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Los Angeles District

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# **Los Angeles River Ecosystem Restoration Feasibility Study**

## **APPENDIX H Supplemental Environmental Information**

Part 1- Supplemental Information

Part 2- Monitoring and Adaptive Management Plan

Part 3- Mitigation Monitoring and Reporting Program

**September 2015**

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# **Los Angeles River Ecosystem Restoration Feasibility Study**

## **APPENDIX H, Part 1 Supplemental Environmental Information**

**April 2015**

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## Appendix H Supplemental Environmental Information

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## 1.0 Special Status and Sensitive Species

The greater Los Angeles Basin includes portions of the Angeles National Forest, the Santa Monica Mountains, and coastal areas where a number of sensitive plants and animals may occur. Sensitive species include plants or wildlife listed as threatened or endangered under the Federal Endangered Species Act (ESA) or as threatened, endangered, fully protected, or a species of concern under the state Endangered Species Act (CESA). Special status species also include plant species designated by the California Native Plant Society (CNPS) as presumed extinct in California (List 1A); plants designated as rare, threatened, or endangered in California and elsewhere (List 1B); and plants designated as being rare, threatened, or endangered in California but more common elsewhere (List 2).

The complete list of species that may occur in the study area was compiled by reviewing Federal, state, and other databases and comparing the habitat requirements of the species found in these lists to the types of habitat that occur in riparian areas of southern California waterways. These databases include the California Natural Diversity Database (CNDDDB), which reports verifiable occurrences of sensitive species by USGS topographic quadrant (CNDDDB 2012); U.S. Fish and Wildlife and California Department of Fish and Wildlife sensitive species lists for Los Angeles County (USFWS 2012a, and CDFW, 2012, respectively); and sensitive plant species lists developed by the California Native Plant Society (CNPS 2012).

From this initial list, those species that could occur in habitats that were identified in the CHAP appendix (Appendix G) were considered in greater detail. Although focused surveys for the species below were not performed, it was still determined that the potential for most of the species to exist there was low, for the following reasons: 1) Habitat patch size was very small, and although suitable habitat characteristics may occur, the size of the habitat patch may be too small or of insufficient quality to support the species, or 2) suitable habitat characteristics may occur, but the habitat patch itself is surrounded by highly unsuitable habitat such as developed areas, streets or freeways, golf courses, or other features that would act as barriers to passage into or out of the habitat patch. Species for which suitable habitat occurs in the study area are discussed in the EIS. All others were identified as “not likely to occur” and are listed below.

Table 1-1. Special Status Plant Species in the Greater Los Angeles Basin

Scientific Name	Common Name	Status Fed/State/CNPS <sup>1</sup>	Habitat Requirements and Probability of Occurrence in Study Area <sup>2</sup>
<i>Acmispon argophyllus</i> var. <i>adsurgens</i>	San Clemente Island bird's-foot trefoil	NA/CE/CNPS 1B	Coastal bluff scrub, coastal scrub. <b>Not expected.</b> Minimal suitable habitat onsite.
<i>Acmispon dendroideus</i> var. <i>traskiae</i>	San Clemente Island lotus	FE/CE/CNPS 1B	Coastal bluff scrub, coastal scrub, valley and foothill grassland. <b>Not expected.</b> Some suitable habitat onsite.
<i>Arenaria paludicola</i>	Marsh sandwort	FE/CE/CNPS 1B	Freshwater marsh, marsh and swamp, wetland. <b>Not expected.</b> Some suitable habitat onsite.
<i>Astragalus brauntonii</i>	Braunton's milk-vetch	FE/NA/CNPS 1B	Coniferous forest, chaparral, coastal scrub, valley and foothill grasslands. <b>Not expected.</b> Some suitable habitat onsite.

Scientific Name	Common Name	Status Fed/State/ CNPS <sup>1</sup>	Habitat Requirements and Probability of Occurrence in Study Area <sup>2</sup>
<i>Astragalus pycnostachyus</i> var. <i>lanosissimus</i>	Ventura Marsh milk-vetch	FE/CE/ CNPS 1B	Marsh and swamp, salt marsh, wetland. <b>Not expected.</b> Some suitable habitat onsite.
<i>Astragalus tener</i> var. <i>titi</i>	Coastal dunes milk-vetch	FE/CE/ CNPS 1B	Coastal bluff scrub, coastal dunes. <b>Not expected.</b> Minimal suitable habitat onsite.
<i>Berberis nevinii</i>	Nevin's barberry	FE/CE/ CNPS 1B	Chaparral, cismontane woodland, coastal scrub, riparian scrub. <b>Not expected.</b> Some suitable habitat onsite.
<i>Brodiaea filifolia</i>	Thread-leaved brodiaea	FT/CE/ CNPS 1B	Vernal pools. <b>Not expected.</b> No suitable habitat onsite.
<i>Chorizanthe parryi</i> var. <i>fernandina</i>	San Fernando Valley spineflower	FC/CE/ CNPS 1B	Coastal scrub, sandy soils. Elevation 3 – 1035 meters. <b>Not expected.</b> Minimal suitable habitat onsite.
<i>Delphinium variegatum</i> ssp. <i>kinkiense</i>	San Clemente Island larkspur	FE/CE/ CNPS 1B	Valley and foothill grassland. <b>Not expected.</b> Some suitable habitat onsite.
<i>Dithyrea maritima</i>	Beach spectaclepod	NA/CT/ CNPS 1B	Coastal dunes, coastal scrub. <b>Not expected.</b> Minimal suitable habitat onsite.
<i>Dodecahema leptoceras</i>	Slender-horned spineflower	FE/CE/ CNPS 1B	Chaparral, coastal scrub, alluvial sage scrub. <b>Not expected.</b> Minimal suitable habitat onsite.
<i>Dudleya cymosa</i> ssp. <i>agourensis</i>	Agoura Hills dudleya	FT/NA/ CNPS 1B	Chaparral, cismontane woodland. <b>Not expected.</b> No suitable habitat onsite.
<i>Dudleya cymosa</i> ssp. <i>marcescens</i>	Marcescent dudleya	FT/CR/ CNPS 1B	Chaparral. <b>Not expected.</b> No suitable habitat onsite.
<i>Dudleya cymosa</i> ssp. <i>ovatifolia</i>	Santa Monica dudleya	FT/NA/ CNPS 1B	Chaparral, coastal scrub. <b>Not expected.</b> Minimal degraded habitat onsite.
<i>Dudleya verityi</i>	Verity's dudleya	FT/NA/NA	Chaparral, Foothill Woodland, Coastal Sage Scrub. <b>Not expected.</b> Some degraded habitat onsite.
<i>Galium catalinense</i> ssp. <i>acrispum</i>	San Clemente Island bedstraw	NA/CE/ CNPS 1B	Valley and foothill grassland. <b>Not expected.</b> Some degraded habitat onsite.
<i>Helianthemum greenei</i>	Island rush-rose	FT/NA/ CNPS 1B	Chaparral. <b>Not expected.</b> No suitable habitat onsite.
<i>Malacothamnus clementinus</i>	San Clemente Island bush-mallow	FE/CE/ CNPS 1B	Valley and foothill grassland. <b>Not expected.</b> Some degraded habitat onsite.
<i>Nasturtium (Rorippa) gambelii</i>	Gambel's water cress	FE/CT/ CNPS 1B	Brackish marsh, freshwater marsh, marsh and swamp, vernal pool, wetland. <b>Not expected.</b> Some suitable habitat onsite.
<i>Navarretia fossalis</i>	Spreading navarretia	FT/NA/ CNPS 1B	Vernal pools, chenopod scrub, marshes and swamps, wetland, playa. <b>Not expected.</b> Some suitable habitat onsite.



