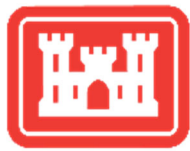


OPERATION, MAINTENANCE, REPAIR, REPLACEMENT,
AND REHABILITATION MANUAL
FOR

**SANTA ANA RIVER MAINSTEM
LOWER SANTA ANA RIVER CHANNEL
(ORANGE COUNTY, CA)**



**US Army Corps
of Engineers**
Los Angeles District

January 2024

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OPERATION, MAINTENANCE, REPAIR, REPLACEMENT, AND REHABILITATION MANUAL

SANTA ANA RIVER MAINSTEM LOWER SANTA ANA RIVER CHANNEL

PART I – INTRODUCTION

AUTHORITY

1. This manual is prepared pursuant to the Code of Federal Regulations, Title 33, Article 208.10, Section 7, 68 Stat 809; 33 USC 709, which directs the operation and maintenance procedures for all structures and facilities constructed by the United States for local flood protection. In accordance with paragraph 10 of Section (a), and subsequent Engineering Regulations adopted by the Department of the Army, an Operation and Maintenance Manual for each completed project will be furnished to local interests to assist them in carrying out their obligations. The Code of Federal Regulations (Extract) is included in this manual as Appendix I. Certain activities carried out under this manual may require authorization under Section 404 of the Clean Water Act (33 U.S.C. 1344), Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403), Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972, as amended (33 U.S.C. 1413), or Section 14 of the Rivers and Harbors Act of 1899 (33 U.S.C. 408).
2. Preparation of the Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R) manual is informed by the U.S. Army Corps of Engineers (USACE, Corps) Engineering Regulations (ER) 1130-2-500, 1130-2-530, and 1110-2-401. Together these regulations guide the preparation of operation and maintenance (O&M) manuals and the policy for the O&M of USACE flood control and related structures at civil works water resource projects and of USACE-built flood protection projects operated and maintained by non-Federal sponsors. The result is an OMRR&R manual that outlines the responsibilities of those local sponsors that have entered into binding agreements with the Secretary of the Army to be solely responsible for the OMRR&R and to pay 100 percent of the associated costs.
3. Revisions to the OMRR&R manual is covered by ER 1110-2-401, which states USACE may update the manual for changed conditions or, if warranted, to correct conditions discovered during inspections. Such updating will be performed in consultation with the project sponsor. The policy further states that the project sponsor may prepare supplements to the manual subject to review and approval of USACE. Revisions are also discussed in Part VI – Operation, Inspections, and Maintenance Reports of this manual, which requires submittal of the OMRR&R Manual Revision Report. The Manual Revision Report should include suggestions, observed discrepancies or inaccuracies and comments relative to this manual's effectiveness in fulfilling its intended function and recommendation to be incorporated into updates of the OMRR&R manual, where appropriate.

PURPOSE

4. This manual is intended to guide the operation, maintenance, repair, replacement and rehabilitation of flood control facilities constructed by the Federal Government and maintained under the auspices of Orange County Flood Control District (OCFCD), also referred to as the County, Sponsor, Local Sponsor, or Superintendent, operating under the Orange County Public Works (OCPW). This manual specifies the policies and procedures that are part of the statutory responsibilities of USACE regarding the operation and maintenance of these facilities to be performed by the Sponsor.

REFERENCED TERMS

5. This manual refers to certain terms such as “flood control” and “free board” that are no longer used in contemporary USACE projects but were part of the original authorizing language. The current usage for “flood control” is flood risk management and for “free board” is risk and uncertainty analysis.

PARTS OF MANUAL

6. This manual is prepared in seven parts.

- | | |
|-------------|--|
| a. PART I | Part I is an introduction to this manual. |
| b. PART II | Part II consists of a description of the project along with pertinent information and construction history. |
| c. PART III | Part III consists of a summary of general operation and maintenance responsibilities. |
| d. PART IV | Part IV consists of the operation procedures for all facilities and appurtenant structures. |
| e. PART V | Part V discusses maintenance procedures with corollary responsibilities, including periodic inspections, investigations, test programs, training of personnel, project modifications review under Section 408 Permit, and USACE inspection of completed works and the training of personnel. |
| f. PART VI | Part VI describes submittal requirements and the preparation of the various required reports. |
| g. PART VII | Part VII describes USACE’s Regulatory Permit Program. |

7. APPENDICES

- | | |
|------------------|---|
| a. APPENDIX I | Code of Federal Regulations (Extract). |
| b. APPENDIX II | Authorizing Document and Local Cooperation Agreement (LCA). |
| c. APPENDIX III | Sample Reporting Forms. |
| d. APPENDIX IV | Sample Permit Application and Site Access Form. |
| e. APPENDIX V | Basis for Recommending Repairs. This appendix is expanded beyond the features of the authorized project to assist in evaluating other non-Federal flood control projects. |
| f. APPENDIX VI | Maps and Data Sheets. This appendix includes project summary sheets, along with project maps. |
| g. APPENDIX VII | Operation and Maintenance for Avio Gates (Tidal) and Drainage Gates. |
| h. APPENDIX VIII | Flood Risk Management Segment/System Inspection Report. |

SCOPE OF MANUAL

8. Basic operation and maintenance procedures are included in this manual for federally-constructed flood control facilities under the jurisdiction of the local sponsor. Essential instructions are provided in sufficient detail to ensure proper operation of the flood control protective works and maintenance of these facilities in a manner that will assure their continued functioning.

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PART II – PROJECT INFORMATION

PROJECT AUTHORIZATION

1. Authorization for construction of this project is contained in the Water Resources Development Act of 1986, (99th Congress 2nd Session, PL 99-662). The project authorization for flood control is contained in the Report of the Chief of Engineers for the Santa Ana River Mainstem (SARM), including the Santiago Creek, California, dated January 15, 1982, except that, in lieu of the Mentone Dam feature of the project, the Secretary is authorized to plan, design, and construct a flood control storage dam on the upper Santa Ana River. The full authorization language is presented in the Main Report of Design Memorandum (DM) No. 1 entitled *Phase 2 GDM on the Santa Ana River Mainstem, including Santiago Creek Volume 3*, dated August 1988.

GENERAL

2. This manual was prepared so it can be used as a guide for the operation and maintenance of flood control facilities including river banks, levees, and channels of the Lower Santa Ana River Channel (LSAR) feature of the SARM project in Orange County, California (See Figures 1 and 2). This manual is applicable for LSAR reaches 1-10, including Reach 9 Phase 1, Phase 2B Orange County section, Phase 3, Phase 4, Phase 5A, and Phase 5B. This manual updates the previous October 2022 SARM LSAR OMRR&R Manual to include SARM LSAR Reach 9 Phase 5B (see Figure 3). It includes instructions on Section 404 and on Section 408 permit requirements for compliance of all reaches of the LSAR Channel. A separate Operation and Maintenance Manual is required under the Santa Ana River Mainstem Project for each dam and reservoir, the Salt Marsh Enhancement and Preservation at the city of Newport Beach, and a Habitat Management Plan is required for the Santa Ana River Canyon (from Weir Canyon Road to the Corona Freeway).

LOCATION

3. The LSAR flood control improvements consist of river banks, levees, and channels located in the lower portion of the Santa Ana River Basin, between the Pacific Ocean and Prado Dam, approximately 30.5 miles in length. See Figures 1 and 2 for LSAR locations. The improvements located in the Santa Ana River Basin are in or near the cities of Huntington Beach, Newport Beach, Costa Mesa, Fountain Valley, Santa Ana, Westminster, Garden Grove, Orange, Anaheim, Buena Park, Yorba Linda, Corona, Placentia and Fullerton.

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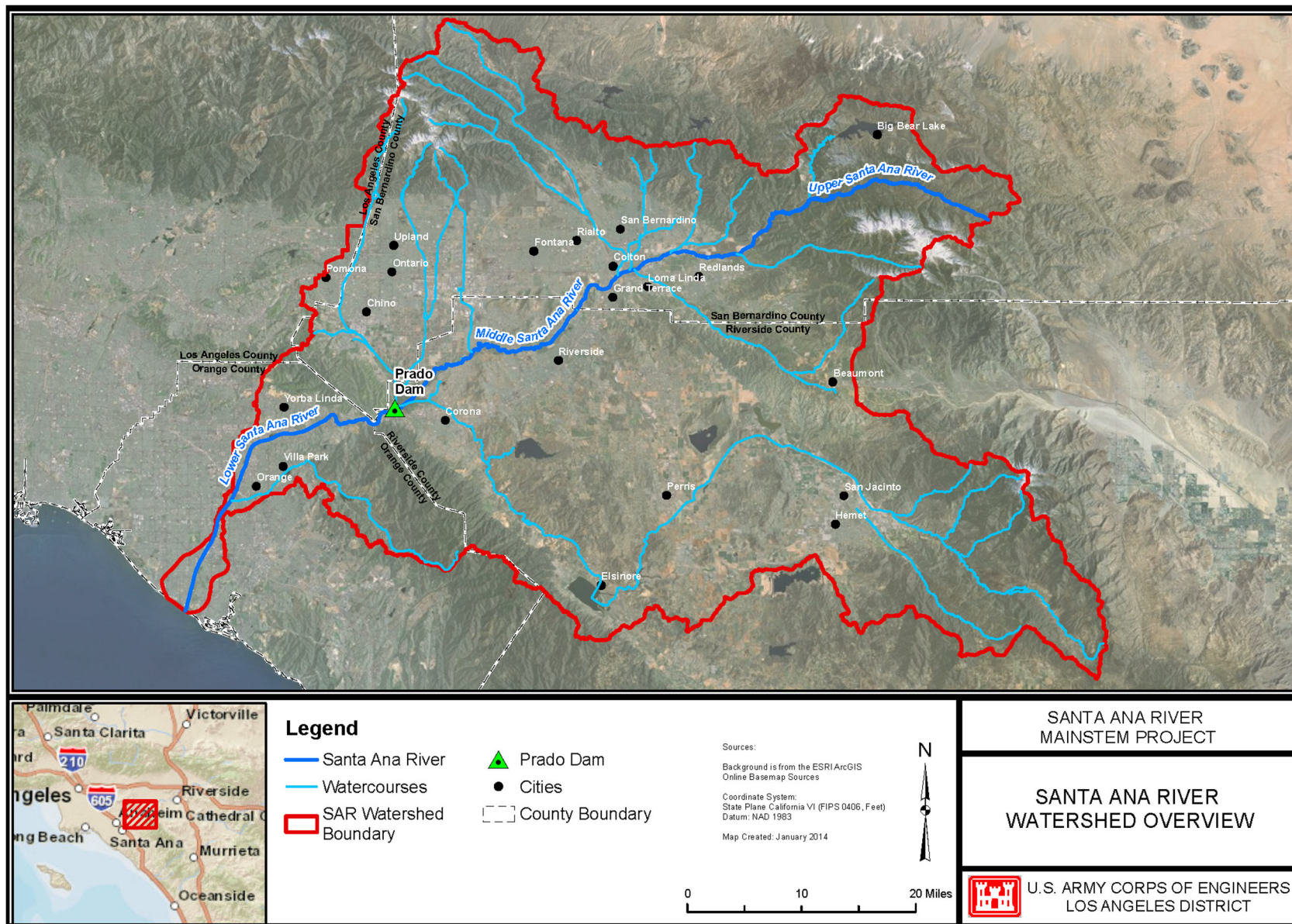


Figure 1: Santa Ana River Watershed Overview

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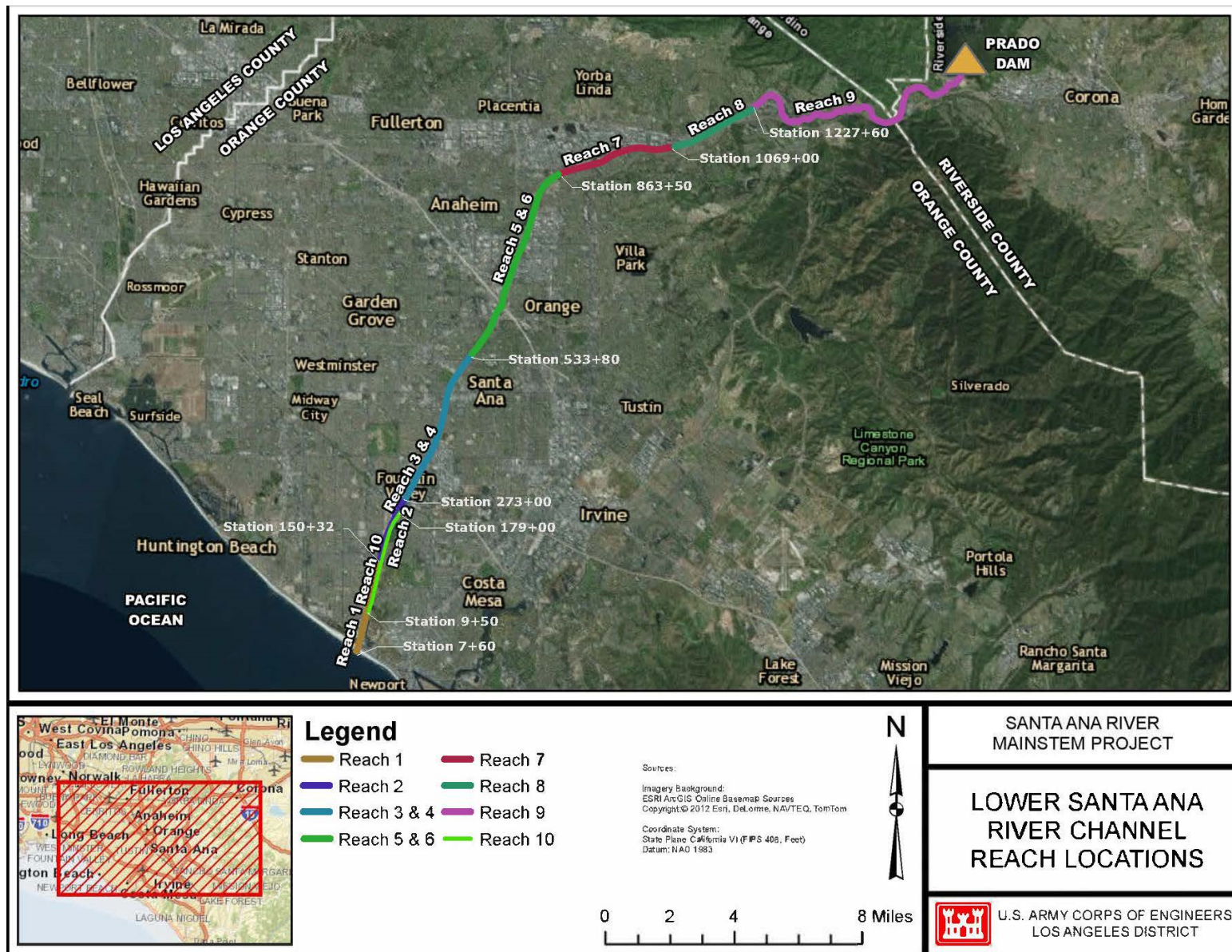


Figure 2: Lower Santa Ana River Reach Locations

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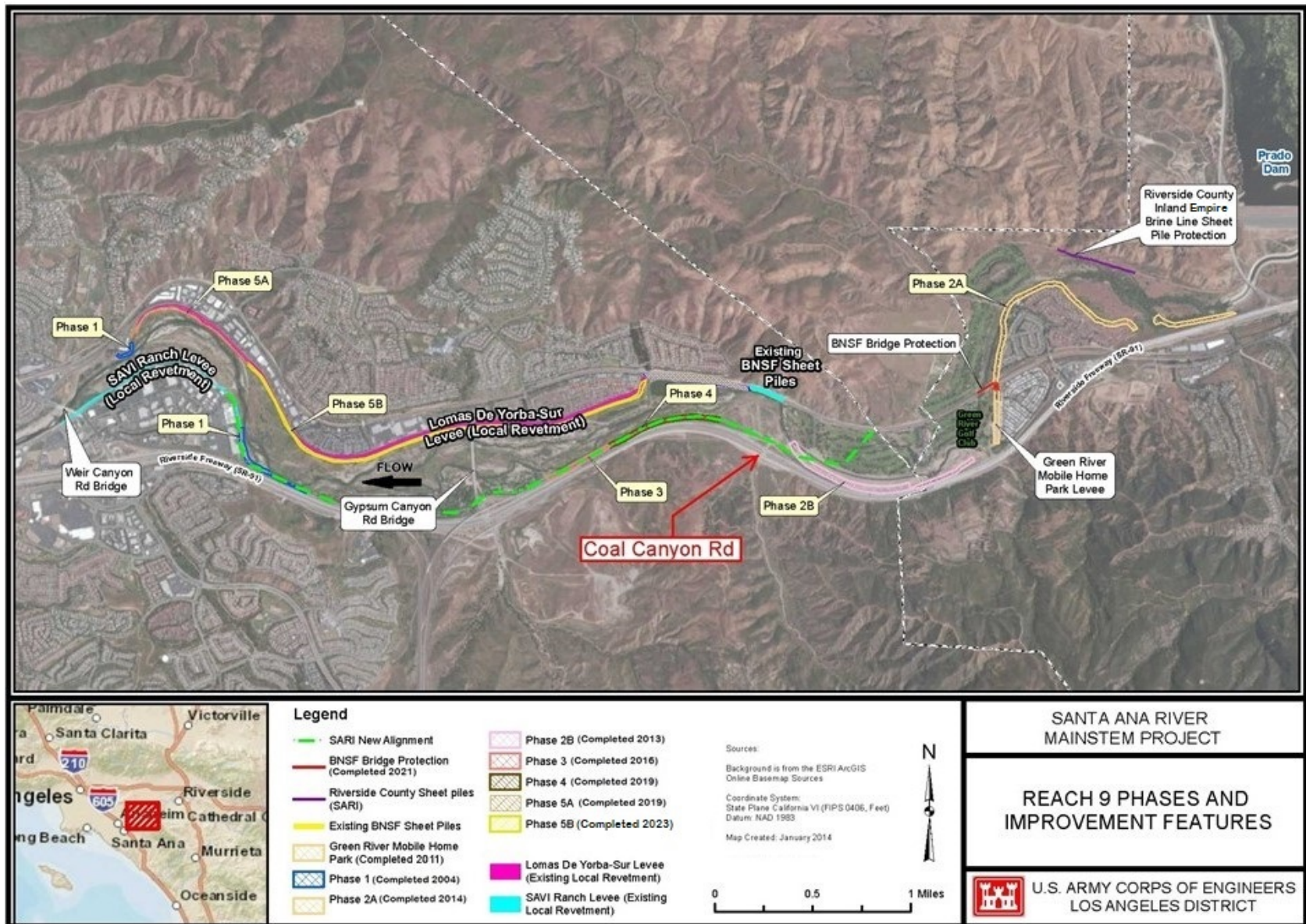


Figure 3: Lower Santa Ana River Reach 9, Bank Erosion Protection

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PERTINENT INFORMATION

4. The SARM flood risk management project provides protection to public infrastructures and private developments along the Santa Ana River (SAR) from flood flow damage due to estimated severe hydro-meteorological rainfall events and increased urban development in the 3,200 mi² watershed (see Figure 1). Authorization for construction of the SARM project is contained in the Water Resources Development Act of 1986, (99th Congress 2nd Session, PL 99-662).
5. The Santa Ana River Basin is the largest river system in Southern California. The Santa Ana Mountains and Chino Hills separate the upper and lower drainage basins in the vicinity of Prado Dam. In the lower basin, the Santa Ana Mountains (over 5,000 feet) stand in contrast to the rolling Chino Hills (1,780 feet). The lower basin occupies about 200 mi² and the coastal plains about 70 mi². The relatively flat coastal plain areas are mainly committed to urban use and any remaining open spaces are few in number and small in size. Over two million people live and work within the floodplain downstream of Prado Dam. The cities of Yorba Linda, Anaheim, Santa Ana, Huntington Beach, Orange, Newport Beach, Fountain Valley, Westminster, Stanton, Costa Mesa, Buena Park, and Fullerton lie wholly or partly within the overflow area from a standard project flood downstream of Prado Dam.
6. The climate is mild with warm, dry summers and cool, wet winters. Both temperature and precipitation vary considerably with distance from the ocean, elevation, and topography. At the city of Corona, about 26 miles from the ocean and 710 feet above sea level, the average temperature is about 63 degrees F, with extremes of 22 degrees F and 118 degrees F recorded. Precipitation characteristically occurs in the form of rainfall, although in the higher elevations some falls as snow. In general, the quantity of precipitation increases with elevation. The 97-year mean seasonal precipitation for the basin, which averages about 20 inches, varies from 10 inches south of the city of Riverside to about 45 inches in the higher mountain areas. Nearly all precipitation occurs during the months of December through March. Rainless periods of several months during the summer are common.
7. The LSAR Channel extends from Reach 9 just downstream of Prado Dam for 30.5 miles to Reach 1 at the Pacific Ocean (see Figure 2, and Appendix VI Maps and Data Sheets for reach details and features). Reaches 1 through 8 are hardscaped channel sides and both hardscape and earthen inverts, whereas Reach 9 is a natural river bottom and allowed to follow its natural meander. Reach 9 is approximately 8.3 miles in length from just downstream of Prado Dam to a grade control structure located approximately 350 feet downstream of Weir Canyon Road Bridge, where the river transitions from a relatively natural channel to an engineered channel, which conveys flows for approximately another 23 miles to the Pacific Ocean. The existing entrenched riverbed along Reach 9 varies in width from 300 feet to 2000 feet and is confined between developed land and state park land on the northerly bank and developed land and the State Route 91 along the southerly bank. The year-round flows are typically contained within an incised stream that varies in width up to 40 feet and is braided with two main streams within a half mile upstream and downstream of the Gypsum Canyon Road bridge crossing. The Reach 9 project area consists of nine project phases across the two counties of Orange and Riverside: Orange County Reach 9 projects include Phase 1, a portion of Phase 2B, and

Phases 3, 4, 5A, and 5B. Riverside County Reach 9 project phases, not included in this manual, consist of the Green River Mobile Home Park Levee (GRMHP) and the Burlington Northern & Santa Fe (BNSF) Bridge Protection, Phase 2A, and a portion of Phase 2B. All phases use the NGVD29 vertical datum, if elevations need to be converted to NAVD 88 it is necessary to add 2.29 ft to the existing NGVD 29 elevations.

8. Prado Reservoir traps nearly all the river bed material load and a large portion of the wash load supplied from the contributing drainage area, creating an imbalance in the LSAR Reach 9 between sediment supply and sediment transport capacity. Some migration of the channel is expected due to the mobilization, deposition, and remobilization of the alluvial materials in the valley bottom of the Santa Ana Canyon. Required scour design profiles were developed by evaluating the potential maximum scour within the extents of the bank protection projects. These profiles account for maximum general degradation during a statistically expected series of floods over a 100-year design life for the flood risk management projects, as well as the effects of local scour components.
9. Refer to Design Documentation Report Hydrology, Hydraulics, & Sedimentation Appendix for technical details, which include long-term flood series, bend scour, bedform scour, current conditions profile, long-term general degradation, low flow channel adjustment, total scour, and potential maximum scour profile.
10. Refer to Part V for steps required during routine and periodic inspection and maintenance activities and Appendix V for list of inspection items and frequency, and maintenance action criteria and frequency.

