

REPORT SUMMARY
Los Angeles River Ecosystem Restoration
Los Angeles, California

Feasibility Scoping Meeting	01 NOV 2007
Alternative Formulation Briefing (AFB)	13 & 25 JUN 2013
AFB Guidance Memorandum	30 AUG 2013
Draft Report Guidance Memorandum	10 SEP 2013
Division Engineer Transmittal	13 MAY 2015
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CWRB Briefing	16 JUL 2015
30-Day S&A Review Start	14 AUG 2015
30-Day S&A Review End	13 SEP 2015
Chief's Report	17 DEC 2015

STUDY INFORMATION

Study Authority and Sponsor. The Los Angeles River Ecosystem Restoration Study was authorized by Senate Committee on Public Works Resolution, approved June 25, 1969, reading in part:

“Resolved by the Committee on Public Works of the United States Senate, that the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby requested to review the report of the Chief of Engineers on the Los Angeles and San Gabriel Rivers and Ballona Creek, California, published as House Document Numbered 838, Seventy-sixth Congress, and other pertinent reports, with a view to determining whether any modifications contained therein are advisable at the present time, in the interest of providing optimum development of all water and related land resources in the Los Angeles County Drainage Area.”

Section 4018 of the Water Resources Development Act of 2007 also provided authorization for a “feasibility study for environmental ecosystem restoration, flood risk management, recreation, and other aspects of Los Angeles River revitalization that is consistent with the goals of the Los Angeles River Revitalization 1 Master Plan published by the City of Los Angeles....” The implementation guidance for this section identified that the scope and substance of the study under the Senate resolution is identical to the study mandated by section 4018 and directed that the ongoing study incorporate the section 4018 study. The feasibility study incorporates, where applicable, conceptual elements and addresses restoration goals from the City’s Los Angeles River Revitalization Master Plan.

Study Sponsor. The non-Federal sponsor for the feasibility study and plan implementation is the City of Los Angeles, California, and for purposes of this report summary is called the “City.”

Study Purpose and Scope. This feasibility study provides a partial response to the study authorities. This study evaluates opportunities for restoration of approximately 11 miles in and along the Los Angeles River from Griffith Park to Downtown Los Angeles, while maintaining existing levels of flood risk management. The study also evaluates related opportunities to provide recreation consistent with the restored ecosystem.

Project Location/Congressional District. The project is located in the City of Los Angeles. The initial study area of 32 of the 51 miles of the Los Angeles River was narrowed in scope to focus on the greatest potential to restore habitat as shown in the project map. Senate representation includes Senators Barbara

Boxer and Dianne Feinstein, and U.S. Congressional Districts are California District 34 represented by Hon. Xavier Becerra, and District 28 represented by Hon. Adam Schiff.

Prior Reports and Existing Water Projects: This project overlaps significantly with the Los Angeles County Drainage Area (LACDA) project which provides flood damage reduction to Los Angeles. The Corps is responsible for operation and maintenance of the portion of the river within the study area. In developing the current study, the Corps consulted over 50 reports previously prepared by various agencies. In addition, many study efforts connected to the Los Angeles River are being conducted concurrently and, as a result, are not ready for review or incorporation into this study. Some of the most relevant reports are listed below.

Selected U.S. Army Corps of Engineers Reports

- Los Angeles County Drainage Area Review, December 1991.
- Final Report, Review of Water Resources within the Los Angeles County Drainage Area, 1985.
- Report on Floods of February and March 1978 in Southern California, 1978.
- Flood Control in the Los Angeles County Drainage Area, 1939.

Selected Individual, Local, and Agency Reports

- Garrett, Kimball. California Department of Fish and Wildlife, The Biota of the Los Angeles River: An Overview of the Historical and Present Plant and Animal Life of the LA River Drainage, March 1993.
- Los Angeles County Department of Public Works (LACDPW). Los Angeles River Master Plan, 1996.
- City of Los Angeles. Los Angeles River Revitalization Master Plan and Programmatic EIS/EIR, 2007.
- Santa Monica Mountains Conservancy & Rivers and Mountains Conservancy. Common Ground: From the Mountains to the Sea, San Gabriel and Los Angeles Rivers Watershed and Open Space Plan, 2001.
- California Coastal Conservancy, Wetlands of the LA River Watershed: Profiles and Restoration Opportunities, May 2000.
- LACDPW, Los Angeles River Alternative Flood Control Study. 1997.
- LACDPW, Multi-Use Study on the Los Angeles River at Taylor Yard, 1994.
- Rio De Los Angeles State Park (Taylor Yard), 2005.

Concurrent Corps Studies

- Arroyo Seco Watershed Ecosystem Restoration Feasibility Study. This study is evaluating alternatives within the watershed of the Arroyo Seco, a major tributary to the River, from the Angeles National Forest boundary to 0.5 mile above the confluence with the River, where it meets the boundaries of this proposed project. This study recently met the alternatives milestone.
- Headworks Ecosystem Restoration Feasibility Study. This study focuses on a portion of the historic flood plain along the River adjacent to Griffith Park. This study may be converted to a Continuing Authorities Program 1135 project in the near future.
- Sun Valley Ecosystem Restoration Feasibility Study. The Sun Valley Watershed is a 2,800-acre urban watershed located approximately 14 miles northwest of Downtown Los Angeles; the watershed is a tributary to the River. The study will evaluate environmental restoration and flood risk management.