Scientific Name	Common Name	Status Fed/State/ CNPS <sup>1</sup>	Habitat Requirements and Probability of Occurrence in Study Area <sup>2</sup>
<i>Orcuttia californica</i>	California Orcutt grass	FE/CE/ CNPS 1B	Vernal pool, wetland. <b>Not expected.</b> Some suitable habitat onsite.
<i>Pentachaeta lyonii</i>	Lyon's pentachaeta	FE/CE/ CNPS 1B	Chaparral, valley and foothill grassland. <b>Not expected.</b> Some degraded habitat onsite.
<i>Phacelia stellaris</i>	Brand's star phacelia	FC/NA/ CNPS 1B	Coastal dunes, coastal scrub. <b>Not expected.</b> Minimal degraded habitat onsite.

1 Status: USFWS: FE – Federal Endangered, FT – Federal Threatened, FC- Federal Species of Concern, NA – Not Applicable CDFG: CE – California Endangered, CT – California Threatened, CC – California Species of Special Concern, CR – California Rare, NA – Not Applicable. CNPS: 1A – Plants presumed extinct in California, 1B – Plants rare, threatened, or endangered in California, and elsewhere, NA – Non Applicable.

2 Probability to Occur Onsite: High – Observed in similar habitat in region, or habitat on the site is a type often utilized by the species and the site is within the known range of the species. Moderate – Reported sightings in surrounding region, or site is within the known range of the species and habitat on the site is a type occasionally used by the species. Low – Site is within the known range of the species but habitat on the site is rarely used by the species. Not Expected – A focused study failed to detect the species, or, no suitable habitat present.

Table 1-2. Special Status Animal Species in the Greater Los Angeles Basin

Scientific Name	Common Name	Status Federal/ State <sup>1</sup>	Habitat Requirements Probability of Occurrence in Study Area <sup>2</sup>
<i>Ammospermophilus nelsoni</i>	Nelson's antelope squirrel	NA/CT	Chenopod scrub. <b>Not expected.</b> No suitable habitat onsite.
<i>Amphispiza belli clementeae</i>	San Clemente sage sparrow	FT/NA	Coastal scrub. <b>Not expected.</b> Minimal degraded habitat onsite.
<i>Anaxyrus (Bufo) californicus</i>	Arroyo toad	FE/NA	Desert wash, riparian scrub, riparian woodland, south coast flowing waters, south coast standing waters. <b>Not expected.</b> Some suitable habitat onsite.
<i>Anniella pulchra pulchra</i>	Silvery legless lizard	NA/CC	Loose soils in chaparral or pine-oak woodlands. <b>Not expected.</b> No suitable habitat onsite.
<i>Anniella stebbinsi</i>	Southern CA legless lizard	NA/CC	Loose soils found under sparse vegetation of beaches, chaparral, sandy washes and stream terraces. <b>May occur.</b> Some suitable habitat onsite.
<i>Athene cunicularia</i>	Burrowing owl	NA/CC	Grasslands with friable soils. <b>Not expected.</b> No suitable habitat onsite.
<i>Branchinecta lynchi</i>	Vernal pond fairy shrimp	FT/NA	Vernal pools. <b>Not expected.</b> No suitable habitat onsite.
<i>Buteo swainsoni</i>	Swainson's hawk	NA/CT	Great Basin grassland, riparian forest, riparian woodland, valley and foothill grassland. <b>Not expected.</b> Some degraded habitat onsite
<i>Catostomus santaanae</i>	Santa Ana sucker	FT/NA	South coast flowing waters. <b>Not expected.</b> Some degraded habitat onsite.
<i>Charadrius alexandrinus nivosus</i>	Western snowy plover	FT/NA	Great Basin standing waters, sand shore, wetland <b>Not expected.</b> Some suitable habitat onsite.
<i>Coccyzus americanus occidentalis</i>	Western yellow-billed cuckoo	FC/CE	Riparian woodlands. <b>Not expected.</b> Some suitable habitat onsite.
<i>Dipodomys merriami parvus</i>	San Bernardino kangaroo rat	FE/NA	Coastal scrub. <b>Not expected.</b> Minimal degraded habitat onsite.
<i>Empidonax traillii extimus</i>	Southwestern willow flycatcher	FE/CE	Riparian woodlands. <b>Moderate.</b> Low quality suitable habitat onsite.
<i>Eumops perotis californicus</i>	Western mastiff bat	NA/CC	Chaparral, coastal scrub, forest and woodland. Roosts in rocky canyons and cliffs. <b>Not expected.</b> Minimal degraded habitat onsite.
<i>Euphilotes battoides allyni</i>	El Segundo blue butterfly	FE/NA	Coastal dunes. <b>Not expected.</b> Minimal degraded habitat onsite.
<i>Euphydryas editha quino</i>	Quino checkerspot butterfly	FE/NA	Coastal scrub. <b>Not expected.</b> Minimal degraded habitat onsite.

Scientific Name	Common Name	Status Federal/ State <sup>1</sup>	Habitat Requirements Probability of Occurrence in Study Area <sup>2</sup>
<i>Gasterosteus aculeatus williamsoni</i>	Unarmored threespine stickleback	FE/CE	South coast flowing waters. <b>Not expected.</b> Some degraded habitat onsite.
<i>Glaucopsyche lygdamus palosverdesensis</i>	Palos Verdes blue butterfly	FE/NA	Coastal scrub. <b>Not expected.</b> Minimal degraded habitat onsite.
<i>Gymnogyps californianus</i>	California condor	FE/CE	Valley and foothill grassland. <b>Not expected.</b> Some degraded habitat onsite.
<i>Lanius ludovicianus mearnsi</i>	San Clemente loggerhead shrike	FE/NA	Coastal scrub. <b>Not expected.</b> Minimal degraded habitat onsite.
<i>Laterallus jamaicensis coturniculus</i>	California black rail	NA/CT	Brackish marsh, freshwater marsh, marsh and swamp, salt marsh, wetland. <b>Not expected.</b> Some degraded habitat onsite.
<i>Neotoma lepida intermedia</i>	San Diego desert woodrat	NA/CC	Sagebrush scrub, chaparral. <b>Not expected.</b> Minimal habitat onsite.
<i>Oncorhynchus mykiss irideus</i>	Southern steelhead - southern California DPS	FE/NA	Aquatic, south coast flowing waters. <b>Not expected.</b> Some degraded habitat onsite.
<i>Passerculus sandwichensis beldingi</i>	Belding's savannah sparrow	NA/CE	Marsh and swamp, wetland. <b>Not expected.</b> Some degraded habitat onsite.
<i>Perognathus longimembris pacificus</i>	Pacific pocket mouse	FE/NA	Coastal scrub. <b>Not expected.</b> Minimal degraded habitat onsite.
<i>Phrynosoma blainvilli</i>	Coast horned lizard	NA/CC	Loose soils in grasslands, woodlands, and chaparral. <b>Not expected.</b> Minimal degraded habitat onsite.
<i>Polioptila californica californica</i>	Coastal California gnatcatcher	FT/NA	Coastal bluff scrub, coastal scrub. <b>Low.</b> Minimal degraded habitat onsite.
<i>Rana draytonii</i>	California red-legged frog	FT/NA	Aquatic, artificial flowing waters, artificial standing waters, freshwater marsh, riparian forest or scrub, riparian woodland, south coast flowing water, south coast standing waters, wetland. <b>Not expected.</b> Some degraded habitat onsite.
<i>Rana muscosa</i>	Sierra Madre yellow-legged frog	FE/CC	Aquatic. <b>Not expected.</b> Some degraded habitat onsite.
<i>Riparia riparia</i>	Bank swallow	NA/CT	Riparian scrub, riparian woodland. <b>Not expected.</b> Some suitable habitat onsite.
<i>Sternula antillarum browni</i>	California least tern	FE/CE	Wetland. <b>Not expected.</b> Some degraded habitat onsite.