RUNOFF CHARACTERISTICS

11. The streamflow is perennial in the canyons of the Santa Ana River and in the headwaters of most of its tributaries and is ephemeral in most valley segments. Streamflow increases rapidly in response to effective precipitation. High-intensity precipitation, in combination with the effects of steep gradients and possible denudation by wildfire may result in intense sediment-laden floods, with some debris load in the form of shrubs and trees. Deposition of sediment occurs in the stream channels as it flows from the canyon mouths onto the lower-sloped valley floor surface. The urbanization taking place in the valley areas of the Santa Ana River Basin tends to make the basin more responsive to rainfall. Hence, the same rainfall occurring over an urbanized segment of the basin will result in higher peak discharges, with a shorter time to the peak and a greater volume than had it occurred over a natural basin without urbanization.
12. Stream flow will be typically controlled by releases from Prado Dam, regulated by the USACE Los Angeles District Reservoir Operations Center (ROC).

CONSTRUCTION HISTORY OF LOWER SANTA ANA RIVER CHANNEL

13. The following paragraphs are required by ER 1110-2-401 to describe the construction contracts along the Lower Santa Ana River channel from the Pacific Ocean (downstream) to Prado Dam (upstream) to inform Operations & Maintenance personnel on the integral function of the entire channel through both Orange and Riverside Counties. For completeness sections in Riverside County are listed but are not part of this manual. Project data sheets and maps for the above projects within Orange County are included in Appendix VI. The data sheets consist of an information page and a respective map for each project within this manual. These sheets furnish general information about the construction contract, date of transfer to OCFCD for operation and maintenance, stormflow data (if any), location of access ramps, bridges etc. Additional information can be obtained from the “As-Built” drawings, which are provided separately when the projects are turned over.

a. (Reach 1) Pacific Ocean to Fairview Channel, Orange County:

Specifications: DACW09-91-B-0004

Contractor: Steve P. Rados, Inc.

Completed: September 1992

Description: 1600 lineal feet of jetties and invert stabilizers downstream of Pacific Coast Highway and 14,500 lineal feet of trapezoidal riprap channel between the jetties and Fairview Channel confluence. Invert is an earth-bottom ranging from 365 to 450 feet wide, side slopes of 1V:2H, and depths ranging from 15 to 22.5 feet and levee heights from 15 to 17 feet above surrounding floodplain. Channel side slopes are protected by riprap 12 to 72 inches thick placed on bedding stone 6 to 12 inches thick. Design channel capacity within this reach ranges from 46,000 to 47,000 cubic feet per second (cfs). The two major tributaries that join the Santa Ana River in this reach are the Greenville-Banning Channel and Fairview Channel. The design at the river mouth called for a transition from an earth-bottom trapezoidal channel with rock revetted side slopes of 2H:1V to a pair of rock jetties just downstream from the Pacific Coast Highway Bridge. The jetties consist of 5 tons of broken rock. A rock revetted training dike was constructed within the river mouth. The jetty and training dike were designed to terminate at about the same location as the original jetties in order to minimize impacts on the surrounding beaches.

The net direction of annual littoral transport in the vicinity of the Santa Ana River mouth has been toward the southeast or downcoast. There are distinct seasonal variations with strong transport being to the southeast during the winter months and more moderate transport to the northwest during the summer months. The improvements were designed to maintain tidal flows in the relocated Talbert Channel and the Santa Ana River Channel to basically replicate the pre-project tidal exchange characteristics and limit the closure frequency.

Salt Marsh Restoration. Operation and Maintenance requirements for the Salt Marsh are not the responsibility of OCFCD, however, the tide gate system is an integral part of the Santa Ana River Channel and is a feature that is covered by this manual. Eight acres of salt marsh were purchased as mitigation for flood control improvements between Victoria Avenue and Pacific Coast Highway. In addition, about 84 acres of salt marsh, existing tidal channels, and an upland area were acquired, modified, and restored to enhance endangered species habitat. The marsh was

modified by regrading, extending the existing channels, and replacing the existing tide gate with a more effective tide gate system in order to improve the overall tidal circulation in the wetland area. A 6-acre island for a least tern colony was constructed as part of the restoration.

b. (Reach 2) Fairview Channel to San Diego Freeway, Orange County:

Specification: DACW09-92-B-0007

Contractor: E.L. Yeager Construction Co.

Completed: September 1993

Description: 12,600 lineal feet of rectangular concrete channel between the Fairview Channel confluence and the San Diego Freeway. From about 1,000 feet upstream from the San Diego Freeway to just upstream from the Fairview Channel (approximately Adams Avenue, Orange County) (2.3 miles): a reinforced concrete rectangular channel was constructed. The upper two thirds of this 2.3-mile reach of channel has a concrete invert width ranging from 246 to 365 feet; and the lower third is an earthen invert, 365 feet in width. The channel depths range from 22.0 to 25.0 feet, and levee heights ranging from 12 to 15 feet above the surrounding floodplain. The channel heights were designed to accommodate the sediment accumulation in this area.

c. (Reach 3/Reach 4) San Diego Freeway to River View Golf Course, Orange County

Specification: DACW09-93-B-0007

Contractor: CBPO of America, Inc.

Completed: September 1994

Description: 25,000 lineal feet of trapezoidal concrete channel between the San Diego Freeway and River View Golf Course. From 17th Street to about 1,000 feet upstream from the 405 San Diego Freeway: a reinforced concrete-lined trapezoidal channel was constructed with an invert width ranging from 160 to 250 feet with depths ranging from 13.5 to 24 feet, with structural levee floodwalls extending on a 2H:1V inside and outside slope with levee heights 4 to 12 feet above the surrounding floodplain.

d. (Reach 5,6,7,and 8) River View Golf Course to Weir Canyon Road, Orange County

i. (Reach 5/Reach 6) River View Golf Course to Glassell Street, Orange County

Specification: DACW09-94-B-0003

Contractor: C.A. Rasmussen, Inc.

Completed: September 1995

Description: 33,000 lineal feet of trapezoidal riprap or grouted riprap channel with channel invert stabilizers and drop structures between the River View Golf Course and Glassell Street. Invert is soft-bottom.

ii. (Reach 7) Glassell Street to Imperial Highway, Orange County

Specification: Paul Hubbs Construction Company, Inc.

Contractor: DACW09-96-B-0003

Completed: September 1997

Description: 20,500 lineal feet of trapezoidal ungrouted riprap channel with channel invert stabilizers and drop structures between Glassell Street and Imperial Highway. The invert is soft-bottom.

iii. (Reach 8) Imperial Highway to Weir Canyon Road, Orange County

Specification: DACW09-99-B-0008
Contractor: E.L. Yeager, Co.
Completed: January 2001
Description: 19,500 lineal feet of trapezoidal grouted riprap channel with channel invert stabilizers and drop structures between Imperial Highway and Weir Canyon Road. The invert is soft-bottom.

Description: Reach 5, 6, 7, and 8 improvements generally consist of a trapezoidal riprap or grouted stone side slope with earthen invert. The channel invert width ranges from 260 to 330 feet with 2H:1V side slopes ranging from 10.5 to 20.5 feet high. In addition, 21 invert stabilizers at approximately 2,000-foot intervals prevent degradation of the invert with 16 drop structures. A parabolic drop structure design, modeled by the USACE Waterways Experiment Station was used. Drop structures are protected by a stone-revetted apron extended on a 2H:1V slope 15 feet below channel invert. Major confluences enter from the Carbon Canyon Diversion Channel (at Sta. 846+25) and Santiago Creek (at Sta. 564+00). Local side drainage structures also enter into the river throughout. Existing weirs used to divert river flows to the spreading grounds in the vicinity of the Riverside Freeway were modified to permit continued use of the water conservation areas. For floods exceeding the channel capacity, a least hazardous overtopping zone was designated to be along the north bank of the channel adjacent to Yorba Regional Park. The freeboard is only 2.5 feet along the right bank for a distance of approximately 10,300 feet.

- e. (Reach 9, Phase 1) Weir Canyon Road (Yorba Linda Boulevard) to approximately 3000 feet upstream towards Gypsum Canyon Road, Orange County

Specification: DACA09-02-R-0007
Contractor: MarCon Engineering, Inc.
Completed: March 2004
Description: Phase 1 North Bank (right bank facing downstream). Weir Canyon to towards Gypsum Canyon Road, Sta. 1227+65 to Sta. 1233+60. The protection consists of grouted stone with derrick stone placed along the toe to a depth of 10 feet below the 2003 thalweg. Grouted stone is 15 inches thick at 2H:1V side slope.

Phase 1 South Bank (left bank facing downstream). Weir Canyon Road to Gypsum Canyon Road, Sta. 1278+00 to Sta. 1305+10. This phase protects the SAVI Ranch Center and State Route 91 and is approximately 1,600 feet of grouted stone with derrick stone placed along the toe to a depth of 10 feet below the 2003 thalweg. Along SR91 approximately 1,100 feet of a composite section of grouted stone slope and sheet pile toe with tieback anchors was constructed. Grouted stone is 15 inches thick at 2H:1V side slope. The grouted stone slope protection section along the SR91 embankment was removed and reconstructed to accommodate relocation of the SARI (Santa Ana Regional Interceptor) sewer line in 2013. The upstream and downstream limits of the protection tie-in to existing high ground. The limits of the protection were set beyond the point where the active channel is located immediately adjacent to the bank. Based on an updated sediment transport analysis performed by USACE in 2012, it was determined that the original design depth of the protection along this south bank was not sufficiently deep enough to protect against design scour. The toe-down depth was originally selected to match adjacent Caltrans sheet

pile protection depth and determined adequate based on pre-2012 scour analysis. However, it will not provide protection up to the 2012 USACE sediment transport analysis. Close coordination should be maintained by Orange County Flood Control District with USACE to prepare an update to this OMRR&R by adding special maintenance procedures and requirements to ensure the protection will continue to perform as intended.

- f. (Reach 9, GRMHP) Green River Mobile Home Park, Riverside County (not part of this manual)
Specification: W912PL-08-D-0025 Task Order 0001
Contractor: CJW Construction, Inc.
Completed: September 2010
Description: Approximately 1100-foot long levee with a 15-foot aggregate base course top width maintenance road on the left bank facing downstream. Levee grouted stone slope protection total height varies from 35 to 37 feet but only projects 6 feet above finished grade. The toe of the grouted stone slope is protected with launchable derrick stone. Invert is earthen bottom.
- g. (Reach 9, GRMHP “Option A”) Green River Mobile Home Park, Riverside County (not part of this manual)
Specification: W912PL-09-B-0013
Contract: W912PL-09-C-0037
Contractor: Harper Construction Co.
Completed: December September 2011
Description: An additional 400-foot long levee with a 15-foot aggregate base course top width maintenance road on the left bank facing downstream. Levee grouted stone slope protection total height varying from 35 to 37 feet but only projects 6 feet above finished grade. The toe of the grouted stone slope is protected with launchable derrick stone. The maintenance road will be accessed from Green River Road. Invert is earthen bottom.
- h. (Reach 9, Phase 2A) BNSF Railroad Bridge at Green River Housing Estates to Prado Dam, Riverside County (not part of this manual)
Specification: W912PL-11-B-0003
Contract: W912PL-11-C-0010
Contractor: CJW Construction Inc.
Completed: March 2015
Description: Project limits are from USACE as-builts Sta. 1519+00 to Sta. 1605+45.5 along the left bank facing downstream providing protection for the State Route 91 and the Green River Housing Estates. Project consists of approximately 2,000 linear feet of grouted stone with launchable toe stone protection along State Route 91. In addition, approximately 4,000 linear feet of grouted stone with launchable toe and bedrock key-ins; approximately 600 feet of anchored sheet pile with tiebacks along toe of grouted stone key-ins; and approximately 1,700 linear feet of sheet pile with tiebacks were constructed along the Green River Housing Estates. Grouted stone is 24 inches thick at 2H:1V side slope and at 1.5H:1V side slope at shallow bedrock areas. Invert is earthen bottom.

- i. (Reach 9, Phase 2B) Coal Canyon Road to Green River Mobile Home Park, Riverside and Orange Counties. The Orange County section is from Sta. 1340+00 to approximate Sta. 1381+60. The Riverside County section (not part of this manual) starts from approximate Sta. 1381+60 to Sta. 1396+65.

Specification: W912PL-09-B-0013

Contract: W912PL-09-C-0037

Contractor: Harper Construction Co.

Completed: September 2014

Description: Along the left bank of the river facing downstream providing protection for the State Route 91. Approximately 5,500 linear feet of bank protection consisting of 48-inch thick riprap slope, 24-inch grouted stone, and approximately 240 linear feet of steel sheet pile with tiebacks was constructed. The toe of the slope or sheet pile is protected with launchable derrick stone. Invert is earthen-bottom. Pipe extensions to existing side drainage structures are provided for drainage continuity from south of SR91 through the bank protection to the channel. New side drainage structures Nos. 10, 11, and 12 with flap gates were constructed through the levee embankment section to convey surface drainage from Green River Road and from the Starr Ranch culvert under SR91 which had historically flowed into the channel. Each side drainage structure daylight through the grouted stone bank inside a concrete outlet structure.

The project also incorporated the perennial stream environmental habitat restoration in the channel between approximate Sta. 1344+66 to Sta. 1393+37. Approximately 24.3 acres of the adjacent stream was restored to provide a perennial stream and riparian woodland habitat to mitigate for environmental impacts to the Santa Ana sucker fish. This perennial stream habitat does not require maintenance by the County. The habitat consists of sands, gravel, and boulders that were placed to create stream riffles and variable flow depth areas. Riprap aprons and drainage ditches were installed at side drainage outlet structure to form channel meandering. Native plants and trees were included to establish the riparian habitat. Monitoring of the perennial stream habitat and removal of non-native plant species will be performed by USACE.

- j. (Reach 9, Phase 3) Gypsum Canyon Road to Coal Canyon Road, Orange County

Specification: W912PL-13-B-0004

Contract: W912PL-12-C-0010

Contractor: ZPSCO Contractors, Inc.

Completed: March 2016

Description: Along the left bank of the river facing downstream providing protection for the State Route 91. The project consists of soil cement slope revetment, extension of existing side drainage structures from under the State route 91, an asphalt and decomposed granite maintenance road, grass lined drainage ditch with atrium inlets, and hydro-seeding. An asphalt bikeway was constructed but is the maintenance responsibility of Orange County Parks, Ca. The revetment extends approximately 1,500 linear feet in length, is 10 feet in width, approximately 30 feet in height, and placed on a 1H:1V slope. Approximately half the height of the structure will be exposed. Channel invert is earthen bottom.

k. (Reach 9, Phase 4) Coal Canyon Road to Gypsum Canyon Road, Orange County

Specification: W912PL-15-B-0009

Contract: W912PL-15-C-0003

Contractor: Harper Construction Co.

Completed: November 2019

Description: Along the left bank of the river facing downstream providing protection for the State Route 91. The project consists of soil cement slope revetment with drainage system, extension of existing side drainage structures from under the State route 91, a manhole, two reinforced concrete box culverts, decomposed granite maintenance road, grass lined drainage ditch with atrium inlets, and revegetated riparian and upland areas. An adjacent asphalt bikeway was constructed but is the maintenance responsibility of Orange County Parks, California. The revetment is 10 feet in width, approximately 30 feet in height, and placed on a 1H:1V slope. Approximately half the height of the structure is exposed above finished grade. The revetment was originally designed to extend 3,950 linear feet with a base bid length of 3,218.7 feet and a supplemental length of 731.3 feet to be constructed under contract Option 3. However, due to environmental restrictions and further analysis of the design, it was determined that the base bid revetment length would provide adequate protection and Option 3 was not constructed. Consistent with the 2015 SEA, the net length of the Phase 4 revetment considered for environmental impact is 3,131.25 linear feet from Sta 1383+27.10 (Phase 3 upstream toe) to Sta 1414+58.35 (Phase 4 upstream toe).

l. (Reach 9 Phase 5A) North Bank Protection, approximately 3000 feet upstream of Weir Canyon Road (Yorba Linda Blvd) to about 7500 feet downstream of Gypsum Canyon Road Bridge, Orange County

Specification: W912PL-15-B-0010

Contract: W912PL-15-C-0026

Contractor: John S Meek Company, Inc.

Completed: January 2019

Description: The project is located along the right bank facing downstream of the Santa Ana River, parallel to East La Palma Avenue. It provides protection for East La Palma Avenue, multiple industrial facilities, commercial buildings, and BNSF Railroad. The project consists of improvements to an existing 4000-foot-long section of the LDY-S (Lomas De Yorba-Sur Levee), City of Yorba Linda, CA. It begins at Sta. 1233+60, tying into the Reach 9 Phase 1 North Bank Protection project, and continues upstream to Sta. 1274+43. The existing riprap revetment was replaced with 24-inch-thick grouted stone side slopes from 1233+60 to 1243+40 and steel sheet pile wall with tiebacks was installed along the remainder up to 1274+43 to avoid significant environmental impacts to the existing aquatic habitat, especially effects to Santa Ana sucker. The Santa Ana River Trail (SART) was relocated as part of this project and included an asphalt (AC) bikeway and a decomposed granite (DG) hiking trail. The AC bikeway and DG hiking trail are being maintained by Orange County Parks, California, including the concrete masonry unit block wall, and all surface drainage associated with the block wall such as concrete ditch, atrium inlet grates, and polyvinyl chloride pipes. Existing six (6) reinforced concrete pipe - interior side drains (SD) located throughout Phase 5A were modified to accommodate north bank improvements.

- m. (Reach 9 Phase 5B) Immediately upstream of Reach 9 Phase 5A to about one mile East of Gypsum Canyon Road Bridge, Orange County
- Specification: W912PL-16B-0005 (previous), W912PL-16B-0005 (current)
- Contract: W912PL-16-C-0037 (previous), W912PL-20-C-0037 (current)
- Contractor: OHL USA, Inc., Contract was terminated for default in August 2019
Silverstrand Construction (current)
- Completed: Scheduled to complete May 2023
- Description: The project consists of improvements to an existing 2.4-mile section of the north bank (right bank facing downstream) of the Santa Ana River Channel for the LDY-S (Lomas De Yorba-Sur Levee), City of Yorba Linda, CA. It provides protection for East La Palma Avenue, multiple industrial facilities, commercial and residential buildings, and BNSF Railroad. Improvements include replacement of the ungrouted stone bank revetment with 24-inch-thick grouted stone bank revetment from station 1274+30 to 1399+60 and protection of an existing Santa Ana River Interceptor (SARI) sewer line and manholes. The new 24-inch grouted stone bank protection would have an adequate foundation depth to below the computed design scour depth. Improvements include continuation of the AC bikeway and DG hiking trail and relocation of the SART. Modification to seventeen (17) existing reinforced concrete pipe-interior side drains were required to accomplish project improvements. The upstream end will have a grouted stone cutoff wall along the edge of the new grouted stone to allow for future extension work with minimal impact to the 5B stone. This cutoff wall will allow for excavation and compaction of the subgrade for the future stone so that the existing stone does not settle during future placement.
- n. (Reach 9 BNSF Railroad Bridge Protection) at Green River Housing Estates, Riverside County (not part of this manual)
- Specification: W912PL-17-R-0046
- Contract: W912PL-17-C-0035
- Contractor: Malcolm International, Malcolm Drilling, Bauer Foundation Corporation. (MMB, AJV)
- Completed: Structural Completion April 2021; Landscape Establishment Completion Scheduled in November 2022
- Description: The project consists of approximately 400 linear feet of grouted stone with launchable toe stone protection along the east bank of the channel to connect Phase 2A and Green River Mobile Home Park bank protections on upstream and downstream side of the bridge, respectively; approximately 1,100 linear feet of concrete diaphragm wall with tieback anchors along the bridge east and west abutments; approximately 1,400 linear feet of concrete diaphragm enclosure wall around the piers; approximately 260 linear feet of cast-in-place concrete pier nose extension walls up to 44 feet high; including concrete training walls, concrete cap slabs at each pier group; and various maintenance access roads, side drainage structures, local drainage features. Channel invert is earthen bottom. Disturbed ground was revegetated by golf course grass, native grass, upland vegetation and riparian vegetation.
- o. (Reach 10) Greenville-Banning Channel, Orange County:
- Specifications: DACW09-91-B-0004
- Contractor: Steve P. Rados, Inc.

Completed: September 1992

Description: The Greenville-Banning Channel enters the project area approximately 1,600 feet downstream of the San Diego Freeway (Freeway 405), parallels the Santa Ana River Channel, and confluences about 2,000 feet downstream from Victoria Street for a total distance of 3.3 miles. Because of the restricted right-of-way, the channel is a rectangular reinforced concrete channel in which the channel invert ranges from 50 to 60 feet in width; and the channel wall height ranges from 13.5 to 17 feet. To accommodate the channel, Victoria Pond was relocated approximately 100 feet to the southeast, retaining its current surface area and depth. An upstream transition section is provided to join the improved rectangular channel with the existing trapezoidal channel. The invert is concrete.

LOCAL COOPERATION AGREEMENT

14. USACE Los Angeles District and the Orange County Flood Control District have entered into a Local Cooperation Agreement (LCA) for this project on December 14, 1989, as required by Public Law (99-622). A copy of the duly LCA is included as Appendix II.

PROJECT PERFORMANCE OF LOWER SANTA ANA RIVER

PAST PERFORMANCE ISSUES

15. Several past performance issues associated with features within the Lower Santa Ana River have occurred since initial construction. Details are found in the levee periodic inspections issued by USACE, however, in general, the areas that had past performance issues include but are not limited to:
 - a. Undermining and subsequent repair of the drop structure at Reach 5, Station 601+28.
 - b. Under-seepage and uplift of the invert slab downstream of Harbor Boulevard at Reach 3, Station 345+00, which was also repaired.
 - c. Settlement and sinkhole damage had occurred to the levees as a result of micro-tunneling under the levee on both the left the right bank of the Santa Ana River. This area is adjacent to the Orange County Sanitation District Plant No. 2 and is approximately 160 feet in length along both right and left bank levees. A combination of jet grouting and deep soil mixing was utilized to repair the levees and completed in 2014. Details of the repairs can be found in "Phase 1 Levee Repairs Construction Report" by Black & Veatch, dated 23 April 2012 and "5-58D Bitter Point Force Main Rehabilitation Santa Ana River Levee Repairs Phase 2 Construction Report" by Black & Veatch, dated May 2014.
 - d. Levee encroachments on landside and riverside (numerous locations) where oversteepening of the levee slope, removal of revetment material, or other alterations of the levee.
 - e. Inspection, repair, and reconstruction of multiple storm-drain penetrations through the levee.

Major deficiencies based on the most recent levee periodic inspections are summarized below:

Left bank from upstream of Yorba Linda Boulevard/Weir Canyon Road (Station 1253+74 to Station 1216+50; or SAVI Station 43+89 to SAVI Station 6+65) and downstream to Station 571+38) (USACE, 2015).

Station 1253+74 to Station 1216+50; or SAVI Station 43+89 to SAVI Station 6+65

a. Interior Drainage Systems:

16. Culverts/Discharge Pipes: The three side-drainage structures could not be visually inspected and have not been video inspected.