Federal Interest. The reconnaissance phase of the study resulted in the finding that there was a Federal interest in continuing and expanding the study into the feasibility phase along the entire river. The Los Angeles River restoration project provides an opportunity for restoration of some of the scarcest and most threatened aquatic and riparian habitat in the United States to support diverse and sensitive wildlife and fish populations, in the nation's only Mediterranean-type climate. The ecosystem project would, in part,

reverse degradation associated with urbanization and development in the historic floodplain and with the channelization of the river system undertaken as part of the LACDA flood risk management project constructed in the mid 20th century by the Corps and LACDPW, and would concurrently advance important federal efforts including the Urban Waters Federal Partnership (UWFP). The study area is also within the National Park Service's Rim of the Valley Special Resource Study Area for consideration of expansion of the Santa Monica Mountains National Recreation Area.

STUDY OBJECTIVES

Problems and Opportunities. The Los Angeles River study area is surrounded by a substantial human population and massive infrastructure development in and adjacent to the river channel and floodplain. The study team and the agencies involved with these planning efforts identified the following problems created by urbanization and flood risk management projects:

1. Elimination of the ability of aquatic species to move freely upstream-to-downstream and to find adequate locations for refuge and proliferation—in particular, there is a considerable absence of aquatic habitat for fish and other wildlife species;
2. Degradation of ecological processes, e.g., exchange and flow of nutrients and sediment within the system, necessary to support ecosystem function in valley foothills riparian and freshwater marsh habitats;
3. Replacement of diverse substrate, such as naturally-occurring mixes of fine silts and boulders, necessary to support valley foothills riparian, freshwater marsh, and fish habitats with concrete;
4. Breaks in connections between the river and its historic floodplain, such as a meandering, fluctuating relationship with its tributaries, which associated loss of ecosystem functioning;
5. Highly-altered hydrologic regime that is simplified (reduced flow options) and magnified (higher flows concentrated in smaller spaces);
6. Highly-altered habitat cycle since extremely high velocity flows within the study area prevent robust establishment of riparian habitat and the adequate protection of species attracted to it;
7. Disruption of natural sedimentation processes and exaggeration of atypical/altered regimes, discouraging the ability of existing areas to support diverse habitat communities;
8. The inability of surface flows to infiltrate and recharge groundwater aquifers, which is necessary to restore native flow regimes and support native habitat communities;
9. Degradation of aquatic habitat due to flows conveyed through the many storm drains of the channelized flood management system;
10. Proliferation of non-native/exotic species and trash/debris, which have degraded aquatic habitat and prevented establishment of native species; and
11. Unpleasant human experience that provides very little understanding of the river's natural history and value and reinforces inability to access/participate in recreation at the river to learn more about its restoration potential.

The study team and the agencies involved with these planning efforts agreed that the problems present the following opportunities for restoration of nationally and regionally significant ecosystem function within the study area. The relationship between each problem and opportunity is noted in parentheses. For example, P1 refers to problem one in the previous list. Opportunities are as follows:

- Restore lost aquatic habitat including valley foothill riparian, freshwater marsh, and native fish habitat (P1).
- Improve diversity and abundance of native valley foothill riparian and freshwater marsh plants to support the diversity and abundance of wildlife species (P1).
- Improve and restore ecological processes in the project area to support ecosystem function in valley foothill riparian communities, freshwater marsh, and native fish habitats (P2).
- Restore substrate in valley foothill riparian, freshwater marsh, and native fish habitats (P3).

- Improve habitat connectivity to floodplains and functioning ecological zones (P4).
- Restore a more natural hydrologic regime (P5).
- Decrease peak discharges and/or increase floodplain area in the mainstem and at tributary confluences to reduce discharges and velocities that prevent establishment of native habitats (P6).
- Improve natural sedimentation processes (P7).
- Improve infiltration and recharge (P8).
- Improve water quality from urban runoff in the river, its tributaries, and other drainages entering the river to prevent degradation of aquatic habitat (P9). This project is not proposing measures to address water quality; any improvements will be ancillary to the project.
- Remove and manage invasives/exotics and trash to reestablish native vegetation (P10).
- Increase recreation allowing compatible human interaction with restored ecosystems (P11).

Planning Objectives

1. Restore Valley Foothill Riparian Strand and Freshwater Marsh Habitat: Restore valley foothill riparian wildlife habitat types, aquatic freshwater marsh communities, and native fish habitat within the study area throughout the period of analysis, including restoration of supporting ecological processes and biological diversity, and a more natural hydrologic and hydraulic regime that reconnects the River to historic floodplains and tributaries, reduces velocities, increases infiltration, and improves natural sediment processes.

2. Increase Habitat Connectivity: Increase habitat connectivity between the River and the historic floodplain, and increase nodal habitat connectivity for wildlife between restored habitat patches and nearby significant ecological zones such as the Santa Monica Mountains, Verdugo Hills, Elysian Hills, and San Gabriel Mountains within the study area throughout the period of analysis.

3. Increase passive recreation that is compatible with the restored environment through the period of analysis. Passive recreation was included as a means to direct human interaction with ecosystem restoration features to connect to existing recreation infrastructure, increase environmental education and increase the trail system to coincide with the restored areas.