Scientific Name	Common Name	Status Federal/ State <sup>1</sup>	Habitat Requirements Probability of Occurrence in Study Area <sup>2</sup>
<i>Streptocephalus woottoni</i>	Riverside fairy shrimp	FE/NA	Vernal pools, ponds, and other ephemeral pool-like bodies of water. <b>Not expected.</b> No suitable habitat onsite.
<i>Thamnophis hammondi</i>	Two-striped garter snake	NA/CC	Pools, creeks with nearby oak woodlands, chaparral, scrub-shrub. <b>Not expected.</b> Minimal viable habitat.
<i>Vireo bellii pusillus</i>	Least Bell's vireo	FE/CE	Riparian forest, riparian scrub, riparian woodland. <b>LOW.</b> Marginal habitat onsite.
<i>Xerospermophilus mohavensis</i>	Mohave ground squirrel	NA/CT	Chenopod scrub. <b>Not expected.</b> No suitable habitat onsite.

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2 Probability to Occur Onsite: High – Observed in similar habitat in region, or habitat on the site is a type often utilized by the species and the site is within the known range of the species. Moderate – Reported sightings in surrounding region, or site is within the known range of the species and habitat on the site is a type occasionally used by the species. Low – Site is within the known range of the species but habitat on the site is rarely used by the species. Not Expected – A focused study failed to detect the species, or, no suitable habitat present.

## 2.0 Recreational Resources in the Study Area

Table 1-3 includes a listing of recreational resources in the Study Area including name, type, and amenities included. This supplements information found in Section 3.9.2 of the main report.

Table 2-1. Recreational Resources in the Study Area

Name	Type, Location	Amenities
Bette Davis Picnic Area	Public, Los Angeles	Picnicking, walking, jogging, viewing
Chevy Chase Park and Recreation Center	Public, Los Angeles	Playground, basketball, handball, gym, picnicking, auditorium, pool
Crystal Springs Picnic Area	Public, Los Angeles	Picnicking
Ferraro Soccer Fields	Public, Los Angeles	Soccer fields
Griffith Park	Public, Los Angeles	Amphitheatre, bird sanctuary, camping, educational programming, equestrian, golf, hiking, jogging, museum, observatory, picnicking, soccer, swimming, tennis
Harding Golf Course	Public, Los Angeles	18-hole golf course
Lincoln Park	Public, Burbank	Playground, picnicking
Los Angeles Equestrian Center	Private, Los Angeles	Boarding stalls, training rings, indoor/outdoor show arenas, grass fields, riding academy, professional trainers, equestrian trails
Los Angeles Zoo	Public, Los Angeles	Municipal zoo and botanical gardens
Los Feliz Golf Course	Public, Los Angeles	9-hole golf course
Milford Mini Park	Public, Glendale	Playground, picnicking
Mountain View Park	Public, Burbank	Playground, restrooms, picnicking, tennis, basketball, horseshoe
North Atwater Park	Public, Los Angeles	Baseball, basketball, playground, volleyball, restrooms
Pelanconi Park	Public, Glendale	Ballfield, basketball, playground, picnicking, special facilities
Roosevelt Municipal Golf Course	Public, Los Angeles	9-hole golf course
Wilson Golf Course	Public, Los Angeles	18-hole golf course
Chavez Ravine Arboretum	Public, Los Angeles	Picnicking, playground, restrooms
Egret Park	Public, Los Angeles	Viewpoint, plantings, interpretive signage
Elysian Park	Public, Los Angeles	Walking, hiking, jogging, restrooms, picnicking, horseshoe, arboretum, baseball, sports field, therapeutic center, lodge, art exhibits, historical monument, community garden, playground
Elysian Valley Gateway Park	Public, Los Angeles	Plantings, benches, River access, picnicking
Elysian Valley Recreation Center	Los Angeles	Community rooms, auditorium, baseball, basketball, playground, handball
Glenhurst Park	Public, Los Angeles	Playground
Oso Park	Public, Los Angeles	Plantings, art, interpretive signage
Marsh Park	Public, Los Angeles	River access, viewing, picnicking, grass field, playground, infiltration area
Rattlesnake Park	Public, Los Angeles	Art exhibit, plantings, benches
Rio De Los Angeles State Park	Public, Los Angeles	Natural wetlands, hiking trails, sports fields, playground, recreation building
River Garden Park	Public, Los Angeles	Fountain, benches, picnicking, lawn area, restrooms
Silver Lake Recreation Center	Public, Los Angeles	Playground, community room, gym, picnicking, sports field, walking, jogging trails, classes, summer camps

Steelhead Park	Public, Los Angeles	Plantings, outdoor amphitheater
Sunnynook Park (under construction)	Public, Los Angeles	Plantings, walking paths, outdoor classroom
William Mulholland Memorial	Public, Los Angeles	Memorial fountain, seating, grass area
Chavez Ridge Disc Golf Course	Public, Los Angeles	18-hole course, restrooms
Confluence Park	Public, Los Angeles	Fountain, benches, plantings,
Dodger Stadium	Private, Los Angeles	Professional baseball stadium
Downey Recreation Center	Public, Los Angeles	Auditorium, baseball, playground, picnicking
Lacey Street Neighborhood Park	Public, Los Angeles	Picnicking, parking lot
Los Angeles Historic State Park	Public, Los Angeles	Walking, jogging, cycling paths, picnicking, natural and urban viewing, multipurpose field, restrooms, telescopes
Pecan Recreation Center	Public, Los Angeles	Baseball, playground, community room, handball, gym, picnicking, restrooms, seasonal pool, volleyball
Radio Hill Gardens	Public, Los Angeles	Trails, plantings, viewing
Solano Canyon Community Garden	Public, Los Angeles	Community gardening, picnicking

Sources: LARRC 2011c. City of Los Angeles 2012c, 2012d, 2012e. CDPR 2012a, 2012b, Linton 2012, PDGA 2012. Sources: SMMC & MRCA 2007. LARRC 2011c. City of Los Angeles 2012c, 2012d, 2012e, CDPR 2012a, 2012b, Linton 2012. Sources: City of Burbank 2012c, City of Glendale 2012c, 2012d, City of Los Angeles 2012c, 2012d, and 2012e.

### 3.0 Lands Screened from the Project Area

Table 1-4 supplements section 4.5.2 of the main report and lists lands that were screened from the project area.

