Elkhorn Canal construction.

Table 2-19 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.

Table 2-19
Anticipated Equipment Requirements and Duration of Use for Construction of the New GGS/Drainage Canal Segment in 2008

Construction Phase	Equipment Types and Number of Each Type	Duration (days)
Clearing and grubbing/stripping	Dozers (4)	18
	Water trucks (2)	18
	Front-end loaders (10)	18
Utility relocations	Dozers (2)	16
	Excavators (2)	16
	Compactor (1)	8
Excavation and trenching	Scrapers (4)	10
	Excavators (2)	14
	Water trucks (2)	14
Facility construction	Backhoes (2)	24
	Flatbed trucks (2)	24
	Generators (2)	24
	Compactor (1)	8
Embankment and access road construction	Dozers (2)	8
	Sheepsfoot rollers (2)	8
	Water trucks (2)	8
	Smooth drum rollers (2)	4
	Motor graders (2)	8
Reclamation	Backhoes (2)	16
	Water trucks (2)	16
Drainage interconnections	Excavators (2)	6
	Water truck (1)	6
	Motor grader (1)	6
Erosion control	Hydroseeding truck (1)	1
	Water truck (1)	15
Demobilization/cleanup	Truck (1)	1
	Front-end loader (1)	1

Table 2-20 lists the material sources, estimated quantities, estimated hauling requirements, and waste quantities and hauling requirements for the 2008 GGS/Drainage Canal construction.

Table 2-20
Hauling Requirements for Construction of the New GGS/Drainage Canal Segment in 2008

Construction Phase	Material Source	Material Destination	Volume (cubic yards)	Number of Trucks[1]	Total Truck Trips per Day	Days to Complete
Clearing/Grubbing	Project	Waste	20,000	20	80	18
Excavation	–	–	–	–	–	–
Scraper	Project	Irrigation ditch	31,000	Scraper to levee		
Trucked[2]	Project	Irrigation ditch	54,000	30	300	12
Concrete delivery	Off-site	Project	30	1	1	5
Miscellaneous deliveries	Off-site	Project	NA	NA	1	4
Finish grading	Off-site	Seeding	8,000	2	2	16

Notes:
[1] Truck capacity is assumed to be 15 cubic yards.
[2] Assumes average round trip haul of 2 miles.

2009 GGS/Drainage Canal Construction

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 2-21 lists the construction phases and estimated construction equipment requirements for this effort.

Table 2-21
Anticipated Equipment Requirements and Duration of Use for Construction of the New GGS/Drainage Canal Segment and West Drainage Canal Improvements in 2009

Construction Phase	Equipment Types and Number of Each Type	Duration (days)
Clearing and grubbing/stripping	Dozers (4)	28
	Water trucks (2)	28
	Front-end loaders (10)	28
Utility relocations	Dozers (2)	24
	Excavators (2)	24
	Compactor (1)	12
Excavating and trenching	Scrapers (4)	55
	Excavators (2)	76
	Water trucks (2)	76
Facility construction	Backhoes (2)	36
	Flatbed trucks (2)	36
	Generators (2)	36
	Compactor (1)	12

Table 2-21
Anticipated Equipment Requirements and Duration of Use for Construction of the New GGS/Drainage Canal Segment and West Drainage Canal Improvements in 2009

Construction Phase	Equipment Types and Number of Each Type	Duration (days)
Embankment and access road construction	Dozers (2)	12
	Sheepsfoot rollers (2)	12
	Water trucks (2)	12
	Smooth drum rollers (2)	6
	Motor graders (2)	12
Reclamation	Backhoes (2)	24
	Water trucks (2)	24
Drainage interconnections	Excavators (2)	9
	Water truck (1)	9
	Motor grader (1)	9
Erosion control	Hydroseeding truck (1)	2
	Water truck (1)	15
Demobilization/cleanup	Truck (1)	2
	Front-end loader (1)	2

Table 2-22 lists the material sources, estimated quantities, estimated hauling requirements, and waste quantities and hauling requirements for the 2009 GGS/Drainage Canal construction.