Station 1216+50 to Station 571+38

a. Levee Embankment:

17. Non-Compliant Vegetation Growth: Significant vegetation growth including trees with trunks larger than 2-inches in diameter, shrubs, large rocks, and an irrigation system were present within the vegetation-free zone (VFZ). The vegetation, large rocks, and irrigation were all added to the levee for esthetic purposes and are included on the landscape drawings (USACE LAD 2006 and 2007). The VFZ extends 15 feet outward from both the landward and riverward toes of the levee.
18. Depressions/Rutting: A depression measuring 10 inches deep, 7 feet long, and 4 feet wide was observed on the landward slope. The depression is greater than 6 inches deep and may lead to ponding water.
19. Cracking: A crack in the levee embankment measuring 1.5 inches wide and up to 18 inches deep was observed along the landward slope from the top to the toe.
20. Riprap Revetments and Bank Protection: Erosion has displaced a 50-foot-wide by 6-foot-deep portion of the derrick stone apron at the downstream end of a drop structure; however, the cut-off wall associated with the drop structure was not undermined.

b. Floodwalls:

- Non-Compliant Vegetation Growth: Vines with diameters less than 2 inches were obstructing the inspection of a concrete wing wall.

c. Interior Drainage Systems:

- Vegetation and Obstructions: The outlet or inlet of 12 of the side-drainage structures was obstructed by more than 10 percent.
- Foundation of Concrete Structures: The cut-off wall at the outlet of the Fletcher Channel side-drainage structure was completely exposed and undermined for a width of 66 inches, a height of 6 inches, and 10 inches back into the structure.
- Culverts/Discharge Pipes: The majority of the side-drainage structures could not be visually inspected and have not been video inspected.
- Flap Gates/Flap Valves/Pinch Valves: The flap gate was missing at the outlet of a 24-inch-diameter side-drainage structure. The side-drainage structure was shown on the as-built drawings as having a flap gate.

d. Flood Damage Reduction Channels:

- Flap Gates/Flap Valves/Pinch Valves: The flap gate was missing at the outlet of one of the side-drainage structures. In addition, a 36-inch-diameter RCP side-drainage

structure and a 48-inch-diameter RCP side-drainage structure did not have flap gates and no documentation was available to show if a flap gate was or was not required.

- Revetments other than Riprap: Along a channel reach, the shotcrete slope protection was missing from approximately a 5-foot to 10-foot wide portion of the riverward slope from top of the channel bank to the junction with riprap that provides toe and lower bank protection of the riverward slope.

Left bank from Santiago Creek (Station 571+38) to Victoria Street (Station 90+40) (USACE, 2014).

a. Levee Embankment:

- Non-Compliant Vegetation Growth: Significant vegetation growth including trees with trunks larger than 2-inches in diameter, shrubs, large rocks, and an irrigation system were present within the VFZ. The VFZ extends 15 feet outward from both the landward and riverward toes of the levee. Except for along Riverview Golf Course, the vegetation was planted as part of the landscape drawings (USACE LAD 1993b, 2002).
- Depressions/Rutting: A depression measuring 7 inches in depth was observed in the asphalt pavement on the levee crown of the GB Channel behind the channel wall panel.
- Underseepage Relief Wells/Toe Drainage Systems: Cleaning and pump tests of the subdrainage system have not been performed to date, and the subdrainage system is likely to be clogged. Records provided by OCPW indicate the vaults associated with the subdrainage system at the toes of the concrete lined channels were cleaned once every 5 years. OCPW is in the process of cleaning the subdrainage system, including the subdrain pipes and vaults (OCPW 2014).
- Seepage: There was a significant amount of seepage coming into the channel through the joint of two adjacent side panels of the reinforced-concrete low-flow-channel at one location. Seepage through the joints could create voids behind the concrete panels damaging the integrity of those panels; however, none were detected during subsequent geotechnical investigations conducted on the behalf of OCPW (GMU 2014). The seepage may be a result of a cutoff wall at this location that was left in-place due to construction phasing.

b. Floodwalls:

- Non-Compliant Vegetation Growth: Vines were observed growing on the reinforced-concrete retaining walls. The trunk diameters of some of the vines exceeded 2 inches. were present within the vegetation-free zone. The vines observed were consistent with what is shown on the landscape drawings.

c. Interior Drainage System:

- Vegetation and Obstructions: Vegetation, sediment, and/or debris were obstructing more than 10 percent of the inlet and/or outlet of three side-drainage structures.
- Encroachments: There was a 6-inch-diameter steel water line located inside a 24-inch-diameter reinforced concrete pipe (RCP) side-drainage structure. The water line is not shown on the construction drawings and no permits were available from the USACE LAD.

- Culverts/Discharge Pipes: A video inspection was not available for one of the side-drain junction structures.
 - Flap Gates: A flap gate shown on the construction drawings was missing from the outlet of a side-drainage structure.
- d. Flood Damage Reduction Channel:
- Foundation of Concrete Structures: The foundation soils were eroded beneath the top of the reinforced-concrete slope paving on the riverward slope. The void below the concrete slope paving extended approximately 2 feet in depth.

Left bank along Greenville-Banning (GB Station 164+00) to Victoria Street (GB Station 24+10) (USACE, 2014).

- a. Levee Embankment:
- Non-Compliant Vegetation Growth: Significant vegetation growth including trees with trunks larger than 2-inches in diameter, shrubs, large rocks, and an irrigation system were present within the VFZ. The VFZ extends 15 feet outward from both the landward and riverward toes of the levee.
 - Underseepage Relief Wells/Toe Drainage Systems: The subdrainage system was observed to be in good condition; however, no records were provided by OCPW indicating subdrains are cleaned a minimum of once every 3 years.
- b. Interior Drainage System:
- Encroachments: One of the side-drain junction structures was abandoned and blocked with plywood 7 feet inside the pipe from the outlet per the video inspection. Another side-drain junction structure was filled with sediment near the outlet. The abandonment of the pipes is not shown on the construction drawings (USACE LAD 1991) and no permits are available from the USACE LAD. OCPW subsequently removed the flap gates from the outlet of the pipes and pressure grouted the inside of the pipes flush with the outlet surfaces.
 - Culverts/Discharge Pipes: An 18-inch-diameter RCP side-drain junction structure was only partially video inspected; the video inspection was stopped 2 feet into the pipe because of an obstruction.

Left bank from Victoria Street (Station 90+40) to Greenville-Banning confluence (Station 76+40): no major deficiencies observed (USACE, 2013).

Left bank from Greenville-Banning confluence (Station 76+40) to Pacific Coast Highway (Station 13+40) (USACE, 2013).

- a. Levee Embankment:
- Animal Control: Numerous animal burrows were observed on the landward slope. The existing animal-control program that is in place needs to be improved and properly implemented. The levee damage due to the rodent burrows observed during the periodic inspection has been evaluated by OCPW (OCPW 2013c) since the periodic inspection, and repair work is planned.

- Riprap Revetments & Bank Protection: Riprap was missing from a 30-foot by 30-foot square area on the riverward slope at the interface with the concrete slope paving.
 - Revetments other than Riprap: There was a hole in the grouted riprap on the riverward slope measuring 7 feet long by 3 feet wide by 2 feet deep.
- b. Interior Drainage System:
- Trash Racks: Trash rack missing from the inlet of one of the three 36-inch-diameter RCP side-drainage structures.

Left bank along Greenville-Banning Channel from Victoria Street (GB Station 24+10) to GB Station 9+50) (USACE, 2013).

- a. Levee Embankment:
- Non-Compliant Vegetation Growth: Significant vegetation growth (brush, tall grass, and trees with trunks greater than 2 inches in diameter) was present within the VFZ on the landward slope of the levee embankment. The VFZ extends 15 feet outward from both the landward and riverward toes of a levee. The vegetation was planted as part of the USACE LAD Esthetic Treatment and Erosion Control Plan (USACE LAD 1993).
- b. Interior Drainage System:
- Trash Racks: Trash Rack was missing from the inlet of the 24-inch-diameter RCP side-drain junction structure.
 - Non-Compliant Vegetation Growth: The inlet of the 12-inch-diameter RCP side-drain junction structure is half full with sand.
 - Foundation of Concrete Structures: Active erosion and scouring toward the base of the structure were observed at the inlet of the 24-inch-diameter RCP side-drain junction structure.
 - Culverts/Discharge Pipes: Video inspection of the interior of the 24-inch-diameter RCP side-drain junction structure revealed multiple fractures in the soffit of the pipe located near the outlet.

Right bank from Yorba Linda Boulevard/Weir Canyon Road (Station 1214+00) to Pacific Coast Highway (Station 13+40) (USACE, 2023).

- a. Levee Embankment:
- Non-Compliant Vegetation Growth: Trees with trunks larger than 2-inches in diameter were present within the VFZ. The VFZ extends 15 feet outward from both the landward and riverward toes of a levee.
 - Encroachments: There were significant portions of the levee that have been excavated along the landside slope. These excavations were mostly caused by homeless encampment activity. Additionally, construction at one bridge crossing restricts access to the levee crown and inhibits inspection and maintenance. There was also a timber retaining wall cutting into the tow of the landside slope.

- Erosion/Bank Caving: There were several eroded areas on the landside slope that threaten the stability and integrity of the levee.
 - Depressions/Rutting: Depressions and rutting deeper than 6 inches were observed on the levee crown and landside slope of the levee.
 - Animal Control: There were multiple deep animal burrows observed on the landside slope of the system.
- b. Interior Drainage System:
- Vegetation and Obstructions: The inlet and outlets were obstructed by more than 10 percent by sediment, debris, or vegetation at several side-drainage structures.
 - Encroachments: Several side-drainage structures were abandoned. The abandonment of the side-drainage structures was not permitted by USACE. There was also a plug at the outlet of one of the side-drainage structures inhibiting the culvert to work as intended.
 - Fencing and Gates: There was broken and missing fencing that poses a potential safety hazard at three locations.
 - Culverts/Discharge Pipes: Documentation of the interior condition of the pipes (via video or visual inspection methods) was not provided.
 - Flap Gates: Two flap gates were completely obstructed by sediment and were unable to be visually inspected.
- c. Flood Damage Reduction Channel:
- Vegetation and Obstructions: There were trees along the channel invert that may have impaired the channel flow capacity.
 - Concrete Surfaces: Bucking of concrete, spalling, and delaminated concrete were observed at several locations along the shotcrete protection, channel wall, and side slopes of the channel.
 - Foundation of Concrete Structures: There was missing fill material underneath a concrete panel on the riverward slope.

21. The project provides 0.005 annual exceedance probability (AEP), or 1/200, flood risk management for communities along the 30.5 miles of river and channels. The channel downstream of Prado Dam is designed to pass the Standard Project Flood (SPF), which has a peak outflow from Prado Dam of 30,000 cfs. Channel capacity will range from 30,000 cfs at the outlet of Prado Dam to 47,000 cfs at the Pacific Ocean outlet with a minimum of 3.0 feet of freeboard at all locations. As of January 2022, there has not been a significant release from Prado Dam to fully test the performance capabilities of the LSAR. Below are observations resulting from recent moderate releases from Prado Dam.

a. During the flood season of 2005, Reaches 1 to 8, 10, and Reach 9 (Phase 1) improvements were completed and functional, and a release of approximately 10,000 cfs occurred from Prado Dam for approximately 6 days to draw down the pool from a series of storm events and to reduce pressure to the dam. The closest USGS stream gage number 1107400 (Santa Ana River below Prado Dam) recorded about 13,200 cfs in the river, which is the largest historical release to date.

b. During the flood season of 2010, the storm discharge, as recorded by USGS stream gage 1107400, was 5,010 cfs. Prado Dam releases reached approximately 5,000 cfs with no visible signs of

distress throughout all previously constructed reaches of the LSAR. No known project performance issues have been documented for the 2010 storm.

c. During the flood season of 2017, Reach 9 (Phases 2A, 2B, and 3) were completed and functional and Prado Dam releases reached approximately 4,700 cfs for approximately 7 days during January and reached approximately 4,000 cfs for 2 days in February from a series of storm events. No significant distress of the improved LSAR was noted other than localized erosion of the maintenance road at a drainage gutter crossing from the Green River Housing Estates along Phase 2A.

d. During the flood season of 2021, Prado Dam releases reached approximately 5,000 cfs for approximately 2 days during December from a series of storm events. Nuisance ponding was reported near the riprap area, which is part of a drainage channel from the side drain outlet with flap gate. No known project performance issues have been documented.

HISTORICAL, CULTURAL AND ARCHAEOLOGICAL RESOURCES

22. As a result of construction, and other natural causes, all previously known archaeological and historical resources within the area of operation and maintenance have been destroyed. However, there may be resources buried beneath the sediment that might be uncovered by future ground disturbing activities. If any are discovered, the USACE's Environmental Resources Branch shall be notified in order to coordinate any avoidance or other requirements.

ENVIRONMENTAL EFFECTS

23. There were environmental impacts associated with construction and operation of flood control improvements on the Lower Santa Ana River. Impacts are summarized below. However, environmental impacts associated with the continued OMRR&R have been identified, analyzed and minimized. Relevant Environmental Commitments to avoid and reduce impacts for Reach 9 feature OMRR&R for activities can be found in the corresponding NEPA documents:
- 1988 Phase II General Design Memorandum on the Santa Ana River Mainstem including Santiago Creek;
 - 2001 Supplemental Environmental Impact Statement and Environmental Impact Report for Prado Basin and Vicinity, Including Reach 9 and Stabilization of the Bluff Toe at Norco Bluffs;
 - 2008 Final Supplemental Environmental Assessment and Addendum to Environmental Impact Report 583 for the Reach 9 Phase II Green River Mobile Home Park Embankment;
 - 2009 Final Supplemental Environmental Assessment and Addendum to Environmental Impact Report 583 for the Santa Ana River: Reach 9 Phase II Green River Golf Club Embankment Project;
 - 2011 Final Supplemental Environmental Assessment and Addendum to Environmental Impact Report 583 for Reach 9 Phase 2A Embankment;
 - 2013 Final Supplemental Environmental Assessment and Addendum to Environmental Impact Report 583 For Reach 9 Phase 3;
 - 2015 Final Supplemental Environmental Assessment and Addendum to Environmental Impact Report for Reach 9 Phases 4, 5A, 5B and BNSF Bridge;

- 2017 Final Supplemental Environmental Assessment and Addendum to Environmental Impact Report for Reach 9 Phase 5A; and the
 - Biological Opinion's from December 2001 as amended in March 2012, February 2013, and July 2015.
24. Sedimentation. Because the nature of the river is ephemeral at the downstream end, meaning that significant flows to the ocean occur only during storms, sand outflow to the ocean is expected only during storm events. Events of 0.1 AEP (10-year) frequency or greater would not be expected to produce significant amounts of sediment, regardless of channel conditions. In the long term, however, sediment is expected to increase. It is estimated that an additional 5,000 cubic yards of sediment per year (approximate) will reach the ocean. The increase is due to the higher releases made possible from Prado Dam improvement with the SARM project; larger releases are more efficient in scouring and transporting sediment. The sediment throughout the Lower Santa Ana River Channel is meant to be self-flushing and to occur during significant flood events but accumulates at the end of Reach 1 where the channel mouth meets the Pacific Ocean. The Sponsor is expected to clear the sediment at the mouth to ensure an unobstructed drainage path into the ocean. See PART V for frequency of sediment removal.
25. Channel Scour. Prado Dam's reservoir traps nearly all the bed material load and a large portion of the wash load supplied from the contributing drainage area, creating an imbalance in Reach 9 between sediment supply and sediment transport capacity. As a result, the river bed and banks become sources of sediment to reduce the deficit in sediment supply compared to the sediment transport capacity. The progressive erosion and transport of sediment from the river bed and banks can lead to incision and widening of the channel. The potential maximum scour profile was established for Reach 9 along with the required scour design profile, as seen in Figure 4. In order to provide sufficient protection against the anticipated future scour, the bottom-line toe protection line, which is set to 1 foot below the maximum scour profile, extends from elevation 313.93 ft NGVD29 at 1271+50 (6,500 feet upstream of Weir Canyon Grade Control Structure) to elevation 372.48 ft NGVD29 at station 1399+60 (22,500 feet upstream of Weir Canyon Grade Control Structure). Similarly, the top of protection line, which is equivalent to the current elevation of the existing banks at the downstream end where Phase 5B ties-in to the Phase 5A sheet piles and sufficiently above the design water surface elevation for the remainder of the project alignment, extends from elevation 345.95 ft NGVD29 at Station 1274+43 to elevation 397.23 ft NGVD29 at station 1399+60. The Sponsor is expected to perform routine inspections, as described in Part V "Inspection Function" of this manual and as required by Article 208.10 of the Code of Federal Regulations, Title 33, to examine the river bed for elevations that drop below the potential maximum scour profile to ensure bank protection is maintained continuously.

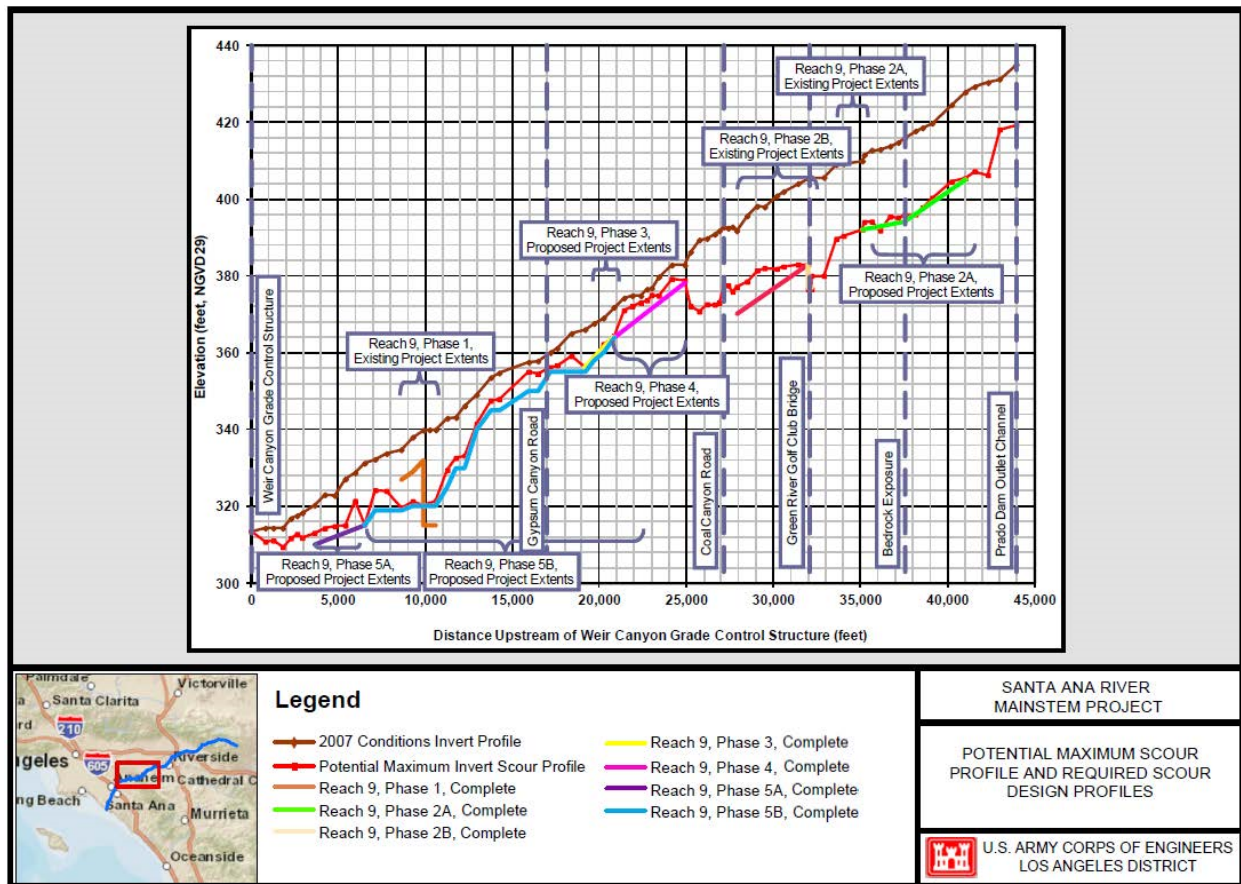


Figure 4: Potential Maximum Scour Profile and Required Scour Design Profiles (USACE 2015)

26. Land Resources. The construction for each phase of Reach 9 temporarily impacted native habitat areas that were revegetated and maintained free of exotic weeds by the construction contractor for 12 months after completion of project. As a condition of the Biological Opinion, the revegetated temporary disturbance footprint of the project is to be monitored and maintained for a period of 5 years for riparian habitat and 8 years for upland habitat including the 12-month establishment period by the construction contractor. Maintenance of the revegetated areas will have minor effects that will not impact land resources or habitat.
27. Water Resources. Some turbidity would result from SARM beach replenishment. Construction of SARM improvements will introduce turbidity into the river if not adequately contained. Some reduction in dissolved oxygen in the ocean water may occur from near-shore disposal. Eutrophication could occur in the river channel if a plug were to form. High tides will introduce salt water farther into the enlarged channel. Similar to the statement above, the Sponsor is expected to clear the sediment at the mouth of the river to avoid eutrophication. No other measurable impacts to water resources will occur from OMRR&R for other reaches of Lower Santa Ana River.

28. Air Quality. Emissions will occur from the various operation and maintenance vehicles and equipment used to inspect and maintain SARM improvements. However, project impacts will constitute only a small, immeasurable incremental degradation of air quality. Dust may be generated from sediment management-related activities, but will be minor and on a short-term basis.
29. Biological Resources. Listed species such as California gnatcatcher (*Polioptila californica*) and least Bell's vireo (*Vireo bellii pusillus*) occupying habitat in and adjacent to the Reach 9 and BNSF projects were impacted by temporary and permanent loss of habitat due to construction of the projects, as well as indirect impacts such as noise and human presence. Impacts to flows within the floodplain had potential impact to Santa Ana sucker (*Catostomus santaanae*). Temporary impacts to wildlife movement occurred during the construction phase of each project, but permanent features were designed to allow wildlife movement. To avoid impacts to nesting birds, vegetation maintenance and sediment removal will be conducted outside of the nesting bird season (nesting season is from February 15th until August 15th).
30. However, prior to conducting O&M activities and throughout this activity, a qualified biologist will conduct a thorough survey of the work area and adjacent areas to determine if any birds (including LBV) are nesting that could be potentially impacted by the proposed work activities. If active nests are found, the biologist will coordinate as needed with local organizations and agencies to determine appropriate avoidance or minimization measures. These measures may include setting up some buffers to lessens impacts near the nest.
31. Regular maintenance will not impact biological resources in the LSAR, beyond what was analyzed in the environmental compliance documents. If OMRR&R activities have the potential to impact biological resources, appropriate permits will be acquired.

RECREATION FEATURES

32. The availability of prime vacant land in the middle of a heavily urbanized area, in conjunction with the need to provide safe bicycling and equestrian trails for recreation and transportation, provided the impetus for making recreation facilities available as an integral element of the Lower Santa Ana River Flood Control Project.
33. The recreation plan for the Lower Santa Ana River consists mainly of two parts, (1) Santa Ana Canyon Road to Prado Dam, and (2) Relocated Recreational Development from Weir Canyon Road to the Pacific Ocean.
34. The basic objectives were:
- To provide a high-quality experience for bicycling, hiking and equestrian riding opportunities through a well-planned trail system.
 - To locate trails and ancillary facilities with respect to resources sensitive to human use.
 - To interpret the project resources to the public. Public education of the value of the Lower Santa Ana River's natural ecological systems would be increased through personal interactions and experiences with the natural environment.