Table 3-1. Lands Screened from the Project Area

Name	Description
<b>Equestrian Center</b>	<p>The current uses of the 75-acre world class horse show complex and equestrian center along the river are an important recreational activity in the local community that, because of various urban land use constraints, cannot occur elsewhere. In addition to hosting shows at least 45 days a year, the center is a location frequently used for local community meetings, banquets, and weddings. Its over 500 boarding stalls, 17 trainers, tack shop, and equestrian gift shop are heavily used. The site is often used as a movie location as well. Many of those who use the facility have chosen to live in that area because of the center's location. Relocation to an area with equal access to Griffith Park and the Santa Monica Mountains is not possible. This nexus is important because of the intense urbanization of the Los Angeles area which is not conducive to horseback riding activities. Conversion of the Equestrian Center parcel to include a riparian area or detention basin was considered publicly unacceptable because it would be obtained at the expense of the long-standing equestrian community use that is virtually irreplaceable. A thin strip in the current right-of-way may be available for a riparian corridor. The preliminary cost-benefit analysis confirmed that the costs associated with moving/ relocating/ cleaning/ preparing/ redeveloping the site for use as an underground basin would not provide substantial local benefits and could not accommodate the retention of enough peak flows (in isolation or combination with other river-adjacent sites) to facilitate meaningful restoration downstream.</p>
<b>Bette Davis Park Restoration to River Level</b>	<p>Measures, such as bringing the entire park down to river level, reestablishing geomorphology through the park area, establishing open water areas, creating side channels through the park with freshwater marsh wetlands and habitat corridors, lowering channel banks and protecting them with setback levees, were screened out for implementation on the entire site. The park currently has relatively dense tree cover and provides functioning habitat for avian and small-scale terrestrial species. Given that it could be relatively easily connected to the restored riparian corridor as envisioned in the Study with minimal disruption to the existing park, the decision was made to preserve much of this scarce resource while including a portion for restoration along the river's edge.</p>
<b>Ferraro Fields</b>	<p>The current use of Ferraro Fields for soccer is an important recreational activity in the local community. The community fought for years to locate the facility in the area. The present use of the site is important because of a lack of open space options that could/can be used for more intensive recreation (additional soccer fields were and are not supported within Griffith Park and the proximity to freeway access was and is deemed critical). While conversion of all of the parcel to a riparian area, lowering it to become a part of the riverbed, or conversion to a detention basin with riparian habitat is considered publicly-unacceptable, a strip in the current right-of-way may be available for a riparian corridor and a side channel with a riparian fringe along the outer edge may be possible and will continue to be considered in the alternatives. Because of the importance of soccer facilities to residents of communities that are considered to have been historically-underserved from a lack of access to such recreational amenities, retention of this area for soccer use is considered an environmental justice issue. A portion of Ferraro Fields would be used in project alternatives, but use of the entire parcel is not feasible.</p> <p>Throughout the two-year development and implementation of the City's LA River Revitalization Master Plan, numerous groups expressed interest in creating new soccer facilities at/near the river, including Anahuak Youth Soccer Association, The City Project, and the Alianza de los Pueblos del Rio. In general soccer playing is</p>

Name	Description
	discouraged in open spaces because of the damage to grass and potential conflicts with other uses—such as habitat establishment/restoration. Soccer is also a very popular activity for populations that have been historically underserved in terms of access to natural and recreational spaces in LA, so there is an environmental justice component. Therefore, it is important to balance the availability of resources and accommodate established soccer-playing facilities in close proximity to the river and multiple modes of transportation in a way that also facilitates connections to natural open space resources—reducing negative interaction effects as much as is possible. Given the established use of Ferraro Fields for soccer and the ability of the river’s ecosystem restoration to benefit from an off-stream channel near the Fields, the compatible use scenario was chosen so as not to displace/disrupt an established recreational use that could not be replaced as part of the ecosystem project. However, a portion of this site would be available to use for the restoration project without impacting the soccer fields.
<b>Zoo Parking Lot Habitat Corridor</b>	This real estate was determined to be unavailable to the project because an extensive City-sponsored storm water/water quality project was recently completed in the same area and the parking itself is necessary to support activity at the zoo, the Autry Museum of Western Heritage, and other nearby uses in Griffith Park. Disruption of the parking was not considered to be feasible given the high demand for use by visitors to these important regional amenities. Moreover, the site is separated from the river by the I-5 freeway and any diversions would require costly infrastructure, including tunnels, and extensive, expensive channel modifications at the access point/s. The site remains potentially useful as a shared parking facility to accommodate future visitors to the Study area.
<b>Griffith Park Golf Course</b>	This real estate was determined to be unavailable to the project because of the overall cost of the extensive infrastructure that would be required to bring off-channel flows to the course from the river, the considerable modifications that would be made to the I-5 Freeway, and the substantial disruption of use at a heavily-used facility. Preliminary analysis indicated that the peak flow reduction accommodated by the off stream flows and use as an underground basin would be negligible in accommodating additional habitat in the downstream channel even though the local habitat connection could be meaningful. This area has been designated a Significant Ecological Area (SEA) for the City of Los Angeles and the open space has extensive tree cover. It remains important for avian species and is a reservoir for native species, but near term hydrologic/hydraulic connections were deemed too expensive and extensive given the freeway and utility infrastructure barriers and opportunity costs associated with the disrupted use. However, a side channel using existing tunnels/culverts under the freeway was feasible at this site and is included in the remaining measures.
<b>Department of Recreation and Parks Central Service Yard</b>	<p>The Central Service Yard (CSY) is a 24.6 acre site owned by the City of Los Angeles Department of Recreation and Parks (RAP) located on the eastern bank of the Los Angeles (LA) River. It is situated across from Griffith Park and upstream of North Atwater Park. It was considered as a potentially-available property in initial plan formulation of the Los Angeles River Ecosystem Restoration Feasibility Study (Study), but the CSY was subsequently deemed infeasible for inclusion in the Study because of the prohibitive costs associated with relocating and replicating its current uses elsewhere.</p> <p>The CSY is the primary support facility and service yard for RAP and services the entire recreation and park system of the City of Los Angeles (City). The CSY houses irreplaceable uses of vital necessity to the operation and maintenance of all parks and recreation facilities in the City. The CSY is centrally located within the City and provides RAP with quick, trouble-free access to the region’s major north-south and east-west highways. The centralized location of the CSY permits RAP a number of positive operational and budgetary efficiencies, which are of increasing benefit to the</p>



Name	Description
	<p>City given the ongoing fiscal and budgetary challenges it continues to face.</p> <p>In December 2012, the City conducted an initial analysis of the cost and feasibility of relocating the functions of the CSY to other parcels currently for sale in Los Angeles County. From this investigation, the City estimates that the cost of purchasing new land would be approximately \$70-110 million, and the cost to construct new facilities and relocate the existing uses would be approximately \$130-140 million, yielding a total cost of approximately \$200-250 million.</p> <p>Moreover, no available parcel was identified that is large enough to accommodate the existing uses in one place, and the largest available parcels are not located in areas of the City that are as advantageously located as CSY. Until a location of acceptable size and proximity is identified to facilitate the relocation of the CSY's functions, it must continue to support its current uses. In the near-term, a linear habitat corridor along the river's edge that does not encroach upon the site remains a feasible option for inclusion in the Study.</p>
<b>Albion Dairy</b>	<p>This location was eliminated because of current plans and agreements already in place to use this site for storm water quality treatment, which would preclude bringing river water into the site. This site was purchased under agreements for this specific use. Moreover, hydrologic/hydraulic connections between the site and the river are complicated by existing at-grade railroad tracks. Whereas connections at/under rail tracks remain desirable in other locations, such as the Cornfield/LA State Historic Park and the Piggyback Yard, the connection at this site is less feasible given the much smaller amount of ecosystem restoration that would be accomplished at/near/on the Albion site.</p>
<b>DWP/Main Street Facility</b>	<p>This real estate was determined to be unavailable to the project because of the costs associated with moving/relocating/cleaning/preparing/redeveloping the site for the ecosystem use. New use of the entire site would drastically impact existing City service provision and current rail uses and would require an extremely expensive and logistically undesirable relocation of a power transmission station. The approximately 3-acre parking lot on the river-side of the rail tracks could function as a linear habitat corridor and buffer along the river's edge next to the site and therefore this remains a viable option.</p>
<b>Metro Union Bus Service Yard (Division 13 Bus Maintenance Facility)</b>	<p>Along the river's western bank near Union Station across from Piggyback Yard was not considered because it is a property belonging to the Los Angeles County. The County recently invested over \$1 million to renovate and expand the facility for bus maintenance and storage. The County has been clear that it is unwilling due to economic considerations to consider selling the property for expansion of Union Station, high speed rail, or ecosystem restoration purposes, because of the costs associated with moving and relocating the recently upgraded facilities. The site is under the ownership/control of others, therefore, it was considered unavailable.</p>
<b>Area with Restoration Benefits and Opportunities for Revitalization (ARBOR) Outlet</b>	<p>Terrace, Remove Concrete, and Create Habitat Corridor. This reach is constrained by a series of active and parallel rail lines along both sides of the river. The bridges are critical locations for conveying flow through this area. Removal of concrete requires alternate measures to offset the loss in conveyance. Modifications to this area of the river were determined to be infeasible because of extensive rail and roadway infrastructure and because it may need to be used as a transition between any restoration and the downstream flood risk management project.</p>
<b>Consolidated North Central District Yard.</b>	<p>The Consolidated North Central District Yard (CNC DY) is a 10 acre site owned by the City of Los Angeles. It is located on the south bank of the Arroyo Seco and upstream of the confluence with the LA River. It was considered as a potentially-available property in initial plan formulation of the Study but was subsequently deemed infeasible for inclusion in the Study because of the prohibitive costs associated with relocating and replicating its current uses elsewhere. Past investigations have yielded a</p>