Table 2-22
Hauling Requirements for Construction of the New GGS/Drainage Canal Segment and West Drainage Canal Improvements in 2009

Construction Phase	Material Source	Material Destination	Volume (cubic yards)	Number of Trucks[1]	Total Truck Trips per Day	Days to Complete
Clearing/grubbing	Project	Waste	30,000	20	80	27
Excavation	–	–	–	–	–	–
Scraper	Project	Irrigation ditch	180,000	Scraper to levee		
Trucked[2]	Project	Irrigation ditch	310,000	30	300	70
Concrete delivery	Off-site	Project	45	1	1	7
Miscellaneous deliveries	Off-site	Project	NA	NA	1	6
Finish grading	Off-site	Seeding	12,000	2	2	24

Notes:
NA = not available
[1] Truck capacity is assumed to be 15 cubic yards.
[2] Assumes average round trip haul of 2 miles.

2.3.3.4 AIRPORT WEST DITCH (2009 CONSTRUCTION)

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 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 the proposed NLIP improvements. 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 improvements required to reroute these flows would be implemented along with the GGS/Drainage Canal construction.

Table 2-23 lists the anticipated equipment requirements for modifications to the Airport West Ditch.

Table 2-23
Anticipated Equipment Requirements and Duration of Use for Airport West Ditch Modifications in 2009

Construction Phase	Equipment Types and Number of Each Type	Duration (days)
Clearing and grubbing/stripping	Dozers (2)	10
	Water truck (1)	10
	Front-end loaders (2)	10
Excavation and trenching	Excavators (2)	20
	Front-end loaders (2)	20
	Water truck (1)	20
Pipeline rehabilitation	Excavators (2)	10
	Dump truck (1)	10
	Generator (1)	10
	Water truck (1)	10
	Small compactor (1)	2

Table 2-23 Anticipated Equipment Requirements and Duration of Use for Airport West Ditch Modifications in 2009		
Construction Phase	Equipment Types and Number of Each Type	Duration (days)
Backfill and finish grading	Compactors (2)	10
	Front-end loaders (2)	10
	Water truck (1)	10
Erosion control	Hydroseeding truck (1)	1
	Water truck (1)	15
Demobilization/cleanup	Truck (1)	1
	Front-end loader (1)	1

Table 2-24 lists the estimated hauling equipment requirements for modifications to the Airport West Ditch.

Table 2-24 Hauling Requirements for Airport West Ditch Improvements in 2009						
Construction Phase	Material Source	Material Destination	Volume (cubic yards)	Number of Trucks[1]	Total Truck Trips per Day	Days to Complete
Clearing/grubbing	Project	Waste	2,000	2	8	20
Filling existing ditch	Borrow site	Existing ditch	15,000	10	80	13
Miscellaneous deliveries	Off-site	Project	NA	NA	1	5
Finish grading	Off-site	Seeding	650	1	1	3

Notes:
NA = not available
[1] Truck capacity is assumed to be 15 cubic yards.

2.3.3.5 PUMPING PLANT NO. 2 IMPROVEMENTS (2008 AND 2009 CONSTRUCTION)

Removal of Culvert at Pumping Plant No. 2 Site (2008 Construction)

SAFCA would undertake a second phase of the levee repairs and facility removal adjacent to the RD 1000 Pumping Plant No. 2 site at the west end of the North Drainage Canal as part of the proposed project. The first phase of repairs 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.

The second phase of work at this site includes: (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 last activity, reconstruction of the pumping plant, would be conducted in 2009 and is described in the next subsection.

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 (North American Vertical Datum 88).

Total excavation volume is approximately 48,000 cubic yards. Excavated material would be stored on the site along the dewatered section of the North Drainage Canal, east of the abandoned sump, and in an adjacent agricultural field along the canal.

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. A temporary plastic fabric-lined ditch at the outfall of this pipe would also be relocated to provide for sufficient staging and stockpile areas. A short irrigation system outage would be taken to allow for relocation of the pipe and ditch.