- d. To limit incompatible development. Trails would be built in a manner which would be in harmony with surrounding and abutting uses. General esthetic treatments would benefit both the trail users and abutting land users.
35. The entire 32-mile system of trails would provide direct off-road access to major recreational facilities at the Pacific Ocean and proposed facilities within Prado Basin and Chino Hills State Park. The trail is a significant element in a comprehensive recreation plan, consisting of a mountain-to-sea trail corridor extending from the Pacific Ocean to the San Bernardino National Forest and tying into the Pacific National Trail as well as various local and community parks adjacent to the trail corridor. The trail corridor would support national and state goals to reduce energy consumption by helping to minimize dependence on motor vehicle transportation to recreation areas.

WATER CONSERVATION

36. Prado Dam and Reservoir is congressionally authorized to provide flood risk management to the residents for Orange County downstream of the dam. During times of low flood threat, the dam is used to regulate the Santa Ana River such that outflow from the dam will not exceed the capacity of the Orange County Water District (OCWD) ground water replenishment facilities downstream of the dam. When the dam is regulated in this manner, Santa Ana River water is used to recharge the OCWD ground water aquifer, and runoff lost to the Pacific Ocean is minimized. Grading takes place within the SAR channel, located upstream of the OCWD diversion structure, which helps to maintain the low flows that naturally pass through the Prado outlet works to percolate into the river channel. Water conservation related activities within the SAR channel to groundwater recharge facilities has little to no impact to the Reach 9 constructed features.

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PART III – SUMMARY OF OPERATION AND MAINTENANCE RESPONSIBILITIES

OPERATION AND MAINTENANCE REGULATIONS

1. This manual implements the basic regulations applicable to operation and maintenance of federally constructed flood control structures which are contained in Article 208.10 of the Code of Federal Regulations, Title 33. An extract of the regulation is included as Appendix I of this manual.
2. Section (a) of Article 208.10 states:

"(1) The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits."
3. This section details the procedures prescribed by the Secretary of the Army pertaining to both operation and maintenance of flood control facilities, including the establishment of an agency responsible for implementing these procedures, the inspection of the flood control structures, and the reporting of their condition.
4. In accordance with ER 1110-2-401, the USACE District Engineer may update the manual for changed conditions or, if warranted, to correct conditions discovered during inspections. Such updating will be performed in consultation with the project sponsor.
5. For any work to be performed in the channel or in areas that could be impacted by discharges from Prado Dam during routine operation of the dam, the work must first be coordinated with the USACE Reservoir Operations Center (ROC). POC for the ROC, Tel# (213) 452 -3623 (24/7) and Email: ROC-LA@usace.army.mil. The ROC requires that a "Site Access Form" be completed to describe the work being performed, the duration of the project, the location of the project, and a 24/7 point of contact that the ROC can contact if changes in Prado Dam releases could impact the work. The "Site Access Form" is available online ([Site Access Form](#)) and attached in Appendix IV.

AGENCIES RESPONSIBLE FOR OPERATION AND MAINTENANCE

6. Organizations responsible for operation and maintenance: The Orange County Flood Control District and USACE Los Angeles District are separately required to maintain organizations capable of adequately operating and maintaining the project units for flood control in accordance with the project LCA. The County shall appoint an official (referred to "Superintendent" in the basic regulations) who shall be responsible for the development and proper functioning of that County's operation and maintenance organization in accordance with instructions in this manual.
7. Assistance to be furnished by the USACE District Engineer. The USACE District Engineer shall:

- a. Furnish to the Superintendent “As-Built” reproducible drawings of the flood-control improvements as soon as they are available after completion of construction.
- b. Make determination under the Section 408 permit that any proposed encroachment, improvement, excavation, or construction within the rights-of-way or alteration of the flood control works will not impact the channel capacity or flow characteristics, or the flood control structures; and furnish to the Superintendent a written determination.
- c. Assist the Superintendent, as may be practicable, in the performance of his duties in ascertaining storm development having flood-producing potentialities, assembling flood-fighting forces and material, and initiating and carrying out flood-fighting operations.

FUNCTIONS OF THE OPERATION AND MAINTENANCE ORGANIZATIONS

8. General. The functions of the organizations responsible for the operation and maintenance of the flood control system are traditionally divided into two categories: those concerned with operation or use of the flood control facilities, and those involved in the continuing maintenance of the facilities themselves. These functions are detailed in PART IV and PART V of this manual, respectively, and are summarized here. Also, reporting functions are detailed in PART VI of this manual.

OPERATION

9. Operation, as defined in this context, encompasses all uses of the flood control system or any of its components. The principal and overriding purpose of the system is clearly the conveyance of storm-runoff in such a way that the impact of the runoff on the urbanized areas through which it passes is minimized and the efficient functioning of the project produces the benefits set forth in the project authorization. Such alternative uses require a Section 408 permit. The operation function, then, is subdivided as follows:
 - a. Flood Operation. The flood operation function includes responsibility for operating the project in accordance with Federal flood control regulations. There are several aspects to flood-operation procedures.
 - b. Mobilization. The mobilization function includes responsibility for providing sufficient equipment, material, and trained personnel for adequate operation of the project units in times of flood emergency.
 - c. Coordination. The coordination function requires that appropriate measures be taken to ensure that the activities of all local organizations connected with the protective works are coordinated with the operating agency during flood periods.
 - d. Inspection. The inspection function provides for scheduled patrolling of flood control activities during periods of storm runoff in order to detect and correct any condition that endangers the structure. Also included in this function is a complete inspection following each major high-water period, to ascertain if any other damage has occurred. The responsibilities of the patrols include the following:
 - The embankment structure should be inspected for unusual settlement, caving, seepage, damage of riprap, damage of grouted stone, soil cement, and

- deterioration of top road.
 - Side drain structures and drainage ditches should be freed of any debris accumulation that could impact its proper functioning. Flap gates (if present) should be in good working condition.
 - OCFCD will have vehicles, heavy equipment and stockpiled material available for use at debris-accumulation locations and potential breach locations.
- e. Multi-Purpose. Multi-purpose use is the term applied to all uses of flood control facilities that do not involve conveyance of storm runoff. They include, but are not limited to, water conservation, wetland/wildlife habitat, water quality functions, recreation, and development for increased land utilization.

MAINTENANCE

10. Maintenance includes all activities concerned with insuring proper and continued functioning of the project units. The aspects of the maintenance function are as follows:
 - a. Inspection. The inspection function requires that such inspections shall be made as are necessary to ensure that the flood control facilities are maintained in a properly functioning condition. Those inspections may include, as necessary, test programs to determine the condition of those features and investigation to determine the cause of some potential or actual malfunction and the corrective action necessary, where such cannot be adequately ascertained by direct inspection. Programs of this type may be used in making current and long-range maintenance policies. If "test programs" and "investigations" involve activities that discharge dredged or fill material (includes excavation) into waters of the United States or involve work or structures in or affecting navigable waters of the United States, the local sponsor must contact the USACE Los Angeles District Regulatory Division for assistance in applying for regulatory permits. Early coordination with Regulatory Division is recommended.
 - b. Training. The training function includes responsibility for implementing a program, subject to USACE review, to provide an adequate number of trained personnel to perform the various functions of operation and maintenance under either normal or flood-emergency conditions.
 - c. Public Interest. The public interest function includes the responsibility for providing flood risk management of the project units and the responsibility for public health and safety in connection with the various flood control facilities.

REPAIR, REPLACEMENT AND REHABILITATION (RR&R)

11. Repair, Replacement, and Rehabilitation (RR&R) as referenced in Section 12 of ER1110-2-401 states:

“Repair is considered to entail those activities of a routine nature that maintain the project in a well-kept condition. Replacement covers those activities taken when a worn-out element or portion thereof is replaced. Rehabilitation refers to a set of activities as necessary to bring a deteriorated project back to its original condition. RR&R actions are to conform to the project

“As-Built” plans and specifications unless other arrangements are made with the district commander. These activities are the responsibility of the project sponsor.”

12. Appendix V provides the basis for recommending repairs of the Project and its associated features.

REVIEW AND REPORTING REGULATIONS

13. Project Review and Section 408 Permit Requirements. Any proposed modifications to an existing USACE project (either federally or locally maintained) that go beyond those modifications for required normal operation and maintenance require approval under 33 USC 408 (Section 408). Further discussion of the Project Review and Section 408 permitting process is contained in Part V.
14. Reports. Federal regulations require that the operating and maintaining agency prepare a semiannual report to the USACE District Engineer covering operation and maintenance of the flood control facilities, together with such supplemental or supporting reports as are required by the USACE District Engineer.

PART IV – OPERATION

INTRODUCTION

GENERAL

1. The term "operation," as defined in PART III, encompasses all uses of the flood control system or any of its components. Clearly, the principal use of the system, the purpose for which it was designed and constructed, is to collect and convey storm runoff in such a way that its impact on urban areas is minimized. The maintenance program and flood-operation procedures are oriented toward this purpose.
2. Subject to permissions granted under the Section 408 permit program, alternate uses are permitted under special circumstances. Federal regulations forbid the use of protective works for other than flood control purposes if that use adversely impacts flood operations or maintenance of the protective works; the USACE District Engineer is responsible for evaluating a proposed use and determining whether or not a conflict or incompatibility exists. If the proposed alternate use requires work that involves discharges of dredged or fill material (including excavation) into waters of the United States, or involves work or structures in or affecting navigable waters of the United States, the local sponsor or the proponent of the changed use may need a permit from the Regulatory Division. Such a use may not be implemented without approval of the USACE District Engineer.
3. The following sections present the federal directive for operation of the facilities, the current flood-operation procedures, with their corollary functions, and a discussion of the current status of multi-purpose use activities.

OPERATIONAL CONTACTS

4. The Orange County Flood Control District has the responsibility of maintaining close liaison with the ROC. Exchange of hydrologic and hydraulic data, including precipitation and storm flow data, will be coordinated between the two agencies. The contact phone numbers provided on the next page shall be verified to be most recent on an annual basis.
5. During emergency operations the OCFCD is to coordinate with the USACE Emergency Management Branch. In addition, evidence of distress of the levees, embankments, and/or structures must be immediately reported to USACE.

a. USACE Points of Contact:

- | | |
|--------------------------------|--|
| i. Emergency Management Branch | 915 Wilshire Blvd., Suite 1240
Los Angeles, CA 90017
Office: (213) 452- 3440
Cell: (213) 300-9964 |
|--------------------------------|--|

6. Non-emergency points of contact:

a. USACE Points of Contact:

- i. Reservoir Operations Center
Radio: WUK4-ROC
(213) 452-3623 (24/7 Line)
(213) 452-3566 (H&H Branch Chief)
Email: ROC-LA@usace.army.mil
- ii. Regulatory Office
915 Wilshire Blvd.
Los Angeles, CA 90017
Division Chief:
(Office) 805-585-2141
(Mobile) 805-358-9850
Email: Regulatory.SPL@usace.army.mil
- iii. Operations and Division
Chief of Operations Division:
(Office) 213-452-3294
915 Wilshire Blvd.
Los Angeles, CA 90017
Office: (626) 401-4008
Email: SPLOPS@usace.army.mil
- iv. Inspection of Completed Works
Program Manager
915 Wilshire Blvd
Los Angeles, CA 90017
Office: (213) 364-0352
- v. Deputy District Engineer
915 Wilshire Blvd.
Los Angeles, CA 90017
Office: (213) 452-3971
- vi. District Engineer
915 Wilshire Blvd.
Los Angeles, CA 90017
Office: (213) 452-3961

b. Other Agencies:

- i. Orange County Flood Control District
Storm Operations Center
Telephone #: (714) 955-0200
- ii. California Office of Emergency Services
Telephone #: (916) 845-8510

FLOOD-OPERATION PROCEDURES

GENERAL

7. The operation program, which specifies flood-operation procedures, consists of four phases: pre-storm flow, initial storm flow, final storm flow, and post-storm flow. Each phase is characterized by a degree of mobilization or demobilization—a patrol procedure that includes inspection, operation of field facilities such as stream flow gages, and any immediate maintenance, and a reporting requirement. Stream flow gages downstream of Prado Dam called “11074000 SANTA ANA R BL PRADO DAM” (11074000) and “11078000 SANTA ANA R A SANTA ANA” (11078000), which are updated live on the USGS website, should be used for discharge readings for the Lower Santa Ana River Channel. Pertinent information on these phases follows.
8. The stormflow function includes responsibility for providing sufficient mobilization, patrolling, and reporting for adequate operation of the Project units during storm events. These flood risk management activities during periods of high water events are intended to detect and correct any condition which endangers the structure. Also included in this function is a complete inspection following each major high water period, to ascertain if any other damage has occurred.
9. CFR Title 33, article 208.10, section (c) Floodwalls reads in part as follows:
"(2) Operation. Continuous patrol of the wall shall be maintained during flood periods to locate possible leakage at monolith joints or seepage underneath the wall. Floating plant or boats will not be allowed to lie against or tie up to the wall. Should it become necessary during a flood emergency to pass anchor cables over the wall, adequate measures shall be taken to protect the concrete and construction joints. Immediate steps shall be taken to protect the concrete and construction joints. Immediate steps shall be taken to correct any condition which endangers the stability of the wall."
10. The CFR Title 33, article 208.10, section (d) Drainage structures reads in part as follows:
"(2) Operation. Whenever high water conditions impend, all gates will be inspected a short time before water reaches the invert of the pipe and any object which might prevent closure of the gate shall be removed. Automatic gates shall be closely observed until it has been ascertained that they are securely closed. Manually operated gates and valves shall be closed as necessary to prevent inflow of flood water. All drainage structures in levees shall be inspected frequently during floods to ascertain whether seepage is taking place along the lines of their contact with the embankment. Immediate steps shall be taken to correct any adverse condition."
11. The CFR Title 33, article 208.10, section (g) Channels and floodways reads in part as follows:
"(2) Operation. Both banks of the channel shall be patrolled during periods of high water, and measures shall be taken to protect those reaches being attacked by the current or by wave wash. Appropriate measures shall be taken to prevent the formation of jams of ice or debris. Large objects which become lodged against the bank shall be removed. The improved channel or floodway shall be thoroughly inspected immediately following each major high water period. As soon as practicable

thereafter, all snags and other debris shall be removed and all damage to banks, riprap, deflection dikes and walls, drainage outlets, or other flood control structures repaired."

PRE-STORMFLOW PHASE

12. Operations. The pre-storm flow phase occurs whenever the National Weather Service (NWS) forecasts rainfall of more than 0.2 inches per hour or depth of 5.3 inches in a 24-hour, 25-year recurrence interval (0.04 AEP). The operations during this phase are described below.
- a. Mobilization. Only such mobilization is required as is necessary to perform the operations under the pre-storm flow phase.
 - b. Patrolling. The completed phases should be rapidly but completely patrolled to determine their readiness to accommodate storm flow. The responsibilities of the patrols include the following:
 - i. Side drainage flap gates should be freed of any debris and their proper seating checked. Flap gates should be checked to ensure they are still functional.
 - ii. Side drains, drainage swales, diversion ditches, and catch basins should be cleared of blockages and obstructions to flow.
 - iii. Equipment and material should be readied for use at debris-accumulation locations or at other locations where trouble might occur.
 - iv. Any areas from previous routine inspections that were flagged for repair.
 - c. Reporting. No written reports are required for submittal to the USACE. However, internal documentation may be helpful if flow increases to the point where a storm flow report is required.

INITIAL STORMFLOW PHASE

13. Operations. The initial storm flow phase begins when rainfall begins. The major operations during this phase are described below.
- a. Mobilization. Such mobilization is required as is necessary to perform the operations under the initial storm flow phase. However, the operation and maintenance organization should be alerted for full mobilization.
 - b. Patrolling. The project phases should be given a routine patrolling. The requirements for the pre-storm flow phase should be checked to ensure that they have been met. Patrols should be performed on river reaches. As rainfall/floodwaters approach the system, an initial high water/storm inspection should be carried out, in which the patrols should ensure that special attention is given to the following items:
 - i. water conditions, including waves, and any accumulation of trash, debris, etc.
 - ii. condition of road, rail, and water access
 - iii. reconfirming the location, quantity, and conditions of all necessary tools and materials (e.g., sacks, sandbags, lumber, lights) and distribute and store them at points where maintenance is anticipated
 - iv. communication systems check
 - v. inspection of drainage structures (most drainage structures are situated to convey interior drainage from low points of the leveed area through the levee by gravity

flow. Due to the location, drainage structures are generally subject to inundation at lower stages than most other flood defense system features, and special attention should be given to flap gates and other drainage structures that might not be accessible later)

- vi. condition of any recent repairs or areas flagged for repair from previous routine inspections
- vii. Identification of any boil or seepage areas or other type of deterioration or damage, or water level getting close to the levee crest level.
- c. Reporting. No written reports are required for submittal to the USACE. However, internal documentation may be helpful if flow increases to the point where a storm flow report is required.

FINAL STORMFLOW PHASE

14. Operations. The final storm flow phase occurs when discharge from Prado Dam is at or over 10,000 cfs. Flood operations begin at this point; the major responsibilities during this phase are described below.

- a. Mobilization. Full mobilization is required. Each sponsor must have a “Storm Operations Manual,” which establishes a staffing plan for flood fighting with shifts established for 24-hour operation. Staff must be either on duty or on-call.
- b. Patrolling. Patrolling of the project units should be complete and comprehensive. During preliminary response a frequency of once per day is recommended increasing that frequency as the event worsens. Patrols need to be conducted by teams rather than by individuals. If deemed an emergency by USACE, an after-the-fact permit may be required (where the USACE District Engineer issues a permit authorizing the emergency corrective measures completed during the storm). The responsibilities of the patrols include the following:
 - i. The flow reading at the gauge with time of reading should be recorded.
 - ii. Verify that all necessary access roads and ramps are usable or will be satisfactorily conditioned.
 - iii. Photographs should be made and documented at locations where storm flow damage is occurring or has occurred, where such damage has been repaired, where unusual conditions are noted, or where visual records may be useful in making maintenance determinations. Use date/time stamp and GPS co-ordinates, if available. Note gauge readings on photos if possible.
 - iv. Side drainage structures and flap gates should be checked for proper operation. If a gated drain should backflow, the upstream end of the drain inlet should be closed.
 - v. All debris accumulations that would reduce channel capacity should be dislodged or removed at the discretion of the patrolling unit. Inspect fences on the waterside of the levee frequently to ensure they are free from debris (collected debris should be cleared immediately or the fence should be cut to free the debris and decrease the possibility of damage to the levee).

- vi. Any condition endangering any flood control structure should be corrected, provided that correcting said condition does not present a safety threat to personnel. Any distress should be reported per the Operational Contacts section above.
- vii. Specific levee activities—look for the following signs of distress:
 - sand boils or unusual wet areas landward of the landside toe
 - slides or sloughs in levee embankment and signs of embankment instability (rotational or slip failures)
 - overtopping (predicted increase of water level exceeds observed freeboard)
 - seepage (water observed exiting the levee embankment or landside toe)
 - wave wash or scouring of the waterside (vertical scarps appearing along the embankment)
 - low areas in levee crown
 - check relief wells (flowing/non-flowing)
 - check flap/slucice gates for proper closure
 - check gap closures
- viii. Specific floodwall activities—look for the following:
 - saturated areas, seeps, or sand boils landward of the flood wall and sinkholes on both sides
 - settlement (vertical movement) of the flood wall
 - bank caving that may affect the structural stability of the flood wall
 - inspect toe-drain risers (discharging/non-discharging)
 - inspect the monolith joints for signs of failure or material deterioration
 - check gap closures
 - tilting of the structure (where water pressure forced the structure landward)
 - overtopping (predicted increase of water level exceeds observed freeboard)
 - concrete cracking and other deterioration
- ix. Specific pump station activities:
 - verify proper ventilation (e.g., fans, vents) of the pumping plant to prevent overheating of pump motors
 - look for sink holes or wet areas around the perimeter of the pumping plant and/or settlement of the pump house, all of which could potentially be the result of separation in the conduits. If this condition is suspected, pumps and motors should be shut down until an engineering review can be conducted to analyze the condition
 - verify that assigned operators are on duty 24 hours daily (24/7).
- x. The patrol (or inspection) observations and actions should be described in a formal report that can be used, either as a way to pass information to management staff that can decide for emergency maintenance or repairs, or

subsequently as a way to facilitate feedback and improvement of the plan. It can also help the management in difficult legal situations to justify its actions.

- c. Reporting. A storm flow report is required to supplement the spring semiannual report. If storm flow is very large or if unusual damage occurs, a special report may also be required.

POST-STORMFLOW PHASE

- 15. Operations. The post-storm flow phase occurs when available meteorologic or hydrologic data indicate decreasing flow. The phase ends after storm runoff has stopped, and all the major operations indicated below have been performed.
 - a. Mobilization. Some demobilization is possible during this phase; however, full demobilization should be delayed until the operations for this phase have been completed.
 - b. Patrolling. The project phases should be rapidly but completely inspected. The responsibilities of the patrols include the following:
 - i. All damaged flood control facilities should be located, reported, and photographed.
 - ii. Side drainage flap gates should be freed of debris and checked for proper seating.
 - iii. Side drain structures, drainage swales, diversion ditches, and catch basins should be cleared of blockages and obstructions to flow.
 - iv. Each channel should be checked to ascertain whether or not the accumulation of debris/sediment has reached the point where removal is needed.
 - v. All openings of intake structures and the entrances of conduits should be freed of debris.
 - vi. Appropriate temporary or permanent repairs of damaged flood control facilities should be initiated. Any distress should be reported per the Operational Contacts section above.
 - vii. Equipment and materials should be inventoried and made ready for subsequent storm flow.
 - c. Reporting. A post storm flow report is required to supplement the spring semiannual report. If storm flow is very large or if unusual damage occurs, a special report may also be required.

AUXILIARY FUNCTIONS

- 16. Corollary to the minimum flood-operation procedures requirement outlined above are several related responsibilities described by Federal regulations and listed below:
 - a. Coordination. The Code of Federal Regulations, Title 33, article 208.10, section (a) reads in part as follows:

"(9) Appropriate measures shall be taken by local authorities to ensure that the activities of all local organizations operating public or private facilities

connected with the protective works are coordinated with those of the Superintendent's organization during flood periods."

- b. Inspection. The Code of Federal Regulations, Title 33, article 208.10, section (g) reads in part as follows:

"(2) Operation. Both banks of the channel shall be patrolled during periods of high water, and measures shall be taken to protect those reaches being attacked by the current or by wave wash. Appropriate measures shall be taken to prevent the formation of jams of...debris. Large objects that become lodged against the bank shall be removed. The improved channel or floodway shall be thoroughly inspected immediately following each major high water period. As soon as practicable thereafter, all snags and other debris shall be removed and all damage to banks, riprap, deflection dikes and walls, drainage outlets, or other flood control structures repaired."

MULTI-PURPOSE USE

17. Multi-purpose use is the term applied to any use of the flood control system or its components that involves activities other than the conveyance of storm runoff. The Code of Federal Regulations, Title 33, article 208.10, section (h), states in part:

"Those facilities constructed as a part of the protective works shall not be used for purposes other than flood protection without approval of the USACE District Engineer unless designed therefore."

