



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



SANTA ANA RIVER 1 LEVEE SYSTEM

ORANGE COUNTY, CALIFORNIA
NLD SYSTEM ID # 3805010039

PERIODIC INSPECTION REPORT NO 1 **GENERALIZED EXECUTIVE SUMMARY**

FINAL SYSTEM RATING: MINIMALLY ACCEPTABLE
FINAL RATING DATE: OCTOBER 2014

PERIODIC INSPECTION REPORT PREPARED BY TETRA TECH
FOR THE U.S. ARMY CORPS OF ENGINEERS, LOS ANGELES DISTRICT

SUBMITTED: APRIL 2014
INSPECTED: JUNE 17-19 AND NOVEMBER 12-14, 2013

EXECUTIVE SUMMARY

This Executive Summary provides an introduction to the periodic inspection (PI), an overview of the Santa Ana River 1 (SAR1) Levee System, a summary of the major findings of the periodic inspection, and the overall rating for the system.

1.1 Scope and Purpose of Periodic Inspections

The purpose of the SAR1 Levee System periodic inspection is to identify deficiencies that pose hazards to human life or property. The inspection is intended to identify the issues in order to facilitate future studies and associated repairs as appropriate.

This assessment of the general condition of the SAR1 Levee System is based on available data and visual inspections. Detailed investigation and analysis involving hydrologic design, topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of this levee system inspection.

1.2 System Summary

The Santa Ana River 1 Levee System is located on the right/west bank of the Santa Ana River in the state of California, in Orange County, in the cities of Santa Ana, Fountain Valley, and Huntington Beach. The SAR1 Levee System was federally authorized and subsequently constructed by the U.S. Army Corps of Engineers, Los Angeles District (USACE). Construction of the SAR1 Levee System was completed in September 1995 (USACE). The SAR1 Levee System is now entirely operated and maintained by Orange County Flood Control District (OCFCD), which is administered by Orange County Public Works (OCPW) staff. The National Levee Database Number (NLD No.) for the SAR1 Levee System is 3805010039. The SAR1 Levee System has a levee embankment, a trapezoidal channel lined with either reinforced concrete, grouted riprap, or riprap, a rectangular channel lined with reinforced concrete, reinforced concrete floodwalls, reinforced concrete retaining walls, concrete masonry unit (CMU) retaining walls, 28 side-drainage structure pipes, 18 discharge pipes, two side-drain junction structure pipes, four pump stations, numerous utility crossings, 20 bridge crossings, and 14 access ramps.

The SAR1 Levee System extends from immediately upstream of Interstate 5 (I-5) (Station 631+00) to slightly downstream of the Pacific Coast Highway (Station 13+40), a distance of approximately 61,760 feet (11.7 miles).

Figure 1 shows the SAR1 Leveed Area.

1.3 Summary of Major Deficiencies Found

The periodic inspection of the SAR1 Levee System was conducted on June 17-19, 2013 and November 12-14, 2013 and OCPW staff was present. OCPW refers to the SAR1 Levee System as Reach 1, Reach 2, Reach 3, Reach 4, Reach 5, and part of Reach 6. During the inspection of the levee system, deficiencies were noted for which remedial actions are required. The following main deficiencies of the project features were noted during the periodic inspection:

- 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 vegetation-free zone. The vegetation-free zone extends from 15 feet

beyond the landward toe to 15 feet beyond the riverward toe of the levee. Except for along the Riverview Golf Course, the vegetation was planted as part of the USACE LAD “Esthetic Treatment and Erosion Control Plan” (USACE LAD 1993b, 2006, and 2007).

- Encroachments: The landward slope of the levee embankment was steepened by the Associated Ready Mixed Concrete operations, which is located adjacent to the levee. In addition, the toe of the landward slope was cut and large concrete blocks have been placed at the cut toe to serve as a retaining wall. OCPW subsequently surveyed the right-of-way along the property and Associated Ready Mixed Concrete has removed the blocks. The landward slope is still pending repair.
- 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.
- Underseepage Relief Wells/Toe Drainage Systems: A subdrain cleanout was full of sediment. Records provided by OCPW indicate the vaults associated with the low-flow channel are cleaned once every 5 years. There was no indication that the subdrain pipes have been previously cleaned; however, OCPW is in the process of cleaning inside the pipes.
- 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. No water is being discharged from the adjacent subdrainage system, which may indicate that the subdrainage system is clogged.
- Floodwalls:
 - Non-Compliant Vegetation Growth: A tree with a trunk larger than 2-inches in diameter was growing next to a reinforced-concrete wingwall. The vegetation-free zone extends from 15 feet beyond the landward side to 15 feet beyond the riverward side of floodwalls.
- Interior Drainage System:
 - Vegetation and Obstructions: There was sediment blocking more than 10 percent of the inlet and/or outlet of two drainage structures.
 - Encroachments: An 18-inch-diameter RCP side-drainage structure was abandoned, but was not plugged at the outlet.
 - Culverts/Discharge Pipes: Significant damage was noted during the video inspection of a side-drainage structure. OCPW is in the process of requesting the property owner to repair the pipe (OCPW 2014a and 2014c).
 - Flap Gates: A flap gate was missing at the outlet of a 24-inch-diameter RCP side-drainage structure.

- Trash Racks: A trash rack was missing at the inlet of a 24-inch-diameter RCP side-drainage structure and an 18-inch-diameter RCP side-drainage structure.
- Flood Damage Reduction Channel:
 - Shoaling: Shoaling stabilized by saplings, brush, and other vegetation was observed to be diverting flow towards the channel upstream approximate of the line of allowable sediment deposition (OMRRR Manual, USACE 1996). However, shoaling was anticipated at the time of design and freeboard was increased to as much as five feet above the minimum three feet to convey the maximum expected discharge (USACE LAD 1988b). Therefore, while the shoaling should be removed upstream of the approximate line of allowable sediment deposition to be in compliance with the *OMRRR Manual*, shoaling was accounted for along this reach and has not likely reduced the freeboard to below minimum recommended levels.
 - Foundation of Concrete Structures: Erosion from local runoff had undermined the upper concrete slope paving at one location.

1.4 Overall Rating

The Levee Safety Out-Brief Meeting was held on February 26, 2014. An engineering determination has concluded that the observed deficiencies would not prevent the system from performing as intended during the next flood event. Therefore, the Levee Safety Officer (LSO), Los Angeles District, has determined the overall system rating to be “Minimally Acceptable.”

A “Minimally Acceptable” system rating is defined as, “One or more items are rated Minimally Acceptable or one or more items are rated Unacceptable and an engineering determination concludes that the Unacceptable items would not prevent the segment/system from performing as intended during the next significant runoff event.”

The local sponsor will be notified of the overall rating of the levee system by letter with instructions to correct the “Unacceptable” rated items as soon as possible, not to exceed two years, and to correct the “Minimally Acceptable” rated items so that they do not deteriorate further and become “Unacceptable.”

SANTA ANA RIVER 1 LEVEE SYSTEM
FINAL PERIODIC INSPECTION REPORT NO. 1



Figure 1: Santa Ana River 1 Levee System