The levee section would be reconstructed with an engineered fill. Suitable levee embankment soil from the excavation stockpile would be reused for levee reconstruction. Where necessary, materials would be mixed with imported select materials. Approximately 17,000 cubic yards of select embankment materials would be imported from the project borrow sources.

Heavy equipment that would be required for construction includes the following: semi flatbed and/or box trucks to deliver equipment and materials; a crane to drive sheet pilings for additional shoring needs; dump trucks to haul debris, stockpile excavated levee material, and import select soil materials for levee reconstruction; two hydraulic excavators; two dozers for stripping and stockpiling material, a grader, water truck, and front-end loader for maintenance of haul roads and stockpiles; and a roller compactor for levee construction. On-site activities would generate up to 80 truck trips per day during excavation stockpiling for approximately 5 weeks. Normal deliveries and construction personnel would generate an additional approximately 10 round trips per day. During import of materials, 10–15 trucks would be used, generating approximately 60 round-trip truck trips per day for approximately 5 weeks.

Pumping Plant No. 2 Reconstruction and Relocation (2009 Construction)

In response to underseepage observed during extended winter storms in January 2006, RD 1000's Pumping Plant No. 2 was taken out of service and dismantled. RD 1000 also filled the intake channel section approximately 600 feet away from (east of) the Sacramento River east levee and drove sheet piles through the ring levee embankment between the sump for the pump station and the adjacent canal to further cut off the underseepage, as described above. 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" flood elevation in the Sacramento River to maintain the design level of flood protection.

The two 300-horsepower pumps would be operated by electricity most of the time. However, an emergency diesel generator would be used in case of power outages. A single 1,000-gallon diesel tank would be installed at the plant. This system would require monthly testing.

Table 2-25 lists the construction phases and estimated construction equipment requirements for the construction of Pumping Plant No. 2.

Table 2-25
Anticipated Equipment Requirements and Duration of Use for Pumping Plant No. 2 Construction in 2009

Construction Phase	Equipment Types and Number of Each Type	Duration (days)
Clearing and grubbing/stripping	Dozer (1)	2
	Water truck (1)	2
	Front-end loader (1)	2
Dewatering	Crane (1)	15
	Pile driver (1)	15
	Front-end loader (1)	15
	Generator (1)	180
Excavation/trenching	Excavator (1)	3
	Front-end loader (1)	3
Foundation construction	Crane (1)	30
	Pile driver (1)	30
	Front-end loader (1)	30
	Generator (1)	30
Concrete construction	Boom truck (1)	60
	Generator (1)	60
	Concrete pump (1)	10
Pipeline construction	Excavator (1)	30
	Welders (2)	30
	Crane (1)	30
	Front-end loader (1)	30
	Small compactor (1)	5
	Water truck (1)	5

Table 2-25 Anticipated Equipment Requirements and Duration of Use for Pumping Plant No. 2 Construction in 2009		
Construction Phase	Equipment Types and Number of Each Type	Duration (days)
Backfill and finish grading	Front-end loader (1)	10
	Dozer (1)	10
	Water truck (1)	10
	Compactor (1)	10
	Motor grader (1)	2
Electrical and mechanical equipment installation and start-up	Crane (1)	5
Erosion control	Hydroseeding truck (1)	1
	Water truck (1)	15
Demobilization/cleanup	Trucks (2)	1
	Front-end loader (1)	1

Table 2-26 lists the material sources, estimated quantities, estimated hauling requirements, and waste quantities and hauling requirements for the construction of Pumping Plant No. 2.