Planning Constraints and Considerations. The identified constraints are that HTRW must be avoided whenever practicable; the sponsor must be able to provide lands for the potential project area; existing levels of flood risk management must be maintained; conflicts with engineering policies for flood risk management projects must be avoided. Considerations include limited water availability in an arid climate, avoidance of major infrastructure where practicable, avoidance of nesting and flood season where practicable, minimization of impacts to native vegetation, and that passive recreation must not degrade restored areas.

ALTERNATIVES

Plan Formulation Rationale. Public input and local expertise with similar restoration projects was incorporated throughout the plan formulation process. Several charrettes were held to gather ideas for management measures and alternatives. The primary areas of local concern identified during the study formulation process include: (1) technical considerations based upon the specifics of the study area; (2) maintaining or improving the existing level of flood risk management; and (3) coordinating recommended plans with ongoing development and local efforts in ecosystem restoration within the study area. For this study, benefits (or outputs) have been quantified using the Combined Habitat Assessment Protocols (CHAP) approach for the existing, future without project, and future with project conditions. The CHAP has been approved for single use on the Study (21 June 2013).

Management Measures and Alternative Plans. A full array of structural and non-structural measures was formulated to address identified problems and opportunities. Preliminary screening eliminated the following as ineffective, incomplete, unacceptable, or because they were not measures: underground

basins for attenuation and water supply (ineffective, inefficient, incomplete); bypass/diversion tunnels/culverts under the city (ineffective); wildlife bridges/tunnels (ineffective/incomplete); cantilever channel bank (ineffective, incomplete); pervious parking in watershed (unacceptable); Tujunga (upstream tributary) channel system modification (ineffective, incomplete); relocate facilities/utilities (not a measure); deepen entire channel (ineffective); modify upstream dams (ineffective, incomplete), modify pool/riffle complex in existing non-concrete channel bed (ineffective).

Measures retained for inclusion are listed below, along with the objectives they help to achieve.

1. Adjacent or off channel modifications. (*Objective 1, 2*) These include restoration measures both immediately adjacent to and separated from the main river channel. Measures include establishment of riparian, wetland, or open water areas through channel widening, stream daylighting, creating geomorphology and planting freshwater marsh in side channels, grading channel-adjacent areas to lower elevations for habitat, floodplain reconnection, and offline detention, and rebuilding geomorphology for historic wash.
2. Attenuation. (*Objectives 1, 2.*) These measures include capture of flows from the main channel, storm drains, and tributaries into side channels or detention basins. This measure includes slowing input of storm flows, restoring wetlands, and creating a confluence with the River and would require connection to the River.
3. Wildlife access. (*Objective 2*) These measures provide access and crossings for wildlife between the River and adjacent landscape. This measure was determined as one that would be common to all alternatives and added where possible and reasonable. The basis for design will be based on the wildlife expected to benefit in that location. The measures include bridge undercrossings, slopes for access from river to bank in areas with vertical banks, and wildlife passage through/along culverts into the river,
4. Planting. (*Objectives 1, 2*) Planting includes measures to restore wetland, riparian, and buffer zones as well as invasives removal, specifically, restructuring/vegetating river concrete channel walls, habitat corridor/riparian planting on overbanks of the main channel or tributaries, terracing of concrete banks/planting built into modified channel walls, invasives removal and replanting, and buffer zone.
5. Remove concrete or naturalize channel bed and/or banks. (*Objectives 1, 2*) Concrete removal measures include modifying the channel by removing concrete and/or grouted stone. Erosion control would accompany removal and removal would include changes such as modifications to the channel bed and terracing of the banks. The specific measures are: lowering channel banks, widening channel banks, lowering banks and widening the channel, deepening the bed, terracing with earthen banks, and creating geomorphology and planting for freshwater marsh in the main river channel.

Recreation Management Measures to address Objective 3 are those identified in ER 1105-2-100 for passive recreation: trails; parking; sanitation; pedestrian bridges and tunnels; park furniture; signage; and protection/safety features. Recreation measures follow U.S. Army Corps of Engineers guidelines for recreation in ecosystem restoration projects and will be limited to designs consistent with the natural environment.

These management measures were used to generate 19 alternatives, which were divided into eight segments or “reaches” for input into CE/ICA analysis. IWR Plan was used to formulate alternatives, which would use the best plans for each of the reaches in the 19 alternatives. The incremental analysis formulated 21 “Best Buy” plans and over 150 cost effective plans. The final array was selected from the “Best Buy” plans based on the incremental analysis and the study objectives.

Final Array of Alternatives. The Draft IFR included four action alternatives selected from the Best Buy plans that best combined the reach plans. After the Draft IFR was circulated and the Corps performed more detailed cost analysis, a variation on one of the action alternatives was identified as providing more benefits at lower cost. That variation was included in the Final Array in the Final IFR. The five alternatives, including the variation, are:

- **Alternative 10.** It provides restoration in all reaches, restores a historic wash at the Los Angeles Trailer and Container Intermodal Facility (LATC) site, widens the river at Taylor Yard, restores a side channel and a seasonal flow area in the Griffith Park area, restores several daylighted streams, and provides transitions or connections between existing riparian corridors and concrete lined river reaches.
- **Alternative 13.** It includes most of the features in Alternative 10, and it restores an additional side channel, increases widening of the river at Taylor Yard, and restores the Arroyo Seco confluence.
- **Alternative 16.** It includes most of the features in Alternative 13, and in addition, in Reach 5, it widens the river channel bottom and terraces the bank, and in Reach 8, reconnects the river to the historic floodplain in LATC by removing the channel wall, restores the historic wash and freshwater marsh within the LATC site, removes concrete and restores wetlands within the channel bed, and terraces channel banks.
- **Alternative 20.** It includes all the features of Alternative 16 except that in Reach 7 in addition to restoring the lower Arroyo Seco, it daylights three streams, restores freshwater marsh at the Los Angeles State Historic Park, and creates a terraced bank connection to the River. In addition, it widens the channel in Reach 2 and restores the confluence with Verdugo Wash in Reach 3.
- **Alternative 13v** (for variation) is a more cost effective variation on Alternative 13. It is identical to Alternative 13 except it substitutes the Reach 7 plan included in Alternative 20 that provides 10 acres of marsh and a connection to the Los Angeles State Historic Park and daylights three streams, in addition to restoring the lower Arroyo Seco.

Comparison of Alternatives. The table below provides a summary comparison of restoration benefits for the final array.

	10 ART	13 ACE	Alt 13v	16 AND	20 RIVER
Total AAHUs	5,321	5,902	5989	6,509	6,782
Total Acres Acres	528	588	598	659	719
Incremental nodal increase between alternatives	Minor improvement	309% over Alt 10	33% over Alt 13	39% over Alt 13v	120% over Alt 16
Regional Connections	Santa Monica Mtns	Santa Monica & San Gabriel Mtns	Elysian Hills, Santa Monica & San Gabriel Mtns	Santa Monica & San Gabriel Mtns	Verdugo & Elysian Hills, Santa Monica & San Gabriel Mtns

Key Assumptions. Key assumptions made during plan formulation were as follows:

- Future without-project conditions assume that no Federal action would be taken to restore the study area and ongoing activities including flood risk operation and maintenance, would be comparable to the present.
- The River channel, confluences with major tributaries, and areas of open space adjacent to these watercourses within the study area were presumed to be available for restoration.

- The non-Federal Sponsor would be able to provide the required real estate in the form in which it is needed (e.g. Sites with known HTRW issues will be delivered fully remediated.)
- Levees would be modified with protection maintained as necessary and levee policies followed. Maintenance requirements for levees, riverbed, and banks would be met.
- The study area includes a portion of the Los Angeles River that was altered and engineered as part of the LACDA Project. Any restoration alternatives had to take into account the continued functioning of the flood risk management system and avoid induced flooding.

Additional assumptions were made regarding implementation of various measures as follows:

- Daylighting streams would result in a riparian area and freshwater marshes at their confluences.
- Grade control structures would be used to stabilize the bed of the river when concrete was removed.
- Erosion control would be included where banks were modified to allow for planting.
- Invasive plant removal and management would be included throughout the project area.
- Cost estimates were developed based on conceptual designs developed for measures.

The NER Plan. The Draft IFR identified Alternative 13 as the NER Plan. Subsequent to release of the IFR, cost estimates were developed further and the Corps performed a validation to confirm the selection of the NER Plan. This more detailed cost analysis confirmed the selection of Alternative 13 as the NER Plan with a variation. The more detailed cost showed that the plan features in Reach 7 included in Alternative 13 were less cost effective and efficient than the plan features in Reach 7 included in Alternative 20. This was attributable to both a reduction in Alternative 20 Reach 7 plan costs, as well as an increase in Alternative 13 Reach 7 plan costs. Therefore, the NER Plan has been modified to include the Alternative 20 Reach 7 plan which includes restoration at Arroyo Seco, terracing of the right bank near the Los Angeles State Historic Park, wetland/riparian restoration at the Park, and daylighting of three streams (identified as Alternative 13v). The increased benefits for habitat value, nodal and regional habitat, hydrologic connectivity, and aquatic ecosystem restoration provided by larger alternatives, including the increase in Regional Economic Development (RED) benefits attained by larger alternatives provided justification for their inclusion in the final array of alternatives considered. However, they have significantly higher costs. The incremental benefits relative to incremental costs did not support either of these plans being designated at the NER Plan.

The NER Plan restores 598 acres of habitat throughout the 11 miles of study area and provides 5989 Habitat Units (HU) of restoration benefits. This includes restoration of valley foothill riparian and freshwater marsh habitat, daylighting of 15 streams currently encased in storm drains, creation of side channels in Ferraro Fields and Griffith Park, seasonal flooding and lowering at Los Feliz Golf Course, river widening and restoration at Taylor Yard, restoration of riparian marsh in the Los Angeles State Historic Park with a terrace connecting it to the river mainstem, and restoration at the downstream end of Arroyo Seco tributary. Railroad tracks would be put on a trestle in the reach with the Los Angeles State Historic Park. It also includes restoration at the LATC site (currently a railroad facility). The NER plan includes a recreation plan formulated to be consistent with the restoration plan.

Recommended Plan. In a letter dated April 10, 2014, the City of Los Angeles requested selection of Alternative 20 as the recommended plan. By memo dated May 27, 2014, the Assistant Secretary of the Army (Civil Works) (ASA (CW)) granted the requested LPP exception and authorized the Corps to recommend the LPP in the Final IFR and the report of the Chief of Engineers.