Name	Description
	<p>necessity to locate the uses of the CSY near Griffith Park because they serve Park operations and maintenance functions. To preserve the natural open space value of the Park, the Griffith Park Master Plan working group has discouraged the location of any new maintenance yards in the park itself. Given this, a comparable site of considerable size would need to be identified at/near the Park to accommodate the CSY uses. This has not yet been accomplished and does not seem likely in the near-term.</p> <p>The CNCDY provides for the storage and maintenance of Bureau of Sanitation and Bureau of Street Services vehicles, including refuse trucks serving a large portion of the City. Its location offers fast and efficient access to major roads and freeways.</p> <p>In 2007, the City conducted an initial analysis of the cost and feasibility of relocating the functions of the site to other parcels currently for sale in Los Angeles County. From this investigation, the City estimates that the cost of purchasing new land would be approximately \$70-75 million, and the cost to construct new facilities and relocate the existing uses would be approximately \$130-170 million, yielding a total cost of approximately \$200-245 million.</p>
<b>LACDA Footprint Only</b>	<p>The District also examined whether an alternative wholly within the existing LACDA footprint in the study area was feasible. The LACDA boundary includes the channel bottom and sides with very limited rights of way on either side, much of which is occupied by bicycle paths on the west/south side of the river. The team concluded after consideration that a LACDA-footprint-limited alternative would not meet objectives because it would not meet the objective for restoring regional connectivity, and it would also be likely to fail the objective for restoring habitat because flow velocities would not be reduced sufficient to support restored habitat. Lands within the LACDA boundary are included in the alternatives including the TSP, but the lands within the boundary are not sufficient in themselves to support restoration objectives.</p>

#### 4.0 References Cited

California Department of Fish and Wildlife (CDFW). 2012. Endangered, Threatened, and Rare Plant and Animal lists. Internet webpages located at: [http://www.dfg.ca.gov/wildlife/nongame/t\\_e\\_spp/](http://www.dfg.ca.gov/wildlife/nongame/t_e_spp/). Accessed in Jul, 2012.

California Native Plant Society (CNPS). 2012. CNPS Rare Plant Ranking System. Internet webpage located at <http://www.cnps.org/cnps/rareplants/ranking.php>. Accessed August 2012.

California Natural Diversity Database (CNDDDB). 2012. Subscriber-limited access on-line database for Burbank, Hollywood, Pasadena, and Los Angeles topographic quadrangles.

U.S. Fish and Wildlife Service (USFWS). 2012a. Carlsbad Fish and Wildlife Office Species Status List. Internet website located at <http://www.fws.gov/carlsbad/TEspecies.html>. Accessed August 2012.

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Los Angeles District

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# **Los Angeles River Ecosystem Restoration Feasibility Study**

## **APPENDIX H, Part 2 Monitoring and Adaptive Management Plan**

**September 2015**

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## 1.0 INTRODUCTION

This document outlines the feasibility level Monitoring and Adaptive Management Plan (MAMP) for the Los Angeles River Ecosystem Restoration Project (LARERP) in Los Angeles, California. The U.S. Army Corps of Engineers, Los Angeles District (USACE) in partnership with the City of Los Angeles (City), has developed feasibility level plans to restore approximately 11 miles of the Los Angeles River from approximately Griffith Park to downtown Los Angeles, identified as the Area with Restoration Benefits and Opportunities for Revitalization (ARBOR) reach. This plan identifies and describes the monitoring and adaptive management activities proposed and estimates their cost and duration.

The general purpose of the MAMP is to provide a systematic approach for improving resource management outcomes and a structured process for recommending decisions, with an emphasis on uncertainty about resources response to management actions and the value of reducing that uncertainty to improve management.

More specifically, the MAMP will:

- Establish the framework for effective monitoring, assessment of monitoring data, and decision making for implementation of adaptive management activities in the project area.
- Provide the process for identifying adaptive management actions in the project area.
- Establish decision criteria for vegetation and wildlife evaluation and modification of adaptive management activities.

This plan will be reviewed and revised as needed during the Preconstruction, Engineering, and Design (PED) phase as specific design details are made available.

### 1.1 Statutory Basis for Monitoring and Adaptive Management

Section 2039 of Water Resources Development Act (WRDA) 2007 directs the Secretary of the Army to ensure that, when conducting a feasibility study for a project (or component of a project) for ecosystem restoration, the recommended project includes a plan for monitoring the success of the ecosystem restoration.

Section 2039 of WRDA 2007 requires that the monitoring plan include a description of the monitoring activities, the criteria for success, and the estimated cost and duration of the monitoring, and specifies that monitoring will be performed until restoration success is achieved.

The Corps' implementation guidance for Section 2039, in the form of a memo dated 31 August 2009, also requires that an adaptive management plan (i.e., contingency plan) be developed for all ecosystem restoration projects.

This MAMP includes all elements required by the WRDA 2007 implementation guidance for section 2039, including:

- the rationale for monitoring (Section 2.2), including:
  - key project specific parameters to be measured (Section 2.3.2)
  - how the parameters relate to achieving the desired outcomes or making a decision about the next phase of the project (Sections 2.3.2, 6.1),
- the intended use(s) of the information obtained (Section 2.3.4)
- the nature of the monitoring including duration and/or periodicity (Sections 2.3.2, 2.3.3),
- the disposition of the information and analysis (Sections 2.3, 5.0)
- the cost of the monitoring plan (Section 7.0)
- the party responsible for carrying out the monitoring plan (Section 1.2)
- a project closeout plan (Section 6.3).

### **1.2 Adaptive Management Team**

The MAMP provides the framework and guidance for an Adaptive Management Team (AMT) to review and assess monitoring results and consider and recommend adaptive management actions when ecological success is not achieved and decision criteria are triggered. The AMT members shall work together to make recommendations relevant to implementing the MAMP. The AMT is composed of the Corps, the City of Los Angeles (City), and interested resource agencies. Although the Corps and City have coordinated with the entities that will comprise the AMT in development of this Integrated Feasibility Report (IFR), the AMT will be officially established during PED.

The AMT focuses on the ecological function of the habitats through related management actions to maintain and provide functional riverine habitat for general species and special status (threatened and endangered species) within the project area. This MAMP provides a monitoring plan and identifies triggers upon which an adaptive management action may be implemented. The AMT shall review the monitoring results and advise on and recommend actions that are consistent with the project goals and reflect the current and future needs of the habitat and the species they support within the project area. The Corps shall have final determination on all adaptive management actions recommended.

The Corps is responsible for ensuring that monitoring data and assessments are properly used in the adaptive management decision-making process. If the Corps determines that adaptive management actions are needed, it will coordinate with the AMT on implementation of those actions. The Corps is also responsible for project documentation, reporting, and external communication.