Table 2-26 Hauling Requirements for Pumping Plant No. 2 Construction in 2009						
Construction Phase	Material Source	Material Destination	Volume (cubic yards)	Number of Trucks[1]	Total Truck Trips per Day	Days to Complete
Clearing/stripping	Project	Waste	200	2	8	2
Excavation/backfill	Project	Stockpile at site	1,900	2	20	7
Dewatering	Project	Project	NA	1	1	15
Pipeline and foundation rock backfill	Off-site	Project	1,000	5	20	4
Foundation and pipe pile supports	Off-site	Project	NA	2	4	3
Concrete delivery	Off-site	Project	300	2	4	10
Pipe	Off-site	Project	NA	2	8	4
Rock	Off-site	Project	700	2	10	5
Miscellaneous deliveries	Off-site	Project	NA	NA	1	30
Equipment supply	Off-site	Project	NA	1	1	5
Finish grading	Off-site	Project	100	1	1	1

Notes:
NA = not available
[1] Truck capacity is assumed to be 15 cubic yards.

2.3.4 HABITAT DEVELOPMENT AND MANAGEMENT (BEGINNING IN 2008)

2.3.4.1 SUMMARY OF LAND COVER CHANGES

As described in previous sections of this chapter, the proposed project includes elements providing at least 100-year flood protection as quickly as possible, while (1) laying the groundwork to achieve at least "200-year" flood protection over time, (2) facilitating changes in the management of Airport lands that reduce hazards to aviation safety, and (3) enhancing habitat values by increasing the extent and connectivity of the lands in the Natomas Basin managed to provide habitat for giant garter snake, Swainson's hawk, and other special-status species. The project features have been developed with the goal of meeting these multiple objectives simultaneously to the extent feasible. Postproject land cover types and management practices are proposed to offset the loss of preproject habitat values on affected lands and maximize the habitat value of the project features to the extent feasible.

The following is a summary of the anticipated changes in land cover associated with the 2008–2010 proposed project elements:

- **Flood control facility footprint:** The flood control facility footprint and maintenance access area would be on land currently occupied by cropland (mainly row crops, some rice) and field margins, groves of woodlands, and the Elkhorn and Riverside Canals. After project completion, the levee slopes, berms, and right-of-way would have a managed grass cover. The levee crown would be topped with a roadway.

- **New canal alignments:** The alignments of the relocated irrigation canals and GGS/Drainage Canal would generally be on lands currently in row crops.

- **New woodland areas:** Woodlands would most likely be planted on land that has been in row crops; they may be spread around the margins of TNBC properties.

- **Airport north and south bufferlands (borrow source):** Cropland in the Airport's northern bufferlands, recently in rice cultivation or fallowed rice land, would be converted to managed marsh adjacent to existing TNBC marsh, and to a large area of grassland. Cropland in the Airport's southern bufferlands, currently or recently in row crops and grains, would be converted to managed grassland, possibly with a woodland component.

- **Vestal and/or Spangler property (borrow source):** Part of this privately owned land in rice cultivation would be used for borrow and converted to managed marsh, and the rest would be retained in rice cultivation.

- **RD 1001 borrow site, Brookfield property (potential borrow source), and Fisherman's Lake properties (specific parcels to be determined):** This identified borrow site and other potential borrow sources are currently used for rice cultivation and would be converted to managed marsh after borrow material is removed.

- **TNBC Bolen South and Nestor parcels (borrow sources):** These TNBC parcels are planned for managed marsh and upland habitat. SAFCA would remove borrow material and facilitate construction of the planned habitats.

The land cover conversions are summarized in Table 2-27 in terms of general habitat types. Exhibits 2-32 and 2-33 show the existing and proposed land cover types, respectively, on the lands within the footprint of the proposed project features. Note that although the Vestal, Spangler, and Brookfield properties are all shown, only one is likely to be used for borrow.