The LPP restores 719 acres of habitat in and along the 11 miles of the Los Angeles River within the study area and provides 6782 Habitat Units (HU) of restoration benefits. This includes restoration of valley foothill riparian and freshwater marsh habitat, daylighting of 13 streams currently encased in storm

drains, creation of side channels in Ferraro Fields and Griffith Park, seasonal flooding and lowering at Los Feliz Golf Course, river widening and restoration at Taylor Yard, restoration of freshwater marsh in the Los Angeles State Historic Park with a terrace connecting it to the river mainstem, and restoration at the downstream end of Arroyo Seco. It also includes widening of the river bed in two reaches, restoration of the Verdugo Wash confluence, and river restoration and widening at and adjacent to the LATC site. Railroad tracks would be placed on trestles at two locations to facilitate restoration. The LPP includes a recreation plan formulated to be consistent with the restoration plan.

Reach 1- The plan would implement a habitat corridor with riparian planting on the overbanks of both sides of the River and other nearby locations.

Reach 2 Bette Davis Park Area of Griffith Park The plan would modify the right bank of the channel from trapezoidal to a vertical bank with overhanging vines, creating 80 feet of additional soft bottom width in the channel. It would also continue establishment of habitat corridors/riparian planting along the overbanks of both sides of the River, including in the Bette Davis Park on the left bank and the area between Zoo Drive and SR-134, with connections under the highway to a restored linear riparian planting along the River extending into Reach 3.

Reach 3 Ferraro Fields/Verdugo Wash area – The plan would restore the Verdugo Wash confluence, widening the channel mouth and sloping back the left bank of the wash to the existing overbank elevation. It would also create a side channel with a riparian fringe and daylight a stream on the right side of the River. Riparian areas would be located on the right overbank along Zoo Drive and along the River's edge at Ferraro Fields.

Reach 4 Griffith Park – The plan would establish a riparian corridor on the left overbank of the River, daylight eight streams, create a side channel diverting river flows adjacent to the Griffith Park (Harding) Golf Course on the right bank, and lower the Los Feliz Golf Course on the left bank to allow seasonal flooding through existing culverts. The riparian corridor on the left overbank would be implemented as continuously as possible within the requirements of levee regulations.

Reach 5 Riverside Drive – The plan would widen the channel bed by 100 feet by modifying the right bank from trapezoidal to a vertical bank with overhanging vines and would terrace and plant the left bank. It would also continue implementation of the habitat corridor restoration in a narrow strip along the left overbank and would daylight and restore one stream currently encased in a culvert.

Reach 6 Taylor Yard – The plan would restore riparian corridors and widen the soft bottom bed of the River at Taylor Yard by over 300 feet with additional slope back to the overbank elevation along the reach for a length of approximately 1,000 feet. At the upstream end of the reach, a backwater wetland would be developed at river level, and a small area would be terraced at the downstream end of the Bowtie parcel. Aquatic riverine habitats including freshwater marsh would dominate the new river bed.

Reach 7 Arroyo Seco/Los Angeles River State Historic Park -The plan would restore the lower Arroyo Seco tributary, daylight three streams, and restore freshwater marsh at the Los Angeles State Historic Park and terrace the adjacent River bank. To facilitate the terracing, the existing railroad track would be trestled at grade.

Reach 8 Los Angeles Trailer and Container intermodal facility (LATC) – The plan would modify the River channel from concrete to soft bottom to support aquatic habitat including freshwater marsh, and the reach would be widened. The marsh would extend into the adjacent LATC site 500 feet, with riparian area extending another 1,000 feet into the LATC site, gradually sloping up to existing bank elevations. A railroad trestle would be included with this alternative to facilitate the connection between the River channel and the adjacent restored areas. The right bank upstream of LATC and left bank downstream of LATC would be terraced and planted with riparian vegetation.

Systems / Watershed Context. The Corps and Study Sponsor have worked with other Federal agencies and programs such as the Urban Waters Federal Partnership, included involvement from Federal, State, and local organizations in plan formulation, and held public meetings to solicit input to the alternatives. In developing and comparing alternatives, the Corps and City considered the ways in which structure,

function, and dynamic processes work together to achieve restoration objectives. The final array of alternatives takes into account the physical dynamics of the aquatic ecosystem and its connections to the watershed.

Environmental Operating Principles. The study addresses the USACE Environmental Operating Principles as below:

- *Foster sustainability as a way of life throughout the organization:* The project proposes self-sustaining restoration of 719 acres, taking into account water availability.
- *Proactively consider environmental consequences of all Corps activities and act accordingly.* The IFR includes an analysis of direct, indirect, and cumulative effects of the project. Best Management Practices have been incorporated to avoid and minimize adverse effects during construction and operation/maintenance.
- *Create mutually supporting economic and environmentally sustainable solutions:* The proposed project provides Wildlife corridor and ecosystem benefits within urban area in balance with flood risk management.
- *Continue to accept corporate responsibility and accountability under the law for activities undertaken by the Corps, which may impact human and natural environments.* The project applies a coordinated approach to the restore degraded aquatic habitat and complies with environmental laws including NEPA, the Clean Water Act, and the Clean Air Act.
- *Consider the environment in employing a risk management and systems approach throughout life cycles of projects and programs:* A detailed monitoring and adaptive management plan has been developed to manage future risks and identify contingency plans to ensure ecological function of the project.
- *Leverage scientific, economic, and social knowledge to understand the environmental context and effects of Corps actions in a collaborative manner:* The study has used a multi-stakeholder, scientific, and economic approach including coordination with Corps Centers of Expertise.
- *Employ an open, transparent process that respects views of individuals and groups interested in Corps activities.* Throughout the study process, the Corps and the City have sought the views of individuals, agencies, and non-governmental organizations on the best ways to restore the river ecosystem. The plan is responsive to the public input received.