The criterion that forms the basis for such approval is the requirement that a proposed use not adversely affect the functioning of the protective facilities. Determinations of this nature are made as part of the review procedures outlined in PART V of this manual.

18. Although the project was designed for and its principal use remains flood control, there is an increasing awareness of the systems possibilities for use in other activities. The Government allows such alternative uses where such uses are compatible with flood control. Any proposed uses that involve discharges of dredged or fill material (including excavation) into waters of the United States, or involve work or structures in or affecting navigable waters of the United States, may require a permit from the Regulatory Division. The use may also have to comply with the 404 (b) (1) guidelines that regulate activities in wetlands that are water and non-water dependent.
19. However, the National Environmental Policy Act of 1969 requires the preparation of a detailed statement on the environmental impact of any proposed action involving federally constructed facilities. This requirement particularly includes proposals for multi-purpose use. State and local regulations may require assessments. In any event it is the responsibility of the applicant to satisfy all

regulations that are applicable to his proposed work. Approval of multi-purpose use may also be subject to public meeting procedures in addition to the usual environmental review procedures. The current multi-purpose uses involving the project are discussed in PART II, PROJECT INFORMATION.

RECREATION

20. Various local recreation and planning agencies whose jurisdictions include parts of the flood control system may become increasingly interested in the recreational possibilities of the flood control rightsofway. Because these lands are likely to remain in their present condition for some time, investment in the development of recreation facilities on them for public use seems justified; the Government allows such use upon approval through the 408 Permit process. Any proposed recreational facilities that involve discharges of dredged or fill material (including excavation) into waters of the United States, or involves work or structures in or affecting navigable waters of the United States, shall be authorized by the Regulatory Division in a USACE permit.
21. Recreational features have been or can be developed within the basins of flood control dams and along the berm roadways of the channels in the form of bicycle, hiking, and equestrian trails. This development generally involves special berm and invert access ramps, under crossings and protective fencing, and occasionally more extensive recreational features.
22. Such uses generally do not interfere with flood control activities. However, concern must be given for the maintenance of proper access control to prevent unauthorized access to areas beyond the recreation limits, particularly during storm season. Recreation proposals are evaluated through the usual review procedures; address questions and coordination to splpermitinquiries@usace.army.mil.

DEVELOPMENT FOR INCREASED LAND UTILIZATION

23. There has been an increased interest in private development within flood control rights-of-way to increase the utilization of lands adjacent to these rightsofway. This increased utilization may involve the construction of a building or bridge that spans the channel, although proposals to use the berm roadway space for parking or loading are more common. The most significant proposals for development, however, involve covering the channel itself in order to connect both sides of the channel rightofway. This type of development creates the question of maintenance for the channel cover. Because the cover is built by and for private interests, a public agency such as the United States Government or the Local Sponsor cannot be expected to maintain the cover, yet it is difficult to assign the responsibility for maintenance to a private interest. Current policy states that each proposal for development of this type will be reviewed on an individual basis and a decision made.
24. In any event, a proposed development must be compatible with existing land use zoning. Because the United States does not establish zoning regulations, the responsibility for insuring compatibility of existing zoning with a proposed land use lies with the applicant, and any conflicts must be resolved before approval is granted by the United States. Any proposed private developments that involve

discharges of dredged or fill material (including excavation) into waters of the United States, or involves work or structures in or affecting navigable waters of the United States, shall be authorized by the Regulatory Division in a USACE permit.

MISCELLANEOUS

25. Proposals are frequently made for temporary use of flood control facilities or rightsofway for a variety of purposes other than those previously discussed. Such proposals are highly diverse, ranging from motion picture filming to bus driver training classes, and are seldom in the interest of the general public. This is generally allowed, as long as the requirement of no adverse effect on the protective works is met.
26. All such proposals are evaluated under the usual Section 408 Permit review procedure; consideration must be given to the loading that a proposed use would produce on channel structures, the effects on channel capacity, the maintenance of proper access control, potential conflicts with other multipurpose uses or normal operation procedures, and other such factors.

WETLANDS/WILDLIFE HABITAT

27. USACE is required by law to regulate discharges of dredged or fill material (including excavation) into waters of the United States, which includes compliance with the Endangered Species Act and the Fish and Wildlife Coordination Act. These regulated activities may involve impacts to wetlands/wildlife habitats that may require revised maintenance procedures and/or mitigation for impacts to wetlands and wildlife habitats. The Regulatory Division should be contacted when maintenance activities and/or other activities that impact wetland/wildlife habitats or involve impacts to species listed as endangered or proposed for listing may require a permit.
28. During high tides, water can be expected to flow up the channels to the Fairview Channel inlet about 3 miles from the coast. Sea level elevation or Mean Lower Low Water (MLLW) of the constructed channel invert is at approximately the Victoria-Hamilton Avenue Bridge, about 1.7 miles from the shoreline (USACE, SEIS, 1988). The net effect is to provide a lake or estuary; salt and freshwater inputs depending upon flow and tide, and extent of a sand bar forming at the inlet. The design of the inlet is to improve tidal flushing. If flushing does not occur, the lake or estuary could be subject to eutrophication with algae bloom and potential odor due to stagnation, higher water temperatures, and availability of nutrients, similar to conditions previously occurring in the Greenville-Banning Channel prior to channel improvements. Because of channel excavation and intermediate sediment storage, it is not anticipated that any sediment would reach the ocean for approximately twenty years. In the long term, however, on an average annual sediment increase is expected, due to the lower Santa Ana River channel improvements and changes in outflows from Prado Dam. It is estimated that an additional 5,000 cubic yards per year (approximate) will reach the ocean (USACE, SEIS, 1988; Volume 3, Lower Santa Ana River, Hydraulics and Hydrology).

29. Should the periodic removal of accumulated sediment within the outlet and adjacent channel area be deemed necessary, excavation and dredging maintenance activities shall consider potential impacts on existing resources, including but not limited to, sensitive species (e.g., endangered California least tern), coastal and inland water quality, aquatic and emergent vegetation, fish and wildlife, economics, and other general environmental resources. The periodic removal of accumulated sediment shall occur in a manner consistent with the sections on frequency of sediment removal and 404 permit requirements in Part V and which also ensures adequate tidal flushing and influence within the Santa Ana River Salt Marsh (“Marsh”) as to not adversely affect the biological resources within the Marsh.

WATER QUALITY FUNCTIONS

30. USACE requires compliance with Sections 401, 402, and 404 of the Federal Water Pollution Control Act of 1972, which supports the preservation and establishment of wetlands as biomass treatment of many various pollutants, including nutrients, suspended materials, and other pollutants. Operation and maintenance impacts shall be coordinated with the Regulatory Division and Local Water Quality Control Agency to avoid, minimize, and mitigate for impacts to wetland water quality functions.

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PART V – MAINTENANCE AND INSPECTION

INTRODUCTION

OVERALL MAINTENANCE RESPONSIBILITIES

1. Section 208.10 of the Code of Federal Regulations, Title 33, is included in Appendix I of this manual, and in part states:

"...The Superintendent shall provide at all times such maintenance as may be required to ensure serviceability of the structures in time of flood." Although the broad scope of this directive allows considerable freedom of interpretation, it clearly implies a responsibility to detect and correct any condition that might adversely affect the functioning of the flood control system. Explicitly defined are the maintenance function, which involves actual repair and restoration procedures; and the inspection function, which includes programs and procedures necessary to detect hazardous or malfunctioning conditions."

2. Implicit in this directive are also several additional functions that are less directly related to the immediate maintenance requirements but that affect the continued functioning of the system in a manner appropriate to its design purposes. These implicit functions include the training, public-interest, project review, and reporting functions.
3. The County is responsible to protect, maintain, and repair any damages to features, including but not limited to compacted fill, riprap, derrick stone, grouted stone, soil cement, drainage system, pavement, AC paving, concrete paving, concrete retaining walls, bike path striping, metal beam guardrail, cable fence, RCP side drains and flap gates, drainage ditches, inlet and outlet structures, manhole, reinforced concrete box culverts, sheet pile walls, and chain-link fencing and gates. If more than 3 feet of scour into 10-foot soil cement section, it should be restored with cementitious material of similar strength and mix design. See Appendix V for details about derrick stone protection.

MAINTENANCE ASPECTS OF APPENDIX VI

4. The data sheets of Appendix VI provide relevant information of significant features of specific reaches or phases of the project. This information includes a brief construction history; locations of gaging stations or stream flow measuring equipment (if available), access ramps to channel invert or berm roadways, bridges, and other pertinent features.
5. It is the intention to make these data sheets as comprehensive and accurate as possible, particularly with respect to vehicular access to the channel invert and berms, as this type of information is critical to efficient inspection and maintenance procedures. It is therefore requested that any observed discrepancy from the features listed be reported to the USACE, so that the manual may be revised to reflect such changes.

MAINTENANCE FUNCTION

ROUTINE MAINTENANCE MEASURES

6. Code Requirements. The Code of Federal Regulations, under referenced Title 33, specifies in some detail the routine maintenance procedures for various types of flood control facilities. These can be best summarized as follows:

".(g) Channels and floodways - (1) Maintenance. Periodic inspection of improved channels and floodways shall be made by the Superintendent to be certain that:

- i. The channel or floodway is clear of debris, weeds, and wild growth.
- ii. The channel or floodway is not being restricted by the depositing of waste materials, building of unauthorized structures or other encroachments.
- iii. The capacity of the channel or floodway is not being reduced by the formation of shoals.
- iv. Banks are not being reduced by the formation of shoals.
- v. Banks are not being damaged by rain or wave wash, and that no sloughing of banks has occurred.
- vi. Riprap sections and deflection dikes and walls are in good condition.
- vii. Approach and egress channels adjacent to the improved channel or floodway are sufficiently clear of obstructions and debris to permit proper functioning of the project work.
- viii. The capacity of the channel is not being reduced by sediment deposition beyond the limits described in Paragraph 14.

...Immediate steps will be taken to correct dangerous conditions disclosed by such inspections. Regular maintenance repair measures shall be accomplished during the appropriate season as scheduled by the Superintendent."

The referenced article of Title 33 further states that the Superintendent shall provide for periodic repair and cleaning of debris basins, check dams, and related structures as may be necessary.

7. 404 Permit Requirements in Regards to Maintenance. Title 33, parts 320–330, states that maintenance or other activities in which discharges of dredged or fill material (including excavation and substrate disturbance involving vegetation removal) into waters of the United States, including but not limited to channels, flood ways, and impoundments, require the responsible entity to apply for and obtain a Clean Water Act Section 404 permit from the Regulatory Division prior to commencement of such activities. In some cases, a Section 10 permit may also be required.
8. Exemptions from 404 Permit Requirements in regard to Maintenance. The USACE, Los Angeles District, has determined that a Section 404 permit will not be required for the general maintenance activities of currently serviceable structures and emergency reconstruction of recently damaged that meet the 404(f)(1)(B) maintenance exemption [40 C.F.R. § 232.3(c)(2)(EPA regulations) and 33 C.F.R. § 323.4(a)(2)]. Examples of structures are dikes,

dams, levees, groins, riprap, and concrete lined channels and floodways. The bottom of an unlined (earthen or "soft") channel or basin is not considered a structure, even when beset by levees. Section 404 exempted maintenance exclude any modification that changes the character, scope, or size of the original fill design. Emergency reconstruction must occur within a reasonable period after damage occurs (typically within one year) to qualify for the exemption. Concrete lined channels and other structures with shoals that support significant wetland vegetation growth may no longer be serviceable and thus not eligible for the 404-permit exemption; the Regulatory Division must be notified prior to initiation of maintenance activities in such instances. See further discussions in PART VII, REGULATORY PERMIT PROGRAM.

ROUTINE MAINTENANCE

9. Hardscaping and Vegetation-free zone. Must be maintained to appear as originally placed and consist of the following features:
 - a. Gravel and stone-ground covers - remove debris, regrade gravel and stone areas as necessary, and supplement as needed with in-kind material.
 - b. Paving systems - (including ornamental grouted stone, stamped concrete, paver blocks and pavements) - regROUT, repair, repave, replace material in-kind, excavate and regrade, as necessary. Keep areas clean and free of debris.
 - c. Ornamental walls, fencing and barriers - (including planters, artificial stonework, and bollards). Replace material in-kind, repair, repaint or restrain, as necessary.
 - d. Retaining walls - include in periodic inspections for structural integrity, and repair as necessary.
 - e. Signage and wall murals (i.e., artwork) - repair, repaint, and restrain as needed; remove visual obstructions, which may include plant material trimming as necessary; and keep surfaces clean after plant community establishment.
 - f. Lighting systems - replace and repair lighting elements immediately as necessary.
 - g. Graffiti and vandalism - repair, remove, repaint and restrain as necessary, immediately and continually to discourage further damage.
 - h. Vegetation Control – Remove unwanted vegetation types not in the original landscape plans (refer to as-builts) along the river bank and levee slopes, culverts, drainage scales, maintenance roads and toe roads. Native mulefat (*Baccharis salicifolia*) shrubs to be removed from earthen swale and overbank areas to ensure the swale functions as intended. Temporary growth of mulefat would be allowed within the drainage swale but must be removed once the mulefat begins overcrowding the area and significantly reduces the functionality of the swale. For river bank and leveed segments, based on EP 1110-2-18, 1 May 2019, vegetation (other than approved grasses), such as trees, large woody shrubs, or undesirable weeds should be kept out of the vegetation-free zone, which extends 15 feet outward from the riverside and landside toes of the river bank/levee slopes (within the right-of-way limits) as shown on figure 5.

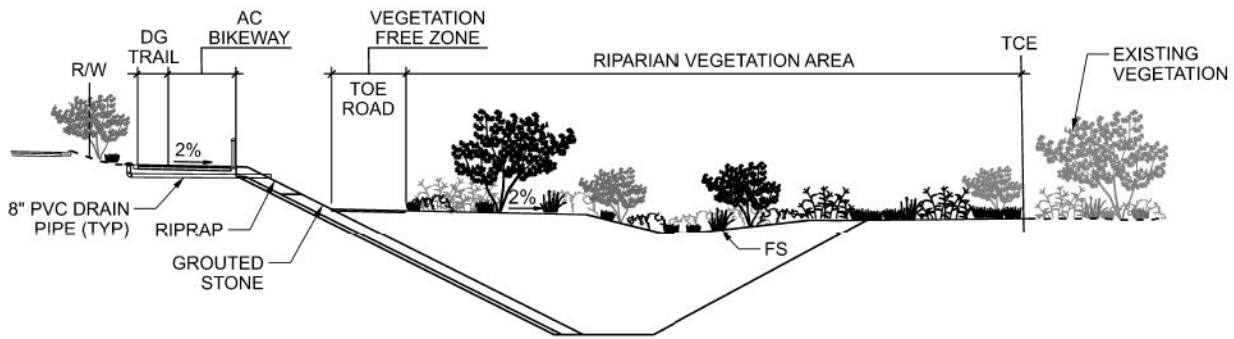


Figure 5: Typical Section Vegetation Free Zone

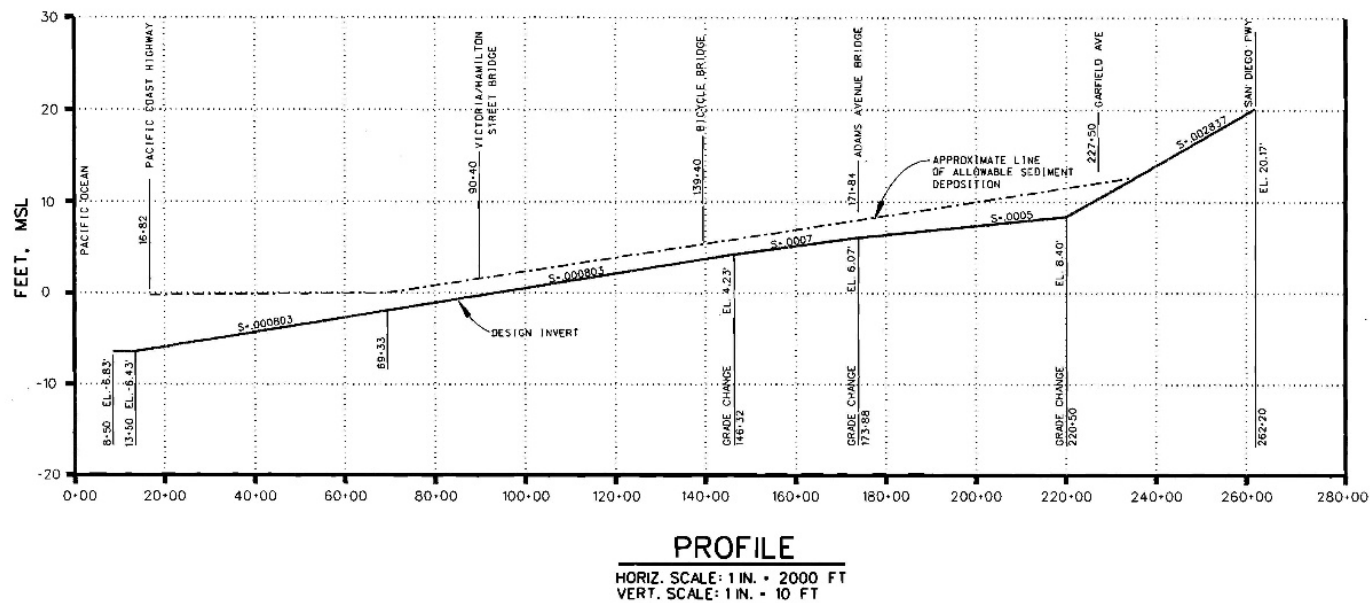
10. Vegetation maintenance in revegetated areas and operations areas. The following actions shall be applied, as necessary, to maintain the vegetation atop and nearby the features during the maintenance and monitoring.
 - a. Supplemental watering - on an as-needed basis or not at all for native planting areas. It is Federal preference that only native indigenous trees and shrubs be planted for revegetated areas.
 - b. Foliage pruning - for plant health and containment, to maintain the planting design concept, or to reduce fire hazards. Pruning is generally necessary when vegetation is growing into operations areas.
 - c. Root pruning as-needed to prevent damage to paving systems, structures, and underground piping, or as part of turf/grass management.
 - d. Apply herbicide or remove major weed infestations anywhere within the embankment Footprint or 5 feet from the hardened structure to provide a clear view for inspections (grass/wildflower areas, crest of the dike, or riprap areas) . Herbicide shall be EPA approved for use near wetlands (e.g., Glyphosate Round up, shelf name Aqua Master), applied under an applicators license and at a concentration less than or equal to 8% depending on need due to the proximity to the Prado Dam area and the Santa Ana River.
 - e. Weed abatement - apply in a timely manner prior to weeds going to seed to maintain planting concept. Methods utilized may be herbicide (chemical) treatment, by hand methods or by mechanical methods, including mowing and weed whipping.
 - f. Fertilization and soil amending - as necessary for each plant grouping. Soil testing may be necessary in problem soil areas.
 - g. Plant removal - if necessary for plant community health (i.e. overcrowding, etc.) with consideration given to plant replacement.
 - h. Plant replacement/reseeding - if necessary to maintain planting concept, or for erosion control.
 - i. Additional plantings - to correct design deficiencies or to strengthen the planting design concept, or for erosion control and slope protection. Reseed any bare areas, refer to the as-builts for the specified mix. Consult with a certified arborist to change the specified mix if it is apparent that it is not developing.

- j. Miscellaneous - grade planting beds for erosion repair; replace/repair erosion control material; supplement mulch; repair watering basins and earth saucers; and replace /repair guying, staking and edging material, as necessary.
 - k. OCFCD must coordinate with USACE and other appropriate agencies and obtain all the required environmental permits before conducting work. In areas with endangered or threatened species, and/or their critical habitat, vegetation removal of any kind may require clearance through the Fish and Wildlife Service or the National Marine Fisheries Service under the Endangered Species Act.
11. OCFCD must undertake a program for the elimination of burrowing animals. This must be an ongoing program to maintain slope stability and prevent development of potential seepage paths in the embankments.
- a. Apply rodenticide using state-certified applicators and EPA-approved methods and chemical treatments only as necessary to maintain the structural integrity of the embankment or the health of the plant community. Apply per manufacturer's instructions when animal burrows are observed, or use other effective means of elimination of active burrowing (i.e., raptor perch). Pesticide use must not contribute to harm of listed species.

Any and all rodenticides must be applied below ground (e.g., into burrows, etc.) and not directly exposed to non-target wildlife. Do not use second-generation rodenticides containing brodifacoum, bromadiolone, difenacoum, and difethialone—identified by the EPA to pose the greatest risk to non-target wildlife—at any time. See the EPA's website for more information: epa.gov/rodenticides/rodent-control-pesticide-safety-review.

- b. Methods of animal burrow repair:
 - i. Remove/recompact – Open the burrows, runways or dens and backfill with moisture- conditioned soil and compact to as-built condition.
 - ii. Grout – Place a tremie pipe into the burrow opening. Pump grout until it overflows around the tremie pipe and out of the burrow opening, which indicates that the burrow has been filled. Do not allow the grout to build pressure. Note that the use of grout to backfill animal burrows will always require USACE Chief of Engineering Division review and approval, including grout mix design and verification of application process to avoid development of excess pore pressures.
12. Frequency of Sediment Removal.
- a. While sediment transport is a normal and expected function of the system, sediment removal may be required periodically within the limits of Reach 9 to maintain and/or restore channel capacity. As part of maintenance requirements for the channel design, an upper grade limit was established to identify the sediment removal required from the channel to maintain the design flood protection. The upper grade limit was established at Sta. 234+25, which is outside of the Reach 9 limits of the LSAR. Sediment would be allowed to accumulate to the upper grade limit line shown on Figure 6 below. Once sediment deposition exceeds this limit, the sediment must be removed, and the invert

restored to design grade. Removal shall be accomplished and phased to avoid ponding and provide for continuous low flow. The Sponsor is expected to perform routine inspections, as described in Part V “Inspection Function” of this manual and as required by Article 208.10 of the Code of Federal Regulations, Title 33, to monitor sediment deposition within the LSAR and/or restore the river bed to the design grade invert.



FOR THE 800-FT. REACH FROM PACIFIC COAST HIGHWAY TO THE OCEAN (SAND PLUG REACH):

- NO SAND PLUG REMOVAL MAINTENANCE IS REQUIRED IF THE LOW FLOW NOTCH EXISTS PROVIDING TIDAL INFLOW AND OUTFLOW TO THE SANTA ANA RIVER SALT MARSH, AND THE SAND PLUG IS BELOW THE LEVEL OF THE TOP OF THE JETTY.
- MAINTENANCE WILL BE REQUIRED IF SAND PLUG PREVENTS TIDAL FLOW OR IS ABOVE TOP OF JETTY.