Table 2-27
Summary of Pre-Project and Post-Project Land Cover Types by Location

Land Cover Type and Location	Created Landscape (Acres)		Existing Landscape (Acres)									
			Field Crop		Rice		Open Water/Canal		Woodland		Developed	
	2008	2009–2010	2008	2009–2010	2008	2009–2010	2008	2009–2010	2008	2009–2010	2008	2009–2010
Project Footprint and Additional Right-of-Way												
Levee/berm grassland	82	200	67	130	7	23		25	3	22		
Project ROW grassland	5	138	5	138								
Canal grassland	19	76	19	76								
Canal aquatic	16	64	16	64								
Woodland	25	125	25	125								
Project ROW developed	15	45									15	45
Subtotal	**162**	**648**	**132**	**533**	**7**	**23**		**25**	**3**	**22**	**15**	**45**
Borrow Sites												
Managed marsh (Airport)	130				130							
Managed marsh (Natomas)	120				120							
Managed marsh (RD 1001)	30	20			30	20						
Airport grassland		500				500						
Preserved rice crop	130				130							
Subtotal	**410**	**520**			**410**	**520**						
Total	**572**	**1,168**	**132**	**533**	**417**	**543**		**25**	**3**	**22**	**15**	**45**
Summary of Acreages by Landscape Type												
Field crop			132	533								
Grassland	106	914										
Woodland	25	125							3	22		
Rice	130				417	543						
Managed marsh	280	20										
Canal aquatic	16	64						25				
Developed	15	45									15	45
Total	**572**	**1,168**	**132**	**533**	**417**	**543**		**25**	**3**	**22**	**15**	**45**

Notes:
RD = Reclamation District; ROW = right-of-way

2.3.4.2 MANAGEMENT ENTITIES FOR PROJECT FEATURES

Agencies and organizations that would have management responsibility for proposed project features are SAFCA, RD 1000, NMWC, the Airport, 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. The Bolen South and Nestor properties are owned by TNBC and would be managed as marsh and upland habitat after SAFCA's removal of borrow material and site restoration. In addition, private land acquired by SAFCA and converted to managed marsh or used for woodland establishment likely would 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).

2.3.4.3 HABITAT CREATION AND MANAGEMENT

New GGS/Drainage Canal

See the description of the construction and planting of the new GGS/Drainage Canal in Section 2.3.3.3 above.

The new GGS/Drainage Canal would 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 the portion of the West Drainage Canal that is proposed for enhancement, 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 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) 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.

Managed Marsh Creation and Rice Preservation

Several soil borrow sites 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. Examples of preliminary designs of marsh habitat are shown in Exhibits 2-34 and 2-35. These design templates feature a combination of uplands and shallow water bodies, sinuosity of swales, and good water control structures to manage precise water levels at different times of the year. 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 potentially hazardous to aircraft at low elevations approaching or departing from runways. An essential component of the managed marshes would be procurement of a firm, reliable water supply and good water quality throughout the giant garter snake's active season of April–October. Created marshes on the Airport's northern properties, Vestal or Spangler properties, and Fisherman's Lake area parcels would be situated adjacent to existing TNBC marsh preserves, thereby providing for greater contiguous management areas and enhancing the overall habitat value of the adjacent preserves.

Large portions of properties that SAFCA obtains for borrow operations that would not be needed for borrow extraction (e.g., an anticipated 100–120 acres on the Vestal or Spangler property) would be retained in rice cultivation through an arrangement with a grower or TNBC.

Managed Grassland on Levee Slopes and Seepage Berms

The proposed levee improvements would result in landside slopes that are less steep than the existing slopes, and several reaches of the Sacramento River east levee would have adjoining 100- to 300-foot-wide earthen seepage berms with 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 would 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 than others specifically 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.

Managed grasslands may include nonirrigated hay, irrigated hay, irrigated pasture, and grazed annual grassland. Management of nonirrigated hay would include crop selection, groundwork and planting, application of fertilizers, and cutting. In the Sacramento Valley, rye grass and oats can be grown as nonirrigated hay crops.

Management of irrigated hay would include crop selection, groundwork and planting, irrigation, application of herbicides and fertilizers, and cutting. A variety of forage plants could be grown as irrigated hay, including perennial rye grass, oats, clover, vetch, alfalfa, Sudangrass, and other species.

Management of irrigated pasture would include irrigation, grazing, and maintenance of fences and other infrastructure. Pastures would be swathed or grazed as needed by cattle or sheep, and irrigated from April to October. The primary objective of grazing irrigated pasture would be to maintain vegetation at a low height (i.e., less than 12 inches). Alternatively, grazed pastures could be swathed to achieve the same objective.