Campaign Plan. The Corps is delivering an enduring and essential solution that meets the Nation's needs under Goal 2, Engineering Sustainable Water Resources Solutions.

Peer Review. All work products were reviewed during Agency Technical Review (ATR) and Independent External Peer Review (IEPR). ATR was conducted beginning with the Alternative Formulation Briefing documents and has continued through the review of the Final IFR documents and all comments have been resolved and satisfactorily closed. The IEPR, managed by Battelle, resulted in 18 final Panel comments. One of the comments was provided as an Addendum to the Final IER and was developed after the panel was provided public comments. Five comments, including the Addendum comment, were rated as having high significance. The District prepared responses to the panel comments, concurring with 13 comments and not concurring with five. The PDT adopted recommendations on all comments (53 of the 63 recommendations). As part of the back check, the Panel concurred with all 18 responses. Several of the significant comments were as follows:

EXPECTED PROJECT PERFORMANCE

Project Costs - A project cost summary for total first cost for the NER and the LPP are provided in Table 1. Note that tables include costs for the recreation plans that were formulated for corresponding NER and LPP ecosystem restoration plans. Costs are presented at October 2015 price levels.

Table 1 Cost Summary

Los Angeles River Ecosystem Restoration Program Year 2016 (Effect Price Level 1 Oct 2015)		
Construction Item	NER PLAN	LPP
	Cost (\$1,000)	Cost (\$1,000)
Lands and Damages	\$348,615	\$526,285
Elements		
Relocations	\$181,305	\$228,562
Ecosystem Restoration Construction	\$114,637	\$450,233
Adaptive Management & Monitoring	\$10,386	\$12,250
Recreation Facilities	\$8,556	\$14,921
Subtotal	\$663,499	\$1,232,251
Preconstruction Engineering and Design (PED)	\$27,556	\$85,135
Construction Management (S&A)	\$13,412	\$39,222
Total First Cost	\$704,467	\$1,356,608

Benefits and Costs of the NER and LPP - A summary of all project costs and benefits is provided in Table 2a for the NER and LPP. The first costs for ecosystem restoration and recreation features of the Recommended Plan total approximately \$1.339 Billion and \$18 million, respectively. The ecosystem restoration plan is projected to generate 6,782 in average annual habitat units, in addition to other benefits as described earlier in this Report Summary. The recreation plan is economically justified with net benefits exceeding \$2.5 million and a benefit/cost ratio of 3.59.

Table 2a Equivalent Annual Benefits and Costs

Los Angeles River Ecosystem Restoration Equivalent Annual Benefits & Costs (Oct 2015 Price Level, 50 Year Period of Analysis, 3.375% Discount Rate)		
Item	NER PLAN	LPP
	(\$1,000s)	(\$1,000s)
Investment Costs		
Total Project Construction Costs	\$704,467	\$1,356,608
Interest During Construction	\$26,268	\$57,965
Total Investment Cost	\$730,735	\$1,414,573
Average Annual Costs		
Interest & Amortization of Initial Investment	\$30,455	\$58,956
OMRR&R	\$1,539	\$2,530
Total Average Annual Cost	\$31,994	\$61,485
Average Annual Benefits - Ecosystem Restoration		
Average Annual Benefits - Recreation	\$2,479	\$3,510
Net Annual Benefits - Recreation	\$1,874	\$2,532
Benefit-Cost Ratio - Recreation	4.09	3.59

Table 2b
Economic Costs and Benefits of the NER and LPP Plans

Item ⁽¹⁾	Ecosystem Restoration		Recreation		Total Cost	
	Allocated Costs	Benefits	Allocated Costs	Benefits	Allocated Costs	Benefits
Investment Cost						
First Cost	\$1,338,553,600		\$18,054,400		\$1,356,608,000	
Interest During Construction ⁽²⁾	\$57,911,000		\$53,700		\$57,964,700	
Total	\$1,396,464,600		\$18,108,100		\$1,414,572,700	
Annual Cost						
Interest and Amortization	\$58,200,800		\$754,700		\$58,955,500	
OMRR&R ⁽³⁾	\$2,306,400		\$223,400		\$2,529,800	
Subtotal	\$60,507,200		\$978,100		\$61,485,300	
Annual Benefits						
Non-Monetary (Ecosystem)		6782 AAHUs				6782 AAHUs
Monetary (Recreation)				\$3,509,800		\$3,509,800
Net Annual Recreation Benefits				\$2,531,700		\$2,531,700
Recreation Benefit-Cost Ratio				3.59		

(1) Based on October 2015 price level, 3.375% interest rate, and a 50-year period of analysis. Values may not add due to rounding.

(2) IDC was calculated based on the start and end of construction for each contract in the MCACES TPCS. See Appendix C.

(3) Operation, Maintenance, Repair, Replacement, and Rehabilitation

Cost Apportionment - Two options for the apportionment of the ecosystem restoration project first costs for the LPP between are presented in the IFR. The non-federal sponsor is responsible for providing 100% of lands, easements, rights of way, relocations, and disposal sites (LERRD) but has voluntarily offered to forgo reimbursement for the costs of LERRD that exceed its statutory share (35%) of total ecosystem restoration costs. In addition, a non-standard cost sharing option is presented in response to a request by

the non-federal sponsor. Recreation is cost shared 50 percent Federal, 50 percent non-Federal. NER cost apportionment provides the basis for Option 1.