PLATE 1
 JULY 2007 REVISION #1

LOWER SANTA ANA RIVER
 ORANGE COUNTY, CALIFORNIA

**UPPER SEDIMENT LEVEL
 STA. 8+50 TO STA. 234+25**

U.S. ARMY ENGINEER DISTRICT
 LOS ANGELES, CORPS OF ENGINEERS

COPY OF LSARPROFILE.DGN

Figure 6: Profile of Upper Sediment Level near the Outlet of the LSAR (outside of Reach 9 limits)

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- b. The upper grade limit was based on the bed change in the HEC-6 analysis after antecedent flow 35,000 cfs for 10 days. The bed change encompassed deposition bed slope of 0.0007986. This corresponds to a deposition volume of about 660,000 cubic yards. Based on the average annual sediment deposition of 37,000 cubic yards per year, the channel in the lower reach would have to be cleaned out on the long term average of once every 18 years. It should be noted that because the annual volume of water/sediment can vary significantly, the average annual deposition rate and maintenance are considered long term averages.
 - c. The upper grade limit was raised to elevation 0.0 feet MSL in the reach downstream of where the upper grade limit crosses elevation 0.0 at Reach 1, Sta. 69+33 downstream to Sta. 16+82 at the Pacific Coast Highway (PCH) Bridge. From this point to the ocean outlet or river mouth at the end of the jetty at about station 8+50, the natural sand plug is allowed to occur as long as the top of plug elevations remain below the top of jetty elevations and a low flow channel exists to allow seawater to circulate into and out of the Santa Ana River and Santa Ana River Salt Marsh with changes in the tide. The adjustment was made to allow the sand plug to form and allow sediment to accumulate upstream of the sand plug that normally forms at the river mouth. The geometric condition was tested in the HEC-RAS sediment module, which determined that no overtopping of the river channel will result. The sand plug will blow out to the ocean with flood flows.
13. No sediment removal maintenance is required in the drop structure including the golf course or concrete channel reach from the inlet at Weir Canyon Road downstream to the concrete channel Reach 2, Sta. 234+25.

NON-ROUTINE MAINTENANCE

14. Certain maintenance procedures that are not explicitly described as routine by the sections of referenced Title 33 are implied by the directive to ensure serviceability in times of flood. Such procedures would include repair of any damage caused by storm runoff, repair of the roadway (so as to provide unimpeded access to the project units at all times), replacement of displaced derrick stone and other such required maintenance that occurs on an irregular basis. See Appendix V for details about derrick stone protection. Non-routine maintenance that involves entering the waters of the United States will require a 404 permit. The Regulatory Division must be notified prior to initiation of such non-routine maintenance activities in such instances. See further discussions in PART VII, REGULATORY PERMIT PROGRAM.

ENVIRONMENTAL COMMITMENTS, EROSION CONTROL AND VEGETATION MAINTENANCE

15. Vegetation as well as hard structure design both provide intrinsic beauty, erosion control, natural habitat, and if utilized correctly, are reasonably low-maintenance. Other than plant species selection, slope steepness can be the most important factor affecting low-maintenance

potential. Slopes exceeding 3 horizontal to 1 vertical (3H:1V) ratio are generally more labor intensive (and more expensive) to vegetate initially as well as maintain later. This applies not only to vegetation, gravel, and rock, but to hardscape surfaces (grouted stone, ornamental concrete and pavers) as well. Areas revegetated around the hardscape surfaces provide habitat for wildlife as well as erosion control during high flows. These features have been designed to maximize these benefits to the extent feasible and provide reasonably easy maintenance for the foreseeable future. Slopes must remain vegetated to provide erosion control.

16. Maintenance shall maintain or improve upon the original design concept level of esthetic quality and utilitarian effectiveness. As stated in Part II, areas disturbed and revegetated post feature construction completion will be maintained and monitored by the local sponsor for success criteria for different features as follows (see table below) to ensure established and self-sustaining native habitat survival:

Table 1: Onsite Restoration

Phases	Number of Years of Maintenance conducted	Remaining Number of Years to Complete Environmental Commitment
Reach 9 Phase 2B Upland	4	4
Reach 9 Phase 2B Riparian	5	0
Reach 9 Phase 3 Upland	4	4
Reach 9 Phase 3 Riparian	4	1
Reach 9 Phase 4 Upland	1	7
Reach 9 Phase 4 Riparian	1	4
Reach 9 Phase 5A Upland	1	7
Reach 9 Phase 5A Riparian	1	4
Reach 9 phase 5B Upland	1	7
Reach 9 Phase 5B Riparian	1	4

17. Non-hardened areas that are required to be free of certain vegetation types for effective operation of the feature will be maintained on a regular basis outside of the nesting bird season (nesting season is typically February 15th through August 15th). If work is conducted during the nesting season, prior to conducting O&M activities and throughout this activity, a qualified biologist will conduct a thorough survey of the work area and adjacent areas to determine if any birds (including Least Bell's Vireo) are nesting that could be potentially impacted by the proposed work activities. If active nests are found, the biologist will coordinate as needed with local organizations and agencies to determine appropriate avoidance or minimization measures. These measures may include setting up some buffers to lessens impacts near the nest.
18. Final Success criteria for the revegetated are listed below:
 - a. Creation and restoration of riparian habitat will be considered successful when the following target/thresholds objectives are met: 1) a minimum of 30 percent absolute

ground cover of native plant species; 2) less than 10 percent absolute ground cover of invasive plant species; 3) the absolute ground cover of native species must be represented by, at least, five dominant or co-dominant plant species; 4) the recruitment of native plant seedlings must be documented to occur within the replanted areas; 5) a positive trend in the diversity and absolute ground cover of native plant species must be observed based on appropriate statistical analyses that account for natural, year-to-year variations; and 6) the structure and composition of the revegetated area is statistically similar (i.e., not significantly different) to habitat occupied by vireos in the vicinity. Alternatively, riparian revegetation efforts can be considered successful if the habitat is occupied by a breeding pair of vireos, flycatchers, and/or yellow-breasted chats (*Icteria virens*). In addition, habitat must sustain itself for 2 consecutive years without supplemental water.

- b. Non-riparian areas that are temporarily disturbed will be maintained free of exotic plants for 8 years. A minimum of 30 percent absolute ground cover of native plant species will be maintained; and less than 10 percent absolute ground cover of invasive plant species should be present.
19. Site Inspections. After plant community establishment, the vegetated areas shall be inspected at least once a year and maintained for the spread of invasive plants and conduct vegetation-free zone maintenance needs.
20. Monitoring and Reporting. OCFCD will conduct restoration monitoring and provide annual monitoring reports to USACE. Monitoring will be overseen by the OCFCD's qualified biologist. Annual reports will include, but is not limited to, information on qualitative evaluation, quantitative data, and photo documentation. Qualitative monitoring will be conducted 3 times each year and quantitative monitoring will be conducted annually. Reports will detail maintenance and monitoring activities for the entire year and evaluate whether or not performance criteria goals are being met, expected to be met, or plans or remedial actions taken to meet success criteria. USACE will provide current reporting documents to the sponsor upon turnover. If sites are not on-track for meeting the final success criteria goals, the OCFCD shall coordinate with USACE to identify problem areas and continue to perform monitoring and maintenance activities to improve the site towards success criteria goals. The OCFCD shall develop a Habitat Maintenance and Monitoring Plan to ensure consistent practices are established for the remaining years of maintenance and monitoring required. The plan will also include coordination methods and procedures to avoid impacts to migratory birds during the bird nesting season (15 February to 15 August).
21. In addition to the regulatory permit conditions, OCFCD is also required to implement the applicable environmental commitments (ECs) for OMRR&R activities as summarized below.
 - a. Protection of Historical, Archaeological, and Cultural Resources
If during OMRR&R activities items of apparent archaeological or historical interest are discovered, activities in the area of the find shall cease until the requirements in 36 Code of Federal Regulations (CFR) 800.13 are met. OCFCD must report the find immediately to the State Historic Preservation Officer.

b. Protection of Air Resources

OCFCD must keep OMRR&R activities under surveillance, management, and control to minimize pollution of air resources. All activities, equipment, processes, and work operated or performed by OCFCD in accomplishing the specified OMRR&R activities must be in strict accordance with the State of California and all Federal emission and performance laws and standards. Special management techniques as set out below are project requirements and must be implemented to control air pollution by the OMRR&R activities. OMRR&R activities are expected to have negligible impacts to air resources due to the type of work expected and the protection measures detailed below.

- Maintain all permanent access roads, and all other operations work areas within or outside the project boundaries free from particulates that would cause air pollution.
- When wind speeds exceed 20 miles per hour, all herbicide, excavation and grading operations must be suspended.
- Truck traffic must be limited to existing access routes.
- Dust particles, aerosols, and gaseous byproducts from all OMRR&R activities, processing and preparation of materials, must be controlled at all times.
- Odors must be controlled at all times for all OMRR&R activities, processing and preparation of materials.

c. Reduction of Noise Pollution

- All noise producing equipment and vehicles using internal combustion engines must be equipped with mufflers, and air inlet silencers where appropriate, in good operating condition that meet or exceed original factory specification. Mobile or fixed “package” equipment (e.g., arc welder, air compressor) must be equipped with shrouds and noise control features that are readily available for that type of equipment.
- All mobile or fixed noise producing equipment used on the project, which is regulated for noise output by a local, state, or federal agency, must comply with such regulation.
- Electrically powered equipment instead of pneumatic or internal combustion powered equipment must be used, where feasible.
- Noise producing OMRR&R activities must comply with local noise control regulations.

22. Environmental Protection Plans

The OCFCD is required to have a Hazardous Materials Management Plan, Emergency Response Plan, or Spill Prevention and Contingency Plan in place for OMRR&R activities that may result in the potential for release of hazardous materials into the environment.

The above Plans will be implemented during OMRR&R activities and include measures to prevent or avoid an incidental leak or spill, including identification of materials necessary for containment and clean-up and contact information for management and agency staff. The plan and necessary containment and clean-up materials shall be kept within designated containment areas.

23. Threatened and Endangered Species and Nesting Birds

Maintenance activities have low potential to negatively impact federally listed Threatened and Endangered Species (TES) and habitats. OCFCD must have qualified biologists to monitor and

survey maintenance and adjacent areas and activities during the bird breeding season (15 February to 15 August) to determine if pairs are occupying habitat within 500 feet of the work area. If active nests are found, the biological monitor will consult with the USFWS and the CDFW regarding maintenance activities and avoidance/minimization measures.

The Migratory Bird Treaty Act of 1918 protects native birds during their breeding season from take (including killing, capturing, selling, trading, and transport). Vegetation removal and debris/sediment removal activities that are planned during the breeding season require coordination with a qualified biologist to ensure that there is no take or that proper permitting is acquired to conduct the work needed. During the breeding season vegetation and debris/sediment removal will be overseen by a biological monitor.

INSPECTION FUNCTION

INSPECTIONS

24. The Code of Federal Regulations, under the referenced article of Title 33, states that inspections shall be made by the County immediately prior to the beginning of the flood season, immediately following each major high-water period, and otherwise at intervals not exceeding 90 days, and at such intermediate times as such may be necessary to insure the best possible care of the protective works. Based on guidance from ER 1110-2-1802 (2023) Reporting Earthquake Effects, perform inspections after seismic events if:
- a. Post-earthquake damage is observed,
 - b. Ground motion is felt at the project,
 - c. Certain magnitude-distance criteria are met (see Table 1),
 - d. Peak ground acceleration (PGA) $\geq 0.15g$ is recorded or reported at the site, or if
 - e. A magnitude 4.0 earthquake results in PGA $\geq 0.15g$ at the project site (specific to USACE Los Angeles District)

Refer to Appendix V, Basis for Recommending Repairs, for guidance on what should be inspected. Also, refer to Appendix V, Stonework, D. Grouted stone & reinforced concrete slab, 2. Cracks, for guidance on how to check for voids behind the grouted stone.

Table 2: Earthquake Magnitude and Distance Inspection Criteria

Earthquake Magnitude*	Epicenter Distance From the Project (Miles)
4.5 to 4.9	31
5.0 to 5.9	62
6.0 to 6.9	124
7.0 to 7.9	250
8.0 to 8.4	375
8.5 (or greater)	500

*Commonly designated M or M_w (moment magnitude)

25. The purpose of these inspections is to determine whether or not each project phase and the flood control system are in a properly functioning condition. This responsibility involves locating and recommending repairs for any damage that may have been caused by storm runoff or the action of other natural forces, ensuring that access to all project units is maintained at all times, and preventing unauthorized encroachment on or access to the project right-of-way. Specifically, the Sponsor shall pay particular attention to the upstream and downstream terminus of each Phase within Reach 9 and the contacts between different types of protection, as these areas are particularly vulnerable to damage from high stream flows, especially areas where the grouted stone is connected directly to the bedrock and where the grouted stone is connected to the sheet pile wall. In addition, it is prudent to perform inspections of areas between Phases (e.g., high ground), where the designers did not consider protection to be necessary and the ungrouted and grouted stone interface. The Sponsor may refer to Appendix

VII, USACE's "Inspection of Flood Risk Management Systems", for specific inspection procedures. The Code of Federal Regulations is quite specific on this point; section (a), under the referenced article of Title 33, reads in part:

"(4) No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted upon the rights-of-way for the protective facilities."

26. Criteria. Appendix V provides the criteria for locating and recommending repairs. It defines each reporting feature, and briefly summarizes the features' pertinent design criteria. This information provides the inspection personnel with a design background to assist in determining deviations from an "as constructed" condition. Typical deviations are listed with the repair terminology to be used in recommending repairs. Figure 7 and 8 at the end of PART VI provides a complete listing of reporting features.
27. Reports. The results of the periodic inspection are noted in the appropriate report as identified in PART VI; these results provide the basis for the maintenance program as a whole and in particular, the investigation and test program.

INVESTIGATION AND TEST PROGRAM

28. Purpose. The investigation and test program are designed to provide criteria for making current and long-range maintenance determinations. A test program is to be initiated whenever the condition of a reporting feature cannot be adequately determined by direct inspection. An investigation program is to be initiated when the cause of a reporting feature's condition and the necessary corrective actions are not immediately apparent.
29. Types of Programs. The various types of programs are described below.
 - a. In general, most investigation and test programs are recommended when the spring semiannual report is prepared. Those programs, which are completed in time to implement repairs during the summer months, are classified as "short-term programs".
 - b. Those programs that require more than one year to develop adequate information are termed "continuing programs".
 - c. Certain reporting features require "periodic programs" whose initiation and continuance is a function of regularly established annual periods rather than by specific recommendations during the semiannual inspections. Such periodic test programs may in turn recommend investigation programs that may be implemented on a short-term, continuing, or periodic basis.
30. Relationship of Programs to Semiannual Report. The semiannual operation and maintenance report forms are described in PART VI and illustrated in Appendix III. The sequence has been prepared for a typical reach and shows each phase of the report with backup documents. The following paragraphs provide specific information on the entries to be made in certain columns of the report form.

- a. Column 5. For reporting features involved in periodic test programs, no mention need be made of deviations in column 5 of the semiannual report. However, for reporting features involved in investigation and non-periodic test programs the deviation shall be reported in column 5.
 - b. Column 14. Whenever an investigation or test program is initiated an appropriate notation is to be made in column 14.
 - c. Column 19. Whenever an investigation or test program is either completed before the fall semiannual report or continued after its submittal, an appropriate notation is to be made in column 19, as indicated in PART VI. Whenever this notation indicates that a short-term or continuing investigation program is complete or that a test program has begun, a supporting report covering the program should accompany the semiannual report.
31. Basis for Initiating Program. The criteria for determining deviations from "as constructed" conditions are provided in Appendix V. Given an observed deviation that requires further study, the factors to be considered in conducting an investigation or test program are also described in Appendix V. This appendix provides the information necessary to develop and conduct such a program.
32. Special Test Program Requirements. Certain recurrent problems with reporting features require more detailed discussion.
- a. Concrete or Grouted Stone Movement and Cracking. A test program is recommended to determine the condition of changes or movement of grouted stone and for monitoring cracks in reporting features. The test program will include measurements to determine if the crack is stable; or if not, the rate of displacement and crack progression. If the test program indicates that the crack is stable, the appropriate repair is recommended in column 15 of the semiannual report. However, if the crack is found to be active, an investigation program is recommended to determine the cause of the crack and the necessary corrective action.
 - b. Extreme Seismic Event. Extreme seismic activity requires immediate inspection and potentially followed up by investigation and testing of the project. An example would be a seismic event that exhibits movement along a fault or observed deformations along the project alignment, which will require immediate investigation and evaluation to determine the need for repairs.
 - i. Post-Earthquake Condition. A post-earthquake condition exists at the project if an earthquake occurs with a magnitude range of 4.5 or greater within a 10-mile radius, 5.0 or greater within a 50-mile radius, or 6.0 or greater within a 75-mile radius, 7.0 or greater within a 125-mile radius, 8.0 or greater within a 200-mile radius from a project. Regardless of magnitude or distance, a post-earthquake condition also exists when there is a report of earthquake damage to a project or if the structure is suspected to have sustained an acceleration of 0.05g or more (0.05g equals to 1.61 feet per second per second, or 49.03 cm per second per second). A post-earthquake

condition may also exist if ground motion was felt at the project. A post-earthquake condition emergency generally requires immediate inspection.

- ii. Seismic Event Identification. When a seismic event occurs, the Sponsor's Operations Manager will obtain data on earthquake time of occurrence, magnitude, location (epicenter latitude and longitude), nearest community, and preliminary damage assessment. This information will be readily available at the following United States Geological Survey (USGS) earthquake information hotline and the USGS Internet websites, or from the local news media:
 - (a) USGS/Caltech, Pasadena, CA
Earthquake Information Hotline for Southern California
<http://www.caltech.edu/content/information-earthquakes-press>
(626)449-2631 (24-Hour Earthquake Hotline)
- iii. Inspection and Evaluation. If the seismic event meets criteria described in paragraph above, the project will be inspected immediately following the earthquake to ensure that the project's structural stability, safety, and operational adequacy is continued after the seismic event. The goal is to promptly detect conditions of significant distress, enable timely restoration and remedial measures, and/or initiate notification procedures to provide maximum protection to downstream life and property. The evaluation of the structural integrity of the project will be based upon inspections and documentation report to identify conditions of significant structural distress and to provide a basis for timely initiation of restoration and remedial measures

Refer to Appendix V, Basis for Recommending Repairs, for guidance on what should be inspected.

- c. Scour Monitoring. The unlined, earthen bottom channel is expected to experience scour, due to the softbottom characteristic of reaches. This is especially true where major side channels or side drainage structures enter the channel, in the vicinity of bridges, downstream of drop structures, and near terminus of bank protection features. Surveying is recommended:
 - i. For all areas that contain an earthen channel bottom, a special test program is required to monitor the progression of this scour and to follow its effects; this test program will include a channel, vicinity of bridges, downstream of drop structures, upstream and downstream terminus cutoff wall, culverts, etc. Take cross sections and plot on CADD files for 100-foot channel station intervals, along with a profile of the lowest scour points, conduct when access to the river is both feasible and safe.
 - ii. Perform a survey and plot CADD files every 5 years after project completion and after every release of 10,000 cfs or greater from the Prado Dam outlet.
 - iii. Report documentation shall be submitted to the USACE Inspection of Completed Works (ICW) Program Manager and include a narrative summary and graphic plots of the surveyed cross sections and channel profile to compare with the as-built

drawings (provided separately to the sponsor when the project is turned over) to compare depth of scour to the maximum depth of grouted stone toe.

- iv. Submit the scour documentation report to USACE within 9 months of completion of land survey.

d. Subdrain Systems.

- i. For each subdrain system a test program is required annually for three years after construction and every three years thereafter, provided the test indicates normal operation. If surging or cleaning is necessary to obtain test results, the system shall be tested every year until a three-year period shows normal operation.
- ii. A test program is always carried out in conjunction with normal maintenance flushing operation. The procedure for the various types of subdrain systems are given below.
 - 1. Pipeless gravel drains, with weepholes shall be flushed at each weephole with sufficient water to develop a clear discharge at adjacent weepholes.
 - 2. Pipe drains with weepholes shall be flushed from weephole to weephole with sufficient water to develop a clear and free-flowing discharge of at least five cubic feet per minute out of adjacent weepholes (as measured with calibrated equipment).
 - 3. Pipe drains with cleanouts and open outlets shall be flushed from cleanout to discharge head with sufficient water to develop a clear and free-flowing discharge of at least five cubic feet per minute at the open outlet (as measured with calibrated equipment).
 - 4. Manhole systems shall be flushed from cleanout to manhole and from manhole to manhole with sufficient water to develop a clear and free-flowing discharge of at least five cubic feet per minute at the downstream manhole (as measured with calibrated equipment).

e. Side Drainage Structures.

- i. The Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500) govern the discharge of municipal, industrial, or commercial wastes into navigable waters of the United States or tributaries thereof; this classification includes all channels in the flood control system. An annual test program is required for side drainage facilities carrying effluent of any kind except storm runoff or ground water base flow in order to predict the rate of deterioration caused by the effluent, to provide a basis for annual repairs or replacement, and to determine whether health and sanitation requirements are being violated. The test information should include the quantity of flow, temperature of the waste with its acidity or alkalinity expressed in pH values, the extent of concrete staining or deterioration, and the extent or growth, if any.
- ii. All side drainage structures are subject to hydraulic and structural review under the provisions of the above cited act. In cases involving waste discharge, the review also includes the degree of rehabilitation or renovation required to

maintain flood control structures in proper operating condition; this involves analysis of corrosive action, gaseous emissions, sediment depositions, and similar factors. In addition, the State Regional Water Quality Control Boards assume the responsibility for monitoring the discharge of water under the 1972 amendments to the Federal Water Pollution Control Act and any applicable state regulations; a permit from a State Board is required with a permit from the appropriate flood control organization before side drainage structures can be connected to a flood control facility. The maintaining organization should ascertain from the appropriate Board which observed discharges are covered by permit; those discharges that are not should be reported to that Board.

- iii. The discharge of oil or other hazardous materials into the flood control system is prohibited. Reports of such discharges should be directed to the Operations Branch of the District and will be handled by existing Federal and State contingency plans (see the appropriate Environmental Protection Agency, Coast Guard, or State Fish and Game Contingency Plans).
- iv. Pipes located in channel reaches: Pipes should be maintained so that they will be functional during storm events. [If pipe inspections are necessary then that will be decided by the sponsor on a case-by-case basis, but there is no reporting requirement that includes a video inspection for the pipes]
- v. Pipes located in levees: A post-installation interior inspection is required immediately after installing a new pipe system, and a follow-up inspection is required within the first 5 years since the continued consolidation of the surrounding soil may shift the pipe alignment and compromise pipe connections. After the follow-up inspection, the frequency for future inspections will be determined by the pipe's condition assessment rating based on EM 1110-2-2902a, 31 December 2020. The intervals between inspections indicated in EM 1110-2-2902a, Figure 6-17 may be more frequent based on consideration of the factors, but may not be extended. In addition to these factors, the respective USACE District or levee sponsor may determine an unscheduled inspection is required during a flood event, after a flood or seismic event, or because of sabotage or other unusual events.
- vi. The minimum inspection distance should be from the outlet to the inlet or to the right-of-way, whichever is less. Inspection records should be submitted to the USACE ICW Program Manager for review.
- vii. The side drain outlet structures should be inspected. The inspector should pay special attention to cracking that may be caused by differential settlement. A method for thorough documentation of any cracking should be established prior to the first inspection.
- viii. Energy dissipation riprap at the outlets of the side drains shall be properly maintained, replacing any missing or damaged stones with similar quality and gradation stones as specified in the design documentation.
- ix. Inspect ponding below grouted stone swale at Phase 5A outlet structure. Ensure ponding doesn't result in detrimental conditions to the function of the outlet structure.