The AMT shall meet at a minimum of once per year, as scheduled by the Corps during the monitoring period, to review the results of monitoring and assess whether project objectives are being met. If objectives are not being met, the AMT may recommend that adaptive management actions be taken in response to monitoring results as compared to decision-making triggers.

The AMT may also consider other related projects along the River and its tributaries in determining the appropriate adaptive management actions, and may consult with other recognized experts or stakeholders as appropriate, to achieve project goals.

Recommendations for adaptive management should be based on:

- Monitoring data from previous years
- Consideration of current habitat conditions
- Consideration of current and potential threats to habitat establishment success
- Past and predicted response by target species

### 1.2.1 Team Structure

The Management Team shall include representatives from the U.S. Army, Corps of Engineers, Los Angeles District and the non-Federal sponsor, City of Los Angeles,.

#### U.S. Army Corps of Engineers

The Corps may be represented by the Project Ecologist as well as the Project Hydrology and Hydraulics (H&H) representative and the Project Geotechnical representative as needed. Other Corps attendees may include the Project Manager, the Project Environmental Coordinator, and/or Operations and Maintenance designees, as needed.

#### City of Los Angeles

The City, as the non-Federal sponsor for the project, will ultimately be responsible for all OMRRR activities once the Corps notifies the City of project completion. Prior to final project completion, the Corps will transfer responsibility of functional elements of the project to the City as they are completed. The City may be represented by its Bureau of Engineering designee. Other City participants may include the City Manager, Director of Planning, City Engineer, and Public Works Division Manager, or their designees.

The AMT shall also include representatives from resource agencies who would serve in an advisory capacity, to assist in evaluation of monitoring data and assessment of adaptive management needs. The agencies shall include, upon their acceptance:

- U.S. Fish and Wildlife Service, Carlsbad Field Office
- California Department of Fish and Wildlife, South Coast Region 5
- California Regional Water Quality Control Board, Los Angeles Region
- United States Geological Survey (USGS), Western Ecological Research Center (WERC)

Additional expertise may be provided by other entities and stakeholders with knowledge of the Los

Angeles River ecosystem, hydrology, and wildlife species, at the discretion of the primary AMT participants.

## **2.0 MONITORING**

An effective monitoring program will be required to determine if the project outcomes are consistent with original project goals and objectives. The power of a monitoring program developed to support adaptive management lies in the establishment of feedback between continued project monitoring and corresponding project management. A carefully designed monitoring program is the central component of the project adaptive management program as it supplies the information to assess whether the project is functioning as planned.

### **2.1 Project Objectives**

The specific restoration objectives of the LARERP are to:

- 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 ARBOR reach 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 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 ARBOR reach throughout the period of analysis.
- 3) **Increase passive recreation:** Include recreation that is compatible with the restored environment in the ARBOR reach.

### **2.2 Rationale for Monitoring**

Monitoring must be closely integrated with the adaptive management components because it is the key to the evaluation of adaptive management needs. Objectives must be considered to determine appropriate indicators to monitor. In order to be effective, monitoring must be able to distinguish between ecosystem responses that result from project implementation (i.e., management actions) and natural ecosystem variability.

Achieving objectives will require monitoring that focuses on the target habitats and the hydrologic and geomorphic processes that support them.

### **2.3 Monitoring Plan**

According to the Corps' implementation guidance memo for WRDA Section 2039, dated 31 August 2009, "Monitoring includes the systemic collection and analysis of data that provides information useful for assessing project performance, determining whether ecological success has been achieved, or whether adaptive management may be needed to attain project benefits."

The following discussion outlines a monitoring plan that will support the LARERP Adaptive Management Program. The plan identifies performance measures along with desired outcomes and monitoring design in relation to specific objectives. A performance measure includes specific feature(s) to be monitored to determine project performance. Additional monitoring is identified as supporting information needs that will help to further understand the interrelationships of restoration features and external environmental variability and to corroborate project effects.

Decision-making triggers are related to each performance measure and desired outcome and identify the need to discuss potential implementation of adaptive management actions with the AMT. These criteria/triggers are identified in Section 6.1.

Overall, monitoring results will be used to evaluate the progress of habitat restoration toward meeting project objectives and to inform the need for adaptive management actions to ensure successful restoration is achieved.

### **2.3.1 Monitoring Period**

Upon completion of construction of each phase or feature of the LARERP, cost-shared monitoring for ecological success and adaptive management will be initiated and will continue for five years or until restoration success is achieved, for no longer than ten years. Concurrent monitoring of one or more nearby reference sites with similar conditions to the desired restored habitat, such as the Santa Ana River or San Gabriel River, is recommended to differentiate changes at the restoration site that are attributable to the restoration activity versus normal environmental variability affecting the region.

This monitoring plan includes the minimum monitoring actions to evaluate success and to determine adaptive management needs. Assuming that multiple construction contracts will be required to implement all of the restoration elements associated with the recommended plan, monitoring and adaptive management will be initiated at the completion of each phase of construction.

Although WRDA 2007 allows for up to ten years of cost-shared monitoring when necessary, this plan anticipates that only five years of monitoring and adaptive management would be required for each feature, for habitat to mature sufficiently to be self-sustaining, and to meet performance criteria for project objectives. Once the Corps determines that ecological success for a feature has been fully achieved, even if this occurs in less than five years, no further monitoring will be performed. For each phase, if performance criteria for project objectives have not been met within the first five years, then cost-shared monitoring and adaptive management would continue within those areas until performance criteria are met or for a maximum of five additional years, whichever is less. If success cannot be determined within the ten-year period of cost-shared monitoring allowed by law, any additional monitoring and management will be a non-Federal responsibility. Cost-shared monitoring shall not continue beyond ten years.

### **2.3.2 Performance Measures and Monitoring Design**

Performance Measure 1a: Vegetative community, cover, and structure

Desired Outcome: Increase percent cover of native riparian and marsh habitat.

Desired Outcome: Maintain appropriate structural diversity of native riparian habitats to support target wildlife species.

Desired Outcome: Increase percent vegetative cover over water to reduce water temperatures to support native fish.

Desired Outcome: Decrease percent cover of non-native invasive species that out-compete natives.

Monitoring Design and Rationale: Permanent vegetation monitoring stations will be established for assessing project area vegetation communities. These stations will be sampled annually for five years post construction.

Supporting Information Need - Depth to Groundwater: Depth to groundwater will be monitored seasonally for five years, along with the hydrologic monitoring as set forth below in performance measure 1b.

Supporting Information Need - Wildlife Surveys: Inventories of general wildlife would be documented during the annual vegetation monitoring effort.

Wildlife surveys will be performed annually for five years post construction in coordination with the vegetation monitoring to provide supporting information on the establishment of target habitats. Data on large mammal use will be compiled from studies performed by existing USGS WERC monitoring programs.

Monitoring of vegetation (including percent cover, structural diversity, cover over water, and cover of invasives) and depth to groundwater, as well as inventorying wildlife will indicate if target habitats and the hydrology that supports them have been successfully restored. Shallow depth to groundwater is essential for riparian habitats to persist and be self-sustaining.

Wildlife surveys serve to provide supplemental information on restoration success for target habitats and habitat connectivity. While wildlife presence is not a requirement to confirm success, presence of riverine obligate and facultative species (such as least Bell's vireo, yellow warbler, and yellow breasted chat) that use the habitat for all or a portion of their life requirements is an indicator of successful habitat establishment, as well as the successful establishment of a self-sustaining ecosystem and its underlying functions. If vegetative cover and structure criteria are not being met, wildlife species presence, distribution, and diversity may provide supporting information to help identify which habitat elements and underlying ecosystem functions have not been achieved in target habitats.