Table 3-NER Federal and Non-Federal Apportionment of Total Project First Cost of the NER Plan

Item ⁽¹⁾	Federal Cost	Non-Federal Cost	Total Cost
Ecosystem Restoration			
PED (2)	\$18,449,900	\$7,865,500	\$26,315,400
LERRDs	\$0	\$523,875,400	\$523,875,400
Federal Admin Cost (3)	\$6,044,600	\$0	\$6,044,600
Ecosystem Restoration	\$125,023,000	\$0	\$125,023,000
Construction Management (2)	\$8,272,800	\$4,583,100	\$12,855,900
Subtotal	\$157,790,200 (23%)	\$536,324,000 (77%)	\$694,114,200 (100%)
Recreation			
PED	\$620,300	\$620,300	\$1,240,600
LERRDs	\$0	\$0	\$0
Recreation Facilities	\$4,278,000	\$4,278,000	\$8,556,000
Construction Management	\$278,100	\$278,100	\$556,100
Subtotal	\$5,176,400 (50%)	\$5,176,400 (50%)	\$10,352,800 (100%)
Total Project	\$162,966,600 (23%)	\$541,500,400 (77%)	\$704,467,000 (100%)

(1) Based on October 2015 price level, 3.375% interest rate, and a 50-year period of analysis. Values may not add due to rounding. (2) Non-Federal PED and Construction Management Costs for Ecosystem Restoration are for Relocations and are therefore part of LERRD. (3) Federal administrative costs of LERRD acquisition oversight.

Cost Sharing Option 1: Under this option, Federal participation in total ecosystem restoration cost is limited to the Federal share of the NER Plan (or \$157.79 million). The non-Federal sponsor is responsible for the remainder of total project first cost for ecosystem restoration features (approximately \$1.18 billion). The effective non-Federal cost share under Option 1 is approximately 88 percent. Costs for the recreation plan developed for the LPP would be shared equally between the Federal Government and the non-Federal sponsor. Table 3-LPP1 summarizes cost apportionment for the LPP under Option 1.

Table 3-LPP1 Apportionment of Total Project First Cost of the LPP (Option 1)October 2015 Price Levels

Item ⁽¹⁾	Federal Cost	Non-Federal Cost	Total Cost
Ecosystem Restoration			
PED (2)	\$68,253,700	\$14,717,700	\$82,971,500
LERRDs	\$0	\$748,652,000	\$748,652,000
Federal Admin Costs (3)	\$6,195,000	\$0	\$6,195,000
Ecosystem Restoration	\$462,483,000	\$0	\$462,483,000
Construction Management (2)	\$30,597,300	\$7,654,800	\$38,252,100
Non-Federal Cash Contribution (4)	(\$409,738,800)	\$409,738,800	\$0
Subtotal	\$157,790,200 (12%)	\$1,180,763,400 (88%)	\$1,338,553,600 (100%)
Recreation			
PED	\$1,081,800	\$1,081,800	\$2,163,500
LERRDs	\$0	\$0	\$0
Recreation Facilities	\$7,460,500	\$7,460,500	\$14,921,000
Construction Management	\$484,900	\$484,900	\$969,900
Subtotal	\$9,027,200 (50%)	\$9,027,200 (50%)	\$18,054,400 (100%)
Total Project	\$166,817,400 (12%)	\$1,189,790,600 (88%)	\$1,356,608,000 (100%)

(1) Based on October 2015 price level, 3.375% interest rate, and a 50-year period of analysis. Values may not add due to rounding. (2) Non-Federal PED and CM Costs for Ecosystem Restoration are for Relocations, part of LERRD. (3) Fed administrative costs of LERRD acquisition oversight. (4) Non-Federal sponsor cash contribution for LPP incremental cost.

Cost Sharing Option 2: The non-federal sponsor’s share of restoration under this option is equal to 50 percent of total ecosystem restoration first cost, subject to the condition that the non-Federal sponsor’s creditable LERRD are limited to 35 percent of total ecosystem restoration cost. Since the value of LERRD for the LPP exceeds 35 percent of total project first cost, but only 35 percent is creditable, the non-Federal sponsor must provide a 15 percent cash contribution to bring its creditable share to 50 percent. The non-Federal sponsor’s offer to forgo reimbursement for LERRD in excess of 35 percent of total ecosystem restoration cost also applies to this cost sharing option. This option would require Congress to authorize the cost sharing.

**Table 3-LPP2 Federal and Non-Federal Apportionment of Total Project First Cost of the LPP (Option 2)
October 2015 Price Levels**