- f. Soil Cement.
 - i. All soil cement should be inspected for deterioration, which includes settlement, spalling, scaling, and cracking. Development of cracks is important if layers of fills are under the facing; continued cracking may indicate settlement of soil cement. Hairline cracks may be expected because of shrinkage in soil cement or because of temperature changes. However, if movement of these stresses should concentrate so that larger cracks develop, they must be sealed to prevent excessive water from entering.
 - ii. All soil cement toe protection may be subjected to cracking from excessive side cutting of water flows. Earth and grading shall be used to shift the low flow area away from the soil cement toe protection and maintain the invert grade.
 - iii. Any vegetation growth or debris accumulation in the cracks of the soil cement should be removed and repaired immediately. Soil cement cracks should be noted and sealed to prevent further damage of the levee and to prevent loss of fill materials.
 - iv. All evidence of distress including cracking, settlement, erosion, weathering, etc., indicating that the soil cement is losing strength should be documented. Cracks should be documented and compared overtime to evaluate for growth, rate of movement and progression. The information regarding a crack should include crack dimensions (length, width, depth), location and frequency, crack map, width and pattern, and infilling, seepage, or staining conditions. Add new cracks to inventories and mapped for future evaluation. Evaluate magnitude and orientation of cracking. All cracks in excess of 1/8-inch wide should be documented in Inspection Reports. For small cracks, 1/8-inch to 1/4-inch, document the crack location. Large cracks, in excess of 1/4-inch should be mapped documenting length, maximum width, location, and orientation. A sketch or photo is necessary for comparison over time. Settlement information should include lateral movement and vertical offset. Erosion information includes dimensions (length, width, depth) of distress and loss of ground. Spalling information includes all dimensions (length, width, and depth).
- g. Drainage Structures and Catch Basins. Maintain drainage to catch basin by removing overgrown vegetation or built-up silts in the swale. Inspect grate and pipe riser and ensure any missing part is replaced.
- h. Discharge of Dredged or Fill Material. Any improvements, excavation, construction, or alteration, which involve discharges of dredged or fill material (including excavation) into waters of the United States or involves work or structures in or affecting navigable waters of the United States, shall be authorized by the Regulatory Division under a USACE permit.
- i. Survey Monument Monitoring. Maintain an active survey monument monitoring log for embankment and concrete structures. Settlement should be determined at each survey

marker at least annually until it is apparent that surveys on a maximum five-year interval are appropriate. Survey settlement data for Reach 9 Phase 2B and Reach 9 Phase 5A are located in Appendix VI Data Sheets. Compare past survey elevations with baseline and determine amount settlement occur at each location. Processes should be established for evaluating the relative offset of the monuments to capture any deformation that may be occurring. The surveys may incorporate additional points that the sponsor selected based on the concerns raised during inspection.

- j. Settlement. Any localized depressions (settlements) observed during O&M tasks should be documented. If depressions are found over a large area, surveys should be conducted and checked against as-built documents. Guidance on performing site surveys and quality control criteria (accuracies) can be found in EM 1110-1-1005 Control and Topographic Surveying. Surveys results shall be submitted with an explanation to the USACE ICW Program Manager for review. Process should be established for evaluating any offsets to captured quantitatively of any deformation that may increase over time.
- k. Sheet Pile Wall. Perform visual inspections and wall deflection monument surveys to track and evaluate movement of sheet pile walls. Refer to Appendix VI, Part I, Data Sheets for Reach 9 Phase 2B and Reach 9 Phase 5A for specific information relating to sheet pile wall deflection monitoring survey procedures, monument locations, tolerances, and baseline data.
 - i. Visual Inspection – Perform annual visual inspection and after trigger events of the sheet pile wall caps and surrounding features for signs of distress. Typical signs of distress may include but not limited to excessive cracking in concrete and adjacent pavement, tilting of the guard rails or signage, and change in roadway horizontal alignment. Trigger events include:
 - 1. Immediately following a seismic event that triggers an inspection based in the magnitude/distance listed in Table 2.
 - 2. After a flood event that results in a release of 10,000 cfs or greater from Prado Dam
 - ii. Wall Deflection Monitoring Survey –Perform survey if visual inspection discovers signs of distress, and every 5 years. Follow the procedures described in Appendix VI, Part I Data Sheets for performing wall deflection monitoring surveys for Reach 9 Phase 2B and Reach 9 Phase 5A.

TRAINING FUNCTION

TRAINING RESPONSIBILITIES

- 33. Program. The training responsibilities of the County include the establishment, with annual evaluation and revision, of a regularly scheduled program to provide training in certain critical areas.
 - a. Inspection Training. Inspection training will be designed to ensure uniform inspection procedures, uniform reporting, and inspection controls over repairs and project

construction; to qualify alternative personnel for each type of inspection; and to supplement and verify adequacy of the inspectors.

- b. Repair Training. Repair training is intended to insure uniform repair procedures and competent workmanship. A corollary responsibility is the development of standard repair methods, in cooperation with the District. These methods should be documented in written form to ensure that the techniques and procedures are not lost with personnel changes.
- c. Investigation and Test Training. Training in the investigation and test program will be designed to develop and maintain uniform methods, procedures, and valid program results.
- d. Operation Training. Operation training is designed to maintain crews adequately trained in operational procedures. The sponsor should produce a protocol on how to safely conduct routine operations performed in the project area while public is using this facility. A Safety Work Plan is required for non-routine operations, and all work performed by a Contractor.
- e. Safety Training. Maintenance crew shall comply with all of the safety directives outlined in the Sponsor's Safety and Operations Manual (SOM), or USACE's Engineering Manual (EM) 385-1-1 Safety Manual, whichever is more stringent.

PUBLIC INTEREST FUNCTION

PROTECTION

- 34. The County is responsible for providing protection for the project phases, obtaining adequate ordinances protecting the units, and obtaining limited police authority for the operation and maintenance organization. Adequate monitoring will minimize litter and damage due to malicious mischief. The County is responsible for removing litter and repairing any such damage.

PUBLIC HEALTH AND SAFETY

- 35. The County should develop liaison with organizations responsible for public health in order to prevent the accumulation of waste discharges, insectbreeding areas, and other menaces in the flood control rightsofway.
- 36. The Code of Federal Regulations, under referenced Title 33, clearly states that unimpaired access to all flood control facilities by authorized personnel be provided at all times. However, this access must be restricted to prevent trespassing or uses that might interfere with flood control. The facilities may be regarded as an attractive nuisance, and adequate fencing must be provided to prevent unauthorized persons, especially children, from gaining access to the right ofway and harming either themselves or the facilities. However, security provisions must consider recreational uses, where applicable.

37. The sponsor is responsible making frequent inspection to ensure public safety on the following categories: fencing, smoothness of bikeway surfaces with respect to hiker trip and fall and bicycling hazards, and non-presence of homeless individuals, especially within side drains.

PROJECT REVIEW OF PROPOSED MODIFICATIONS (SECTION 408)
AUTHORIZATION

38. Drainage patterns established at the time of grading should be maintained throughout the life of the project. Alterations in drainage gradients that prevent runoff from draining to approved drainage structures are not allowed. The basic authorization of the Project review function derives from the Code of Federal Regulations, Title 33, article 208.10, section (a), which reads in part as follows:

"(5) No improvement shall be passed over, under, or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the USACE District Engineer or his authorized representative that such improvement, excavation, construction, or alteration will not adversely affect the functioning of the protective facilities. Such improvements or alterations as may be found to be desirable and permissible under the above determination shall be constructed in accordance with standard engineering practice. Advice regarding the effect of proposed improvements or alterations on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice shall be obtained from the USACE District Engineer or, if otherwise obtained, shall be submitted for his approval."

39. Additionally, any proposed modification to existing USACE projects (either federally or locally maintained) that go beyond those modifications required for normal operation and maintenance require approval under 33 USC 408. It states that there shall be no temporary or permanent alteration, occupation or use of any public works including but not limited to levees, sea walls, bulkheads, jetties, and dikes for any purpose without the permission of the Secretary of the Army. Under the terms of 33 USC 408, any proposed modification requires a determination by the Secretary that such proposed alteration or permanent occupation or use of a Federal project is not injurious to the public interest will not impair the usefulness of such work. The authority to make this determination and to approve modifications to Federal works under 33 USC 408 has been delegated to the Chief of Engineers. Authority to approve relatively minor, low impact alterations/modifications related to the operation and maintenance responsibilities of the non-Federal sponsors has been further delegated to the USACE District Engineer for approval in accordance with 33 CFR 208.10.

40. These provisions apply to the Project review for all federally authorized flood control facilities.

REVIEW PROCEDURES FOR PROPOSED MODIFICATIONS

41. The sponsor will need to follow the guidelines set forth in the USACE Engineering Circular (EC) 1165-2-220, "POLICY AND PROCEDURAL GUIDANCE FOR PROCESSING REQUESTS TO ALTER US ARMY USACE OF ENGINEERS CIVIL WORKS PROJECTS PURSUANT TO 33 U.S.C. 408." This document is available online under <https://www.publications.usace.army.mil/>. The purpose of this Engineer Circular (EC) is to provide policy and procedural guidance for processing requests by private, public, tribal, or other federal entities to make alterations to, or temporarily or permanently occupy or use, any USACE federally authorized civil works project under 33 USC 408 (Section 408). Proposed alterations must not be injurious to the public interest or impair the usefulness of the USACE project. This EC contains guidance applicable to all types of USACE projects that can be tailored to the appropriate level of detail for a specific Section 408 request. Supplemental guidance for specific infrastructure types (i.e., dams, hydropower, levee systems, and navigation) and other procedures can be found in the appendices."

PROJECT INSPECTIONS FOR DESIGN MODIFICATIONS

42. The Sponsor will oversee and inspect project construction to ensure that improvements or alterations do not interfere with the proper functioning of the project and that the construction was performed in accordance with the issued Section 408 Permit and the approved plans and specifications. The inspections will also verify locations to ensure that the "AsBuilt" plans accurately reflect the actual condition of the project feature.

INSPECTION OF FLOOD RISK MANAGEMENT SYSTEMS BY USACE

GENERAL

43. This section will detail future levee periodic inspections to be performed by USACE, which are separate from the quarterly/semi-annual inspections expected from the Sponsor. The primary purpose of these inspections is to prevent loss of life and catastrophic damages; preserve the value of Federal investments, and to encourage non-Federal sponsors to bear responsibility for their own protection. Inspections should assure that Flood Risk Management structures and facilities are continually maintained and operated as necessary to obtain the maximum benefits. The inspections are conducted to determine eligibility for Rehabilitation Assistance under authority of PL 84-99 for Federal and non-Federal systems (ER 1130-2-530, ER 500-1-1). Forms pertaining to this inspection are included in Appendix VIII.
44. The Inspection Checklist will continue to be used for all levee system inspections. The full inspection report will be provided to public sponsors to provide a complete assessment of the levee condition. The full inspection results include description of specific deficiencies are critical information public sponsors need to effectively operate and maintain their levee system,

prioritize any repairs or improvements, and conduct communication and risk reduction activities.

45. Newly constructed Federal levee systems are granted Active status when the public sponsor assumes operation and maintenance responsibilities. Continuing Eligibility Inspection (CEI) determinations for these newly constructed Federal levee systems will use the interim eligibility criteria as follows:
 - a. All public sponsors must complete the maintenance program information on page 2 of Appendix VIII.
 - b. Levee segment/system has received an Individual Item/Component Rating of Acceptable or Minimally Acceptable for the items of the existing Inspection Checklist.

TYPES OF INSPECTIONS

46. USACE conducts several types of inspections of Flood Risk Management systems, as outlined below:
 - a. Initial Eligibility Inspections – Initial Eligibility Inspections are conducted to determine whether a non-federally constructed Flood Risk Management system meets the minimum criteria and standards set forth by USACE for initial inclusion into the Rehabilitation and Inspection Program.
 - b. Site Visits –Routine Inspections are performed annually and are intended to verify proper maintenance, owner preparedness, and component operation.
 - c. Formal Levee Inspections – Formal levee inspections are comprehensive inspections performed every five (5) years. It documents the condition of the levee, assesses progress of levee management activities, informs risk assessments and related recommendations, and includes specific evaluations or testing, such as exercising closures or testing pump station components. It is also used to inform eligibility for PL 84-99 Rehabilitation Program.
 - d. 44. d. Special Inspections – Unscheduled inspections conducted as needed due to changed conditions or to document performance. In coordination with Sponsor, USACE may choose to perform a special inspection before, during, or immediately after a flood. Inspections occurring during floods are important because they provide data on how the structure is performing with water on it. A special inspection can be conducted in other circumstances such as after earthquakes or major structural modifications to observe and record any changed conditions and verify the structure’s integrity.

USE OF THE INSPECTION REPORT TEMPLATE

47. The report template is intended for use in all USACE inspections of levee and floodwall systems and flood risk management channels. The section of the template labeled “Initial Eligibility” only needs to be completed during Initial Eligibility Inspections of Non-federally constructed Flood Risk Management Systems. The section labeled “General Items” needs to be completed with every inspection, along with all other sections that correspond to features in the

system. The section labeled “Public Sponsor Pre-Inspection Report” is intended for completion before the inspection, if possible.

ELIGIBILITY FOR PL84-99 REHABILITATION ASSISTANCE

48. Inspected systems that are not operated and maintained by the Federal government may be Active in the USACE Rehabilitation Program (RP) and eligible for rehabilitation assistance from the USACE. The RP interim policy for determining eligibility status is based on Memorandum, March 2014, subject: Interim Policy for Determining Eligibility status of Flood Risk Management Projects for the Rehabilitation Program Pursuant to Public Law (P.L.) 84-99. Eligibility determination for channels, dams, tunnels, and debris basins will remain suspended and their status (either Active or Inactive) will remain unchanged.
49. As for levees, a summary list of the 18 Rated Items to be used to determine status for the RP. The results of an RP eligibility determination of a levee system will be included as part of the final levee periodic inspection report package provided to the sponsor.

Levee segment/system has received an Individual Item/Component Rating of Acceptable or Minimally Acceptable for the following items, which are a subset of the items of the existing Inspection Checklist (see Table 2):

Table 3: Levee Embankment Rated Items

Rated Item	Page Number, Appendix VIII	Item Number
Encroachments	B-11	3
Closure Structures (Stop Log, Earthen Closures, Gates, or Sandbags Closures)	B-11	4
Slope Stability	B-12	5
Erosion/Bank Caving	B-12	6
Animal Control	B-13	10
Culverts/Discharge Pipes (This item includes both concrete and corrugated metal pipes.)	B-13	11
Under seepage Relief Wells/Toe Drainage Systems	B-14	14

Table 4: Floodwall Rated Items

Rated Item	Page Number, Appendix VIII	Item Number
Encroachments	B-16	2
Closure Structures (Stop Log Closures and Gates)	B-16	3
Tilting, Sliding, or Settlement of Concrete Structures	B-17	5
Foundation of Concrete Structures	B-17	6
Under seepage Relief Wells/Toe Drainage Systems	B-18	8

Table 5: Interior Drainage System Rated Items

Rated Item	Page Number, Appendix VIII	Item Number
Culverts/Discharge Pipes	B-21	9
Sluice/Slide Gates	B-21	10
Flap Gates/Flap Valves/Pinch Valves	B-22	11

Table 6: Pump Stations Rated Items

Rated Item	Page Number, Appendix VIII	Item Number
Intake and Discharge Pipelines	B-27	17
Sluice/Slide Gates	B-27	18
Flap Gates/Flap Valves/Pinch Valves	B-27	19

50. The sponsor may pursue the System-Wide Improvement Frameworks (SWIF) program for levee systems that are Inactive in the Rehabilitation Program. The policy for the implementation of SWIFs was issued in November 2011 (Memorandum, CECW-HS, 29 November 2011, subject: Policy for Development and Implementation of System-Wide Improvement Frameworks (SWIFs) and in Memorandum, CECW-HS, 21 March 2014, subject: Interim Policy for Determining Eligibility status of Flood Risk Management Projects for the Rehabilitation Program Pursuant to Public Law (P.L.) 84-99. The SWIF policy creates a process to work with sponsors to plan and implement system-wide improvements. This process consists of a Letter of Intent (LOI) that leads to the development of a long-term SWIF, which also provides for environmental compliance. The sponsor may contact the District Levee Safety Program Manager for current guidance and additional information on the SWIF program.

PART VI – OPERATION, INSPECTIONS, AND MAINTENANCE REPORTS

REPORT FUNCTIONS

GENERAL REPORTING ACTIVITIES

1. The basis for the report function is given in the Code of Federal Regulations, Title 33, article 208.10, section (a), which reads in part as follows:

"(6) It shall be the duty of the Superintendent to submit a semiannual report to the (USACE) District Engineer covering inspection, maintenance, and operation of the protective works."

2. Although the operation and maintenance organization is required to submit several types of operation and maintenance reports to the USACE, all reporting activities must be oriented toward the submittal of two basic reports each year. These semiannual reports are then supplemented by additional reports as necessary.
3. The following sections define the required reports, report organization, and reporting terminology. The reports can be narrative letter reports or summarized on a form designed by the sponsor. The suggested forms included in this document have been used on other projects and are included as examples. The only requirement is that the information identified be included in the reports.
4. The sponsor should maintain an electronic record of all observations, monitoring, and inspections, as well as all maintenance performed on project features. The records should be available for a period of 10 years for inspection by USACE.

TYPES OF REPORTS

5. Semiannual Operation and Maintenance Report. The semiannual reports, which are the basic communication on the functioning of the flood control system, are prepared in two phases: the spring phase, which indicates the maintenance requirements of the project units at the end of the flood season; and the fall phase, which indicates the ability of those units to accommodate storm runoff after the summer maintenance. The two semiannual reports, with the supporting reports that may accompany the basic reports, give a successive picture of the operation and maintenance of the project from the start of one flood season to the start of the next.
6. Quarterly Operation and Maintenance Report. Federal regulations require a complete inspection at least every 90 days to determine the need for temporary or permanent maintenance and to initiate the necessary maintenance for the project units. Document the 90-day inspection findings and maintenance activities using the semiannual report form and retain in project files.
7. The required separate quarterly reports need only be very brief summary descriptions of maintenance needs and the status of the project units.

8. Investigation and Test Program Report. A supplemental report that accompanies the fall phase of the semiannual report is the investigation and test report. Such a report presents the findings of each test program which is carried out to determine the condition of a reporting feature and the results of each investigation program undertaken to determine the cause of a reporting feature's condition and the necessary corrective action.
9. Storm flow Operation Report. A supporting report that accompanies the spring phase of the semiannual report is the storm flow operation report, which contains the log of operations for each project unit during those periods in which storm runoff is above the staff gage reading indicated on the data sheets in Appendix VI. The log report form shall be the responsibility of the county's operation and maintenance organization.
10. Special Reports. Special reports are prepared to describe any unusual occurrence that affects the flood control system; such phenomenon may include large flood flows or unusual damage from storm runoff, earthquakes, or other causes. A Special Report is to be transmitted to the USACE ICW Program Manager within one week of the occurrence. A copy is to accompany the next following semiannual report.
11. OMRR&R Manual Revision Report. The revision report should include comments, suggestions, and additional data from those directly concerned with operation and maintenance, as well as policymaking, administration, funding, and programming information. The District is particularly concerned with maintaining the accuracy of this manual; because it will be periodically revised, observed discrepancies or inaccuracies and comments relative to the manual's effectiveness in fulfilling its intended function will be incorporated where appropriate.

REPORT ORGANIZATION

12. Time of Submittal. The spring phase of the semiannual report shall be submitted to the USACE ICW Program Manager on or before 1 June and the fall phase on or before 1 December. Included with these reports are any quarterly reports, investigation and test reports, storm flow reports, and manual revision reports. Special reports are transmitted as indicated previously.
13. Report Groupings. For the purpose of this manual, the project has been divided into reaches that correspond roughly with a project unit constructed under one contract, and, where applicable, organized by authorizations or major streams.
14. Fiscal Statements. Information on cost of operation and maintenance is required as part of the semiannual report. Actual costs are to be given when possible, as shown on the sample transmittal letter in Appendix III. Estimates may be used for items where actual costs are not available. Operation and maintenance costs for any work performed or paid for by the operation and maintenance organization are to be shown irrespective of the source of funds. Costs for work performed by other agencies and not reimbursed by the operation and maintenance organization are not required.

15. Inclusions in Semiannual Report. The list of reports that may be included in the spring submittal is given below.

- a. Spring phase of the semiannual operation and maintenance report (including the April inspection).
- b. Copy of the January quarterly report.
- c. Storm flow operation reports.
- d. Manual revision reports.
- e. Special reports (the originals of which were previously submitted).
- f. USACE Periodic Inspection reports (if available).

16. The list of reports that may be included in the fall submittal is given below.

- a. Fall phase of the semiannual operation and maintenance report (including the October inspection)
- b. July quarterly report.
- c. Investigation and test program reports.
- d. USACE Periodic Inspection reports (if available).

REPORTING TERMINOLOGY

17. All those features of the project units that must be inspected, operated, and maintained (and hence reported on) are called reporting features for the purpose of this manual. Each such feature is defined here so that use of these terms will be consistent and clear.

18. The maintenance and inspection requirements of certain reporting features have commonalities which allow them to be described as a group by a single general term that is defined to include them all. For this reason, instructions in the manual on condition reporting, on inspection and testing requirements, on design considerations, and on maintenance and repair are organized into groups by such general terms, each of which is then subdivided by specific reporting features. These features are further differentiated into subgroups. In the case of channels, the subgroups contain those features that extend along the channel and occur only at specific channel locations; in the case of debris and detention basins, the subgroups contain those features associated with the spillway and outlet channel, those associated with the outlet works and those associated with the embankment and basin. A tabulation of reporting features organized by general terms is given in Figure 7 for channels and Figure 8 for detention and debris basins.