Results of monitoring for vegetation communities would also indicate whether habitat components necessary to provide habitat connectivity and support increased wildlife

movement have been successfully established.

Decision-making triggers can be found in Section 6.1.1

Performance measure 1b: Stream channel native fish habitat

Desired Outcome: Increase structure and diversity of in-channel form and habitats.

Desired Outcome: Increase and maintain availability of gravel and cobble substrates.

Monitoring Design and Rationale: Permanent monitoring stations will be established for monitoring of geomorphic and in-channel habitat elements such as large woody debris; stream gradient; channel form, dimensions, and dynamics; gravel bars or riffle-pool-run complexes and distributions; flood refugia and back-channel areas; and substrate composition and distribution. Monitoring will be performed twice annually (wet season and dry season) post construction for five years in soft bottom areas of the main channel and in widened areas.

Bathymetry/topography surveys to evaluate widespread geomorphic changes, such as sediment aggradation and degradation, would be performed at the end of Year 1 after construction and at the end of Year 5 after construction in soft bottom areas of the main channel and in widened areas. Scour and erosion will also be assessed as part of geotechnical O&M procedures.

Supporting Information Need - Hydrology: Water quality, flow, and hydroperiod will be assessed seasonally for five years post construction to support evaluation of suitable fish habitat.

Monitoring of these features is necessary to determine the successful establishment of native fish habitat, including for Santa Ana sucker and arroyo chub, which require gravel and cobble substrates for foraging and spawning, shade over water that supports cooler water temperatures, inputs of large woody debris to support structural diversity and refugia, in-channel geomorphic diversity to support all stages of life requirements, and perennial flowing water.

Furthermore, changes to geomorphic processes will affect the vegetation component of target habitats. If vegetative cover and structure criteria are not being met, data from monitoring of geomorphic and hydrologic processes may provide additional information on the underlying causes of failure. Bathymetry/topography surveys will also provide data on sedimentation that can be used to assess channel conveyance capacity.

Results of monitoring for native fish habitat would also indicate whether habitat components necessary to provide habitat connectivity and support increased wildlife movement have been successfully established.

Decision-making triggers can be found in Section 6.1.2

### 2.3.3 Monitoring Procedures

The following monitoring procedures will provide the information necessary to evaluate the previously identified project objectives for the LARERP:

Vegetation: Vegetation sampling will occur annually at 12 sites per reach and at a reference site for the duration of the monitoring period. Sampling will occur during spring months, at the peak of growing season, and will consist of permanent field monitoring plots along one or more transects either perpendicular to the stream centerline or parallel to the floodplain slope and hydraulic gradient. Plots will be located randomly within each reach/feature, and the distance between plots and along transects will be dependent on the project site area and variability. Monitoring will measure percent cover of native and non-native plant species, structural diversity, and percent cover over water. Photograph stations are also important for documenting vegetation conditions. All plots and photograph stations will be documented via Global Positioning System (GPS) coordinates to reoccupy in each year of sampling.

General observations, such as fitness and health of plantings, native plant species recruitment, and signs of drought stress would be noted during the surveys. Additionally, potential soil erosion, flood damage, vandalism and intrusion, trampling, and pest problems would be qualitatively identified.

A general inventory of all wildlife species observed and detected using the project area would be documented. Nesting sites, roosting sites, animal burrows, and other signs of wildlife use of the newly created habitat would be recorded. These notes would be important for early identification of species colonization patterns.

In-Channel Stream Habitat: To assess the overall stream health and available habitat for native fish, a California Stream Bio-assessment Worksheet (CDFG 1999) will be completed annually at permanent monitoring stations. This assessment is meant to rapidly assess the stream and be able to give it a habitat value score based on the physical characteristics of the site. Some of the physical factors that are assessed include the stream gradient, substrate composition, organic material in the stream (woody debris and leaf litter), and vegetative cover above the stream.

In-stream characteristics will also be recorded annually by taking channel cross-sections at permanent monitoring stations. Methods involve placing a transect line perpendicular to flow at the up and downstream extents of 100 meter monitoring sites. Substrate composition (silt, sand, gravel, cobble, boulder, sandbars, and emergent vegetation), channel width, channel depth, and mid-column current velocity will be measured at 1.0 meter intervals along each transect line.

Bathymetry and topography surveys would occur at Year 1 and Year 5, and may be generated using LiDAR or a ground survey crew.



Supporting Information Need – Wildlife Surveys: A general inventory of all wildlife species observed and detected using the project area would be documented annually in coordination with vegetation monitoring. During the general inventory, station counts will be conducted for sensitive and target species including least Bell’s vireo, yellow-breasted chat, and yellow warbler. Amphibian surveys may also be performed using station counts, fence arrays or pit fall traps. Presence of non-native and nuisance wildlife species will be noted.

Data on wildlife use by large mammals will be gathered from existing monitoring being performed by USGS WERC.

Supporting Information Need - Hydrology: Hydrology will be assessed seasonally each monitoring year and at storm events. Mid-column current velocities will be measured at 1.0 meter intervals along each in-stream cross-section transect line. Measurements for current velocity will be taken using a hand-held flow meter, such as the Global Water Flow Probe, following methods described in Gore (2007). Hydroperiod metrics (depth, duration, and frequency of flooding) will be obtained from documented elevations and recorded water levels. Depth to groundwater will be assessed using installed piezometers.

Supporting Information Need - Water Quality: Water quality parameters will be measured seasonally each monitoring year to assess the quality of native fish habitat. Parameters to be measured include water temperature (°F), dissolved oxygen ([DO]%, saturation, and mg/L), turbidity (nephelometric turbidity units [NTUs]), pH levels, conductivity (uS/cm), and salinity (mg/g). Measurements will be taken using Hanna HI 9928 and HI 93703 water quality meters or other similar water quality meters.

### **2.3.4 Use of Monitoring Results and Analysis**

Results of the monitoring will be assessed in comparison to project 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. The results of the monitoring will be provided to the AMT who will evaluate and compare data to project objectives and decision making triggers. The AMT will use the monitoring results to assess habitat responses to management, evaluate overall project performance, and make recommendations for adaptive management actions as appropriate. If monitoring results, as compared to desired outcomes and decision making triggers, show that project objectives are not being met, the AMT will evaluate causes of failure and recommend implementation of adaptive management actions, as identified in Section 6.2, to remedy the underlying problems.

As data is gathered through monitoring, more information will also be available to address uncertainties and fill information gaps. Uncertainties such as effective operational regimes, urban restoration design needs, benefits generated by restored features, and accuracy of hydrologic models can be evaluated to inform adaptive management actions and future restoration needs.

### **3.0 PROJECT ADAPTIVE MANAGEMENT PLANNING**

The MAMP outlines how the results of the project-specific monitoring program would be used to adaptively manage the project, including specification of conditions that will define project success.

The MAMP reflects a level of detail consistent with the feasibility study phase. The primary intent was to develop monitoring and adaptive management actions appropriate to assess and achieve the project's restoration goals and objectives. The specified management actions, as well as expected timelines for achieving successful establishment and self-sustaining maturity of restored habitat features, were used to develop an estimation of the adaptive management program costs and duration for the project.

The following section outlines restoration actions that will be undertaken to achieve the project objectives and lists sources of uncertainty that may impact the need for adaptive management actions. Subsequent sections describe assessment of monitoring results, data management, and decision-making on the implementation of adaptive management.

The level of detail in this plan is based on currently available data and information developed during plan formulation as part of the feasibility study. Uncertainties may remain concerning the exact project features, monitoring elements, and adaptive management opportunities. Components of the MAMP, including costs, were similarly estimated using currently available information. Uncertainties will be addressed in the preconstruction, engineering, and design (PED) phase, and the MAMP may be amended to incorporate additional detail as part of the design phase.