Item ⁽¹⁾	Federal Cost	Non-Federal Cost	Total Cost
Ecosystem Restoration			
PED (2)	\$68,253,700	\$14,717,700	\$82,971,500
Creditable LERRDs (4)	\$0	\$468,493,800	\$468,493,800
Non-creditable LERRDs	\$0	\$280,158,300	\$280,158,300
Federal Admin Costs (3)	\$6,195,000	\$0	\$6,195,000
Ecosystem Restoration	\$462,483,000	\$0	\$462,483,000
Construction Management (2)	\$30,597,300	\$7,654,800	\$38,252,100
Non-Federal Cash Contribution (5)	(\$200,783,000)	\$200,783,000	\$0
Subtotal	\$366,746,000 (27%)	\$971,807,600 (73%)	\$1,338,553,600 (100%)
Recreation			
PED	\$1,081,800	\$1,081,800	\$2,163,500
LERRDs	\$0	\$0	\$0
Recreation Facilities	\$7,460,500	\$7,460,500	\$14,921,000
Construction Management	\$484,900	\$484,900	\$969,900
Subtotal	\$9,027,200 (50%)	\$9,027,200 (50%)	\$18,054,400 (100%)
Total Project	\$375,773,200 (28%)	\$980,834,800 (72%)	\$1,356,608,000 (100%)
<i>(1) Based on October 2015 price level, 3.375% interest rate, and a 50-year period of analysis. Values may not add due to rounding. (2) Non-Federal PED and Construction Management Costs for Ecosystem Restoration shown are for Relocations and are therefore part of LERRD. (3) Federal Admin Costs- Federal administrative costs of LERRD acquisition oversight. (4) Creditable LERRD is limited to 35% of total ecosystem restoration cost. (5) Non-Federal cash contribution of 15% of total ecosystem restoration cost to bring creditable share to 50%.</i>			

The non-Federal sponsor’s effective share of total project first cost for ecosystem restoration features is approximately 73 percent (vs. 88 percent under Option 1). Table 3-LPP2 also shows cost apportionment for the recommended recreation plan. Recreation costs are apportioned equally between the Federal Government and non-Federal sponsor.

Project Implementation - The City will provide and perform all LERRD required for the project. The Federal Government will complete the PED phase and conduct pre- and post-project monitoring and adaptive management. Numerous environmental commitments, primarily consisting of Best Management Practices, have been developed and will be implemented to minimize or avoid any adverse effects that would occur primarily during construction. A Monitoring and Adaptive Management Plan (MAMP) including parameters for vegetation and fish habitat was developed to identify performance measures along with desired outcomes and monitoring design in relation to specific objectives. Results of the

monitoring will be compared to objectives and decision-making triggers to evaluate whether the project is functioning as planned and whether adaptive management actions are needed to achieve project objectives. Cost-shared monitoring and adaptive management will not extend beyond ten years after construction of each component.

Operation, Maintenance, Repair, Replacement, and Rehabilitation - Operation, maintenance, repair, replacement, and rehabilitation activities (OMRR&R) would occur after the project features are constructed in order to keep project features functioning as designed. This will include annual inspections and maintenance, periodic repair and/or replacement of project features, management of invasive species throughout the constructed features and in-channel areas, and provision of irrigation to constructed features during drought. A detailed OMRRR Plan will be developed during implementation and will be coordinated with the current OMRRR plan for the existing flood risk management project, LACDA, whose footprint overlaps with the restoration project footprint. The LACDA OMRRR manual would be amended to accommodate and complement the restoration project and avoid contradictory maintenance requirements.

Key Social and Environmental Factors - Of key concern in Los Angeles is the growing disparity of access to and use of open space resources, including natural areas by those living in historically underserved communities. Construction impacts would include temporary closures or reduced access to recreational facilities and are less than significant. Effects to environmental justice communities are not disproportionately high and adverse. Improved habitat value, aesthetic quality, and quantity of passive recreation resources, and improved accessibility would provide beneficial effects. The project would result in the displacement of existing businesses. Businesses would be assisted by the sponsor in accordance with the Uniform Relocation Act of 1970. Socioeconomics effects are less than significant. The infusion of construction funds into the regional economy will generate economic benefits.

Stakeholder Perspectives and Differences - Public participation occurred through the NEPA/CEQA review process through both a formal public scoping period and a public and agency review period. The Notice of Intent (NOI) was published in the Federal Register on September 19, 2013. The Notice of Preparation (NOP) for CEQA was distributed with the NOI. A 60-day public review of the Draft IFR including EIS/EIR occurred from September 20 through November 18, 2013, with an extension for EPA of eight extra days for review ending Tuesday, November 26, 2013. Over 500 comments and two petitions were received. Public comments generally focused on whether complete benefits of habitat and hydrologic connectivity were not captured or were underestimated and/or expressed preference for Alternative 20.

Environmental Compliance - As an integrated report, the IFR meets the requirements for feasibility reports and NEPA compliance. The EIS complies with CEQ and USACE NEPA regulations. Fish and Wildlife Coordination Act coordination is complete. No Endangered Species Act consultation was required. A Programmatic Agreement with the State Historic Preservation Officer has been developed under Section 106 of the National Historic Preservation Act. The Corps has applied to the Regional Water Quality Control Board for water quality certification under Section 401 of the Clean Water Act, which the Board cannot issue until after the CEQA document is certified by the non-Federal sponsor after State and Agency review. The 401 certification is expected to be issued shortly after CEQA certification. No Coastal Zone Consistency is necessary, due to the location of the project.

State and Agency Review - State and Agency review would be performed after recommendation is received from the CWRB to release the report.

Certification of Peer and Legal Review - The report and appendices were reviewed with the following certification dates: Cost Engineering Certification, Cost Engineering DX (Walla Walla): March 9, 2015;

Legal Certification: May 12, 2015; Agency Technical Review Certification: April 20, 2015 (Draft Final IFR); and IEPR Completion of Review Phase: January 14, 2014.

Policy Compliance Review - To be completed by HQUSACE after Documentation of Review Findings are complete.