GENERAL		TYPICAL REPORTING FEATURE	
TERM	INCLUSION	ALONG CHANNEL	AT A CHANNEL STATION
EARTHWORK	Fills, cuts, slopes, levees, embankments	Earth channel invert Earth levee Earth berm roadway	Earth Berm access ramp
CONCRETEWORK	Concrete diversion works, side drainage structures, public utilities, bridges, ditch, retaining walls	Concrete channel invert Concrete channel side slopes Concrete toe protection Concrete channel walls Concrete channel roof slab Reinforced concrete pipe Concrete ditch	Concrete invert access ramp Concrete inlet structure Concrete confluence section Equestrian ramp
STONEWORK	Grouted or ungrouted stone facings, sand and gravel bedding and filters, grouted stone dip crossing	Stone channel invert Stone channel side slope Stone toe protection	Stone invert stabilizer Derrick stone protection
SUBDRAIN SYSTEM	Closed system with manholes, open systems with outlets into channel, pipeless gravel drains, overflow spillways, weepholes		Side drainage structures Side overflow spillway
PUBLIC UTILITY	Sewer, water, gas, oil, electricity, telephone		Public utility
FENCING	Wall safety fencing, safety fencing at ends of channels, covered channel barricades, spillway barricades, public utility barricades, access gates, chain barricades	Fencing	Fencing
BRIDGE	Freeway, highway, street, pedestrian, railroad, public utility, gaging station, diversion works		Bridge Bridge piers
BITUMINOUS SURFACING		Surfaced berm roadway	Surfaced berm-access ramp Surfaced side drainage structures entrance
CHANNEL INSPECTION MANHOLE	Vertical street drains, manholes		Channel inspection manhole
GAGING STATION	Floatwells, gages, recorders, transmitters, station houses, gates, ladders, cables		Gaging station
SPREADING GROUNDS DIVERSION	Pipes, gates, and other facilities for diversion of water		Spreading grounds diversion
RIGHTS-OF-WAY	Access ways and ramps, encroachments, loadings, and uses	Rights-of-way	Rights-of-way
LANDSCAPING	Trees, shrubs, grass, etc.		
SHEET PILE	Walls	Earth channel	
SOIL CEMENT	Side slopes	Earth Channel	
SPECIAL FEATURES			Control sill Drop structure Piezometer Trash racks Settlement Monuments

Figure 7: Reporting Features for Flood Control Channels

GENERAL		TYPICAL REPORTING FEATURE		
TERM	INCLUSIONS	SPILLWAY AND OUTLET CHANNEL	OUTLET WORKS	EMBANKMENT AND BASIN
EARTHWORK	Fills, cuts, slopes, levees, embankments	Earth berm roadway		Earth embankment Earth embankment-access road Earth basin-access road
CONCRETEWORK	Pool drain conduits, side drainage structures, public utility, bridge, basin inlet	Concrete channel invert Concrete channel side slopes Concrete spillway apron Broadcrest concrete spillway Concrete channel roof slab Spreading grounds diversion		Inlet and outlet structures Manhole Reinforced concrete box culverts
STONEWORK	Grouted or ungrouted stone facing, sand and gravel bedding and filters, drainage ways, basin inlet.	Stone spillway apron		Stone side slope
SUBDRAIN SYSTEM	Closed systems with manholes, open systems with spillway outlets, pipelines gravel drains with weepholes, toe drains for drain blankets	Subdrain system		Subdrain system
SIDE DRAINAGE STRUCTURES	Side drainage structures with or without gates, overflow spillway	Side Drainage Structure		
PUBLIC UTILITY	Sewer, gas, water, oil, electricity, telephone	Public utility		Public utility
FENCING	Wall safety fencing, spillway barricades, public utility barricades, access gates, chain barricades	Fencing	Fencing	Fencing
BRIDGE	Street, pedestrian, public utility, catwalks, and stairways to intake towers.	Bridge	Bridge	Bridge
BITUMINOUS SURFACING		Surfaced spillway apron		Surfaced embankment-access ramp Surfaced basin-access ramp Surfaced side drainage structure entrance Surfaced parking area Surfaced spillway-access ramp
DEBRIS STORAGE CAPACITY				Debris storage capacity
STAFF GAGE				Staff gages
INTAKE TOWER	Structures and facilities at inlet end		Intake tower	
POOL DRAIN CONDUIT			Pool drain conduit Spillway drainpipes	
POOL DRAIN DIVERSION	All structures and facilities at inlet end		Spreading grounds diversion	
RIGHTS-OF-WAY	Access ways and ramps, encroachments, loadings, land use	Rights-of-way		Rights-of-way
LANDSCAPING	Trees, shrubs, grass, etc.			
SPECIAL FEATURES		Trash racks		Trash racks

Figure 8: Reporting Features of Detention and Debris Basins

SPRING SEMIANNUAL REPORT

PREPARATION OF FORMS

19. Forms to Be Used. The reporting agency has the option to use narrative report, reporting agency form, or use the SPL 403 & 403a forms. When the construction of a project unit is completed and transferred from construction status to operation and maintenance status, master reproducible semiannual report forms SPL 403, SPL 403a, and SPL 403b are supplied to the operation and maintenance organization by the District. These forms are illustrated in Appendix III. For each completed project unit, one copy each of SPL 403a (the signature page) and SPL 403b (the backup page), along with as many copies of SPL 403 as are necessary to cover a reach, are required.
20. Flood Control Channels. The reporting agency has the option to use narrative report, reporting agency form, or use USACE SPL 403 & 403a forms. The steps to use USACE SPL 403 & 403a forms are described below.
 - a. Using as many forms SPL 403 as necessary and one SPL 403a, type in Column 1 the reporting features shown on the appropriate data sheet(s) in Appendix VI. Features should be listed from upstream to downstream by reaches of not more than 1,000 feet in length. These subreaches need not be uniformly the same length and may comprise only a single bridge, confluence section, or other special channel configuration. The length, however, should not exceed 1,000 feet, as these subdivisions are intended to eliminate several types of repairs to a single reporting feature, which would require more specific location data than can be provided by these reporting techniques.
 - b. Using the terminology in Figure 7 and 8, type the reporting features that are included in a particular subreach. Leave sufficient space for any additional features constructed within the subreach under separate lease or permit. Then draw a line across the form to indicate the end of the subreach.
 - c. After a reporting feature has been typed in column 1, in column 2 type the letter "C" if the feature was constructed under the channel contract or the letter "P" if constructed under a permit or lease.
 - d. From the "As-constructed" drawings or the "as-permit constructed" drawings locate the channel stationing of each reporting feature and type either a specific station or the extent of a reach in column 3.
 - e. Type the applicable data sheet code number(s) and title(s) on the heading of each form SPL 403 and the signature form SPL 403a. The pages should be numbered from upstream to downstream. The form SPL 403a is the final sheet of the report.
21. When the heading, signature block, and first three columns of the semiannual report are completed, reproducibles are made from them; the master forms are then filed for use on the following year. The copies are used in completing the spring phase of the semiannual report.
22. Whenever modifications are made to existing reporting features, or additional features are added by project construction, the master report form is corrected and new reproducibles are made. If a change

is made after the reproducibles are reproduced, the revision is typed on it so that the feature may be reported on by the inspector.

23. When the heading, signature block, and first three columns of the semiannual report are completed, reproducibles are made from them; the master forms are then filed for use the following year. The copies are used in completing the spring phase of the semiannual report.
24. Whenever modifications are made to existing reporting features, or additional features are added by project construction, the master report form is corrected and new reproducibles are made. If a change is made after the reproducibles are reproduced, the revision is typed on it so that the feature may be reported on by the inspector.

PREPARATION FOR THE SEMIANNUAL INSPECTION

25. Spring Housecleaning. Effective inspection and maintenance requires physical and visual accessibility to all reporting features. Debris and vegetation should be cleared away, although meticulous neatness is not required. The guiding principle should be that to the general public the appearance of the project units reflects on the competency and adequacy of the flood control facilities. A specific task to be performed is the removal of debris obscuring inspection or hindering maintenance. Accumulations on bridge piers should be removed, and debris on toe blocks and invert slabs should be windrowed lengthwise along the invert to permit inspection and maintenance and to prevent ponding. Vegetation obscuring inspection of channel condition should be removed, eradicated, or trimmed, as applicable.
26. Relationship to April Quarterly Report. As previously stated, the April quarterly report is made for the sole purpose of determining whether conditions exist that would interfere with the detailed inspection required for the spring phase of the semiannual reports. A separate April quarterly report is not necessary; the results of this inspection are noted on the semiannual report. If this reconnaissance indicates that a reporting feature is visually and physically accessible for the detailed inspection, that feature is dated and initialed in column 4 of the semiannual report. If the reporting feature is inaccessible, the notations are not made until subsequent inspection indicates that the feature has been "house cleaned" and is ready for the spring inspection.
27. Cleaning Deferral. If the reconnaissance indicates that cleaning maintenance may reasonably be performed at intervals longer than one year, the inspector should initial a circled letter in column 4 and give his reasons for recommending deferral in a similarly lettered note on an applicable backup page. However, cleaning should not be deferred if debris or vegetation accumulation might be objectionable, and in no event shall such maintenance be phased over a period of more than five years or deferred for more than a year. Approval of phasing or deferral by the operation and maintenance organization must also be indicated in the note and the year that the maintenance will be performed should be recorded.

THE SEMIANNUAL INSPECTION

28. As the inspection is performed, the handwritten notations to be made in the indicated columns are given below.

- a. Column 5. Any deviation of the reporting features from the "as-constructed" drawings is reported in column 5. The terminology to be used in reporting such deviations must correspond to that on the data sheets in Appendix VI. If the deviation exists because the feature is being constructed under permit or lease, use the term "active permit"; if no deviation exists, the abbreviation "AC" for "as-constructed" is placed in the column.
- b. Notations are made in columns 6 through 18 in all cases where a deviation is reported, where there is an "active permit" feature, or an investigation or test program is recommended or is being continued from a preceding year. In all other cases no notation is made.
 - i. Columns 6 through 13 inclusive are used to indicate the eight categories into which deviation causes have been divided.
 1. Column 6. Normal deterioration, progressive wear, or displacement.
 2. Column 7. Loadings, including debris, vehicles, and structures.
 3. Column 8. Vegetation.
 4. Column 9. Modification of adjacent facilities, including side drainage structures, utilities, bridges, or other project construction activities.
 5. Column 10. Public mischief and/or litter.
 6. Column 11. Flood emergency flow.
 7. Column 12. Storm runoff.
 8. Column 13. Other.
 - ii. The applicable column is marked with either an "X" or a circled number referencing a note on a backup page; all other columns are indicated with a "-".
 1. Column 14. This column applies only to those reporting features for which an investigation or testing program is recommended or is being continued from the preceding year. This status is denoted with an "X" to indicate that an investigation or test program is recommended, "T" to indicate that a program is being continued from a preceding year, and a "-" to indicate that no program is involved. The "Inspection Function" in PART V discusses the basis for recommending investigation or test programs.
 2. Column 15. This column is used to indicate the recommended repair for the deviation reported in column 5. The terminology used must correspond with that given in Appendix V. For some recommended repairs supplemental information is supplied; this information may be a station identification, a quantity of materials needed, or a circled number that corresponds to an explanatory note on a backup page. In general, the recommended repair should be listed without regard to when the repair would be required or when it could be made, as such decisions are made in the operation and maintenance organization's office.

- iii. Filling in columns 16 and 17 is normally the responsibility of the operation and maintenance office; consideration is given to the type of repair recommended, the estimated time required, and the availability of personnel.
 - 1. Column 16. Column 16 will contain the programmed repair completion dates of the current summer, as estimated with regard to maintenance priorities. The official responsible for approving these dates must initial them. When the column is not applicable, write a "-".
 - 2. Column 17. Column 17 will be used only if the repairs are to be accomplished within the next three years. Repairs that cannot be effected during the current summer may be programmed within the next three years with revisions made annually. When the column is not applicable, write a "-".
 - iv. Column 18. Column 18 may be used as part of the spring semiannual report or may be deferred until the fall phase. If used during the spring phase, the column contains a circled number that references an explanatory note concerning the deferral of repairs on a backup page. This explanation must either contain the scheduled date of repair or indicate that the work has been or will be corrected in conjunction with project work. A "-" indicates that no repair is involved.
 - c. Columns 19 and 20 are not used during the spring phase of the semiannual report.
 - d. Column 21. Column 21 indicates any deviations noted and corrected during the period 15 October to 15 April; a circled number with a corresponding explanatory note details the type of deviation(s) noted, the cause thereof, the repairs made, and the date such repairs were completed. No other type of entry is required.
29. The spring semiannual report should be reviewed by the organization superintendent for signature. The reports are then used to make at least two copies of the entire report, one copy of that is filed for reference by the operation and maintenance organization and another of which is submitted to the District as indicated in the "Report Organization" subsection of "Report Functions" in this Part. The reports are then filed by the operation and maintenance organization for use in preparing the fall semiannual report.

FALL SEMIANNUAL REPORT

GENERAL

30. The fall semiannual report describes the final inspection of repairs and project construction scheduled for completion before the start of the flood season. It also serves to verify that the project phases are ready for storm flow.
31. As previously indicated, the reporting agency has the option to use narrative report, reporting agency form, or use USACE SPL 403 & 403a forms.

32. If using USACE SPL 403 & 403a forms, note the following instructions: During the course of the fall semiannual inspection columns 18 through 21 are completed for all reporting features that required entries in columns 6 through 17; in other cases no entries in these columns are made.
- a. Column 18. If column 18 was not used during the spring phase; it is now completed with a circled number that references an explanatory note concerning the deferral of repairs on a backup page. This explanation must either include the scheduled date of repair or indicate that the work has been or will be corrected in conjunction with project work. A "-" indicates that no repair is involved.
 - b. Column 19. Column 19 contains required information on a scheduled investigation and test program, if applicable (see Column 14). This column may contain a completion date when the program was finished before the fall semiannual report, the letter "T" to indicate that the program will continue, or a "-" when no program is involved. The results of a completed program will be submitted in the supporting investigation and test program report.
 - c. Column 20. Column 20 is used to indicate the status of repairs scheduled for completion the preceding summer. The entry consists of the inspector's initials to indicate completion of the inspection, or a "-" to indicate that no repair or construction is involved.
 - d. Column 21. Column 21 provides a place for indicating any remarks as may be required to clarify conditions found during repairs. The entry will be a circled number that references an explanatory note on a backup page. A "-" indicates that no clarification is required.
33. The fall semiannual report should be reviewed by the organization superintendent for signature. The reports are used to make at least one copy, which is forwarded to the District as indicated in the "Report Organization" subsection of "Report Functions" section of this Part. The originals are then filed for reference by the operation and maintenance organization.

PART VII – REGULATORY PERMIT PROGRAM

REGULATORY PERMITS

GENERAL

1. The local sponsor must contact the USACE Los Angeles District Regulatory Division for assistance in applying for regulatory permits for activities that may discharge dredged or fill material into waters of the U.S., or for work or structures in navigable waters of the U.S. Early coordination with Regulatory Division is recommended. Certain activities associated with the operation and maintenance of flood control projects that take place within waters of the United States may require permits unless:
 - a. The activity qualifies for the maintenance exemption [CFR 323.4(a)(2); 404(f)(1)(B)]
 - b. The activity does not result in a regulated discharge of dredged or fill material
 - c. The activity is authorized by Nationwide Permit already verified by USACE Regulatory Division
 - d. An Individual Permit has been issued by USACE Regulatory Division that includes the specific maintenance activities that are proposed.
 - e. A Regional General Permit has been issued by USACE Regulatory Division for maintenance and verified for specific use
2. The USACE, Los Angeles District, has determined that a Section 404 permit will not be required to perform the routine operation and maintenance activities for the general maintenance activities of currently serviceable structures and emergency reconstruction of recently damaged structures that meet the 404(f)(1)(B) maintenance exemption [40 C.F.R. § 232.3(c)(2)(EPA regulations) and 33 C.F.R. § 323.4(a)(2)]. Should an emergency or flood event occur whereby major maintenance that would exceed the regular routine maintenance activities is needed, the local sponsor would apply for an emergency permit at that time. Regular routine operation and maintenance activities will include:
 - a. All inspection activities.
 - b. All work that does not discharge fill material into the channel.
 - c. Clean out and removal of vegetation, sediment, debris at side drainage outlet structures and riprap ditches.
 - d. Removal of vegetation to be performed outside of the nesting bird season, between August 16 through February 14.
 - e. Stone backfill of scour holes above the Ordinary High Water Mark of the channel.
 - f. Implement an ongoing program to eliminate burrowing animals to prevent development of seepage potential in the embankment to ensure slope stability.
 - g. Inspect survey monuments and Stationing markers to ensure that they have not been removed or damaged. Repair or replacement is required if they are damaged or missing.
3. The Sponsor is responsible for applying for and taking all necessary steps to obtain the authorizations to perform the required OMRR&R activities that exceed the regular routine maintenance activities. The Sponsor must pursue all available alternatives to secure authorization for required OMRR&R

activities. In the event that the Sponsor exhausts all options but cannot obtain timely authorization for required maintenance, the USACE, Los Angeles District and Sponsor will cooperate to determine a reasonable course of action to obtain the required authorization, or the USACE, Los Angeles District and Sponsor will re-evaluate the required OMRR&R activities in compliance with Federal laws, regulations, and policies.

4. Under current regulations and guidance (as of January 2014), the following activities usually do not require a section 404 permit:
 - a. Application of an USEPA-approved herbicide spray approved for use in aquatic environments.
 - b. Vegetation management activities that involve only the cutting or removing of vegetation above the ground (e.g., mowing, rotary cutting, and chain-sawing) where the activity neither substantially disturbs the root system nor involves mechanized pushing, dragging, or similar activities that redeposit excavated soil material (33 CFR §323.2(2)(ii).
 - c. Emergency reconstruction of recently damaged parts of currently serviceable structures such as levees, riprap, access roads, access ramps, culverts and waterways, provided the reconstruction does not include a modification that changes the character, scope, or size of the original design and does not involve the temporary discharges of fill material in waters of the U.S. associated with access, dewatering and/or stockpiling material. Furthermore, the exempted reconstruction must not have as its purpose the bringing an area of navigable waters into a use to which it is was not previously subject, where the flow or circulation of navigable waters may be impaired, or the reach of such waters be reduced. The bottom of an unlined channel or basin is not considered a structure, even when enclosed by levees. Emergency reconstruction must occur within a reasonable time after damage occurs (typically within one year).
 - d. Discharge of fill material, in the absence of adjacent wetlands or other special aquatic sites, located above the ordinary high-water mark (OHWM) and, therefore outside of waters of the United States. The OHWM is defined at 33 CFR. §328.3(e) as “that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.”

APPLICABLE LAWS AND STATUTES

5. Laws. The Los Angeles District Regulatory Division permit program is based mainly on three Acts of Congress.
 - a. Sections 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 401 and 403) prohibit unauthorized construction or work in navigable waters of the United States.
 - b. Section 404 of the Clean Water Act (33 U.S.C. 1344) governs disposal of dredged or fill material in waters of the United States.
 - c. Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972, as amended (16 U.S.C. 1432), regulates transportation of dredged material for the purpose of disposal in the ocean, namely at designated ocean disposal sites.
6. The USACE permit program also includes an Act of Congress administered outside of the Regulatory permit program.

7. Statutes. Other related laws and executive orders also affect USACE regulatory authority.
- a. The National Environmental Policy Act of 1969 (42 U.S.C. 4321-4347) defines the national policy for encouragement of productive harmony between man and his environment, as evaluated through the USACE decision documents, including Environmental Impact Statements and Assessments.
 - b. Section 401 of the Clean Water Act (33 U.S.C. 1341) requires any applicant for a USACE permit to conduct any activity that may result in a discharge of a pollutant into waters of the United States to obtain a certification from the State.
 - c. The Fish and Wildlife Preservation Act of 1956 (16 U.S.C. 742a, et seq.), the Migratory Marine Game-Fish Act (16 U.S.C. 760c-760g), the Fish and Wildlife Coordination Act (16 U.S.C. 661-666c) and other acts express the will of Congress to protect the quality of the aquatic environment as it affects the conservation, improvement and enjoyment of fish and wildlife resources and describe certain requirements for coordination with State and Federal Fish and Wildlife agencies.
 - d. The National Historic Preservation Act of 1966 (16 U.S.C. 470) requires coordination on matters concerning historic and archaeological preservation.
 - e. The Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1456(c)), requires the USACE to assure that permitted activities directly affecting a state's coastal zone comply to the maximum extent practicable with an approved state coastal zone management program.
 - f. The Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.) requires coordination to ensure that any action authorized by the USACE is not likely to jeopardize the continued existence of listed endangered or threatened species, or result in the destruction or adverse modification of designated critical habitat of such species.
 - g. The Executive Order 11988 of 1977 (42 F.R. 26951) requires that the USACE avoid direct or indirect support of floodplain development wherever there is a practicable alternative.

WATERS DEFINED

8. Waters of the United States. Waters of the United States, which are subject to federal regulation under USACE's jurisdiction under Section 404 of the Clean Water Act (33 C.F.R. Part 328).
- a) Waters of the United States means:
- 1) Waters which are:
 - (i) Currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
 - (ii) The territorial seas; or
 - (iii) Interstate waters
 - 2) Impoundments of waters otherwise defined as waters of the United States under this definition, other than impoundments of waters identified under paragraph (a)(5) of this section;
 - 3) Tributaries of waters identified in paragraph (a)(1) or (2) of this section that are relatively permanent, standing or continuously flowing bodies of water;
 - 4) Wetlands adjacent to the following waters:
 - (i) Waters identified in paragraph (a)(1) of this section; or

- (ii) Relatively permanent, standing or continuously flowing bodies of water identified in paragraph (a)(2) or (a)(3) of this section and with a continuous surface connection to those waters; or
 - 5) Intrastate lakes and ponds not identified in paragraphs (a)(1) through (4) of this section that are relatively permanent, standing or continuously flowing bodies of water with a continuous surface connection to the waters identified in paragraph (a)(1) or (a)(3) of this section.
9. Navigable waters of the U.S. subject to federal regulation under Section 10 of the Rivers and Harbors Act (33 CFR 329) are those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. All navigable waters of the U.S. are also subject to regulation under Section 404 of the Clean Water Act.

A list of navigable waterways within the USACE Los Angeles District's area of responsibility (per 33 CFR §329.4) is available online at <https://www.spl.usace.army.mil/Missions/Regulatory/Jurisdictional-Determination/Navigable-Waterways/>. A determination of navigability, once made, applies laterally over the entire surface of the waterbody, and is not extinguished by later actions or events that impede or destroy navigable capacity.

For purposes of this manual, the Santa Ana River is considered to be a continuously flowing body of water tributary to the Pacific Ocean, which is subject to the ebb and flow of the tide, with the potential for adjacent wetlands, i.e., a water of the United States.

SECTION 408 PERMISSION

10. For any work that could potentially alter existing USACE built facilities, a permission pursuant to section 14 of the Rivers and Harbors Act of 1899, codified at 33 U.S.C. 408 (Section 408), will be required. The non-federal sponsor (NFS) has the responsibility to ensure that Section 408 permissions are obtained before they perform, or permit other third parties to perform, modifications or alterations of USACE built facilities that the NFS operates and maintains. For confirmation regarding whether a Section 408 permission would be required, send inquiries to: SPLPermitInquiries@usace.army.mil.
11. Per USACE Engineering Circular (EC) 1165-2-220, "Maintenance and repair activities conducted by non-federal sponsors on the USACE project for which they have operation and maintenance responsibilities do not require Section 408 permission but may require coordination or concurrence from the USACE district, as further specified below.
- a. Operations and Maintenance (O&M) activities, including any flood fighting and/or other emergency activities, specified in a USACE-issued O&M manual do not require Section 408 permission.
 - b. Activities to restore the USACE project to the physical dimensions and design of the constructed project, without any changes to the real property, existing design features, or physical dimensions or performance of the USACE project do not require Section 408 permission. USACE districts may at any time require the non-federal sponsor to

coordinate with the district to verify the design or construction approach of such activities based on scope and scale. USACE districts should proactively coordinate with the non-federal sponsor to identify, if any, the types of activities that may need this verification.

- c. Geotechnical exploration drilling by the non-federal sponsor associated with activities described in paragraphs 9.c.(1) and (2) does not require Section 408 permission. However, drilling in embankment dams and levees must comply with requirements of ER-1110-1-1807, including a drilling plan. Districts will coordinate with non-federal sponsors to develop the drilling plan.”

PERMIT APPLICATION

12. Additional information related to Section 408 Permission can be found at the following web link:
<http://www.spl.usace.army.mil/Missions/Section-408-Permits/>.