Grazed annual grasslands would be grazed on a seasonal basis value that occurs on annual grasslands during summer. Grazing generally results in vegetation of varied height ranging from 4 to 24 inches. If available animals are not sufficient to maintain vegetation at a desired height, annual grassland could be swathed.

In areas that are not adjacent to the Airport runways, grasslands may be managed more specifically as Swainson's hawk foraging habitat. Management practices would be similar to those described above. Outside the 10,000-foot Critical Zone, enhancement of Swainson's hawk foraging and nesting habitat would also be permissible, provided that enhancement activities would not result in a net increase in hazardous wildlife species diversity or abundance over baseline conditions, and in particular, with the approach/departure zone of the two runways and the planned third parallel runway that may be constructed between the years 2020 and 2030.

Woodlands

Woodlands consisting of native riparian species would be established at several sites as a component of the proposed project. SAFCA would acquire and plant woodland tree and shrub species on approximately 150 acres of existing cropland or fallow or ruderal sites. Selection of the locations of created woodlands would depend on the availability of suitable parcels as SAFCA acquires land 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.

As described in Section 2.3.2.4 under "Use of Relief Wells to Avoid Removal of Structures and Trees along Sacramento River East Levee Reaches 4B–20," 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 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 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).

2.3.5 Additional Actions to Meet FEMA Requirements: Encroachment Management and Bridge Crossing Modifications (2009–2010 Construction)

2.3.5.1 Encroachment Management

USACE levee guidance that is under development 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. As described above, the landside slopes of the improved existing NCC south levee, the adjacent setback levee along the Sacramento River east levee, the PGCC west levee, and seepage berms would be planted and maintained in grasses. No woody vegetation would be allowed to become established on these features.

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. 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. Along the land side of the adjacent setback levee, only minor encroachment removal is anticipated. This would include the removal of existing power poles on the existing landside slope. Removal of some waterside slope encroachments may be required by the end of 2010 for USACE acceptance that the system meets FEMA criteria for the 100-year level of protection.

2.3.5.2 BRIDGE CROSSINGS

Under applicable FEMA 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 41.6. The plane of the northbound crossing is 45.4, and the plane of the southbound crossing is 43.4. To meet FEMA requirements, SAFCA will consider the following options for implementation in conjunction with 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 so as 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.

The appropriate alternative would be determined as part of further consideration of project design for the 2009–2010 project features.

2.4 ABILITY OF THE PROPOSED PROJECT TO MEET THE PROJECT OBJECTIVES

The specific objectives of the proposed project analyzed in this EIR are to:

(1) 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,

(2) 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

(3) use flood control projects to enhance habitat values by increasing 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.

The proposed project would meet these objectives in the following ways:

- The improvements to the flood control system described in Section 2.3 would provide the system with a 100-year level of protection and improve the levee system to a "200-year" level of protection in some reaches. In addition to the proposed increases in levee freeboard and seepage remediation, construction of the adjacent setback levee would provide greater assurance that the USACE will accept that the flood control system meets FEMA criteria for the 100-year level of protection than if the existing levee were raised and improved in place, given the uncertainties about future requirements for encroachment and vegetation removal and the substantial amounts of encroachments and large woody vegetation on the water side of the existing Sacramento River east levee. Acquisition of additional right-of-way would protect the flood control facilities from future encroachments that could undermine the integrity of the facilities and would allow for possible future expansion.

- 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 would 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 would 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 would 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 would 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 enhance their foraging value for Swainson's hawk, within the constraints of the management requirements for Airport safety and maintenance of the flood control system.

- The new GGS/Drainage Canal would provide connectivity of the areas of known giant garter snake populations in the northern and southern parts of the basin and would provide a high-quality movement corridor managed specifically for this species.

- New managed marsh would be created on parcels adjacent to existing marsh habitats managed by TNBC, thus expanding overall managed habitat and improving connectivity between management units for dispersal of the species.

- Woodlands spread throughout the basin would increase potential nest sites for Swainson's hawks and other bird species.

2 PROJECT DESCRIPTION 1