#### **3.1 Management and Restoration Actions**

The PDT performed a thorough plan formulation process to identify potential management measures and restoration actions that address the project objectives. Many alternatives were considered, evaluated, and screened in producing a final array of alternatives. The Corps subsequently identified a Recommended Plan.

The Recommended Plan, which is also the Locally Preferred Plan (LPP), is referred to as Alternative 20, also known as the RIVER (for Riparian Integration via Varied Ecological Reintroduction) Alternative. The restoration actions have been divided into 8 reaches based on the geomorphology of the ARBOR reach to assist with planning (see Figure 1-2 of the Integrated Feasibility Report (IFR)).

The proposed action includes restoration in all 8 reaches and provides transitions or connections between existing riparian corridors and concrete lined river reaches. The RIVER Alternative would riparian, wetland, and riverine habitats and functions and would provide 6,782 habitat units (HU). Large habitat nodes that support native riparian and riverine habitat would be created where the river is widened at Verdugo Wash, Taylor Yard, and the LATC site. Increased habitat connectivity would be achieved with these restored widened areas in combination with restoration of overbank habitat patches, riparian corridors, and daylighted streams, as well as restoration at the Arroyo Seco and Verdugo Wash confluences and the Cornfields site. The Recommended Plan is described in detail in Section 7 of the IFR. Potential plant palettes for each proposed vegetation community are

included in Section 4.4 of the IFR.

### **3.2 Sources of Uncertainty**

Adaptive management provides a coherent process for making decisions in the face of uncertainty. Scientific uncertainties and technological challenges are inherent with any large-scale ecosystem restoration project. Below is a list of uncertainties associated with restoration of the riverine habitats included in the LARERP.

- Correct engineering and design to fully address project objectives
- Correct operational regime to fully achieve project objectives
- Ability of CHAP (Combined Habitat Assessment Protocol) method to predict project benefits
- Ability of hydrologic models to predict project impacts/benefits
- Imprecise relationships between management actions and corresponding outcomes
- Future availability of water for restored habitats due to extreme drought or other climate change issues.
- Other factors which are not completely within the Corps' or Sponsor's control or ability to predict, such as high flow events that may occur before the restored habitat has fully established, vandalism, or upstream watershed changes that may affect the project area.

## **4.0 RATIONALE FOR ADAPTIVE MANAGEMENT**

The primary incentive for implementing an adaptive management program is to increase the likelihood of achieving desired project outcomes given the identified uncertainties listed above.

Given these uncertainties, adaptive management provides an organized, coherent, and documented process that suggests management actions in relation to measured project performance compared to desired project outcomes. The adaptive management program for the LARERP will use the results of continued project monitoring to manage restoration actions in order to achieve the previously stated project objectives. Adaptive management establishes the critical feedback of information from project monitoring to inform project management and promote learning through reduced uncertainty.

Implementation of the MAMP will provide flexibility to account for changing environmental conditions and new information and will allow project success to be measured, though it will not alleviate all uncertainty. The MAMP provides a mechanism to evaluate the effectiveness of the restoration measures implemented in this project and to implement adaptive changes, if required, to realize project objectives.

## **5.0 ASSESSMENT**

The assessment phase of the adaptive management framework describes the process by which the results of the monitoring efforts will be compared to the project performance measures, which reflect the objectives of the restoration action.

The results of the LARERP monitoring program will be assessed annually through the AMT. Monitoring results will be compared to the desired project outcomes as set forth by the project performance measures. This assessment process will measure the progress of the project in relation to the stated project objectives.

The AMT will compare monitoring results to decision-making triggers to evaluate project effectiveness and consider if adaptive management actions are needed.

The assessments will indicate if the habitat responses to management actions are undesirable (e.g., are moving away from restoration goals) or if the responses have met the success criteria for the project. Assessments will also inform the AMT if other factors are influencing the response that may warrant further research.

### **5.1 Database Management**

Database management is an important component of the monitoring plan and the overall adaptive management program. As part of the AMT, individuals with responsibility for data management activities (data managers) in support of an adaptive management program will be identified from the Corps. The data managers should collaborate with the AMT in developing a data management plan to support the adaptive management program. The data management plan should describe how and where data will be archived, data standards, data upload process and format, quality assurance and quality control procedures, metadata standards, and public data release. Storage of all data will be handled by the Corps

Data analysis and reporting will be the responsibility of the Corps, who will provide reports for the AMT to facilitate evaluation of adaptive management needs.

### **5.2 Documentation and Reporting**

The Corps will document the monitoring results, assessments, and the results of the AMT deliberations. The Corps will produce annual reports that will measure progress towards meeting project objectives as characterized by the performance measures. Results of assessments will be used to evaluate adaptive management needs and inform decision-making.

## **6.0 DECISION-MAKING**

Decisions on the implementation of adaptive management actions are informed by the assessment of monitoring results. The information generated by the monitoring plan will be used by the Corps and City in consultation with the other AMT members to guide decisions on adaptive management that may be needed to ensure that the ecosystem restoration project achieves success. Final decisions on implementation of adaptive management actions are made by the Corps.

## 6.1 Decision Criteria

Decision criteria, also referred to as adaptive management triggers, are used to determine if and when adaptive management opportunities should be implemented. They can be qualitative or quantitative based on the nature of the performance measure and the level of information necessary to make a decision. Desired outcomes can be based on reference sites, predicted values, or comparison to historic conditions. Several decision criteria are identified below, based on the project objectives and performance measures.

If assessments show that any of these triggers are met, the Corps would consult with the AMT to discuss which adaptive management action, as described in Section 6.2, is warranted. Investigations may be required to determine the cause of failure in order to inform which of the adaptive management actions identified should be implemented, if needed.

### 6.1.1 Vegetative community, cover, and structure triggers:

- 1) Desired Outcome: Increase percent cover of native riparian and marsh habitat.

Triggers: 50% cover of native riparian and marsh habitats is not achieved (based on locations of restoration of each habitat) within 3 years. 75% cover of native riparian or marsh habitat is not achieved (based on locations of restoration of each habitat) within 5 years.

- 2) Desired Outcome: Maintain appropriate structural diversity of native riparian habitats to support target wildlife species.

Trigger: Suitable structural diversity is not achieved within 5 years, whereby canopy cover exceeds 60% and/or shrub cover does not achieve 50%.

- 3) Desired Outcome: Increase percent vegetative cover over water to reduce water temperatures to support native fish.

Trigger: Percent cover over water does not achieve 25% within 3 years, and 40% within 5 years.

- 4) Desired Outcome: Decrease percent cover of non-native invasive species that out-compete natives.

Trigger: Non-native percent cover does not achieve less than 10% after 3 years. Non-native percent cover does not achieve less than 5% after 5 years.

Riparian and marsh vegetation may not achieve the target percent cover or structural conditions (needed to support habitat and connectivity) due to improper geomorphic conditions. Such conditions may include excessive distance to groundwater, sedimentation, channel incision, or scour of soils. These conditions may be created naturally, such as during storm events, or may be the consequence of design. Lack of water due to drought may affect the establishment and persistence of vegetation, and subsequently the percent cover. Plantings may fail due to predation or trampling.

Invasive infestation may occur due to upstream inputs of seed/source material. It is expected that invasives will be adequately controlled through O&M procedures. However, if invasive infestation control is found to be ineffective, the Corps may recommend adjustments to invasive control methods utilized under O&M.

Adaptive management actions that may be implemented to address problematic conditions and achieve project objectives are outlined in Section 6.2.

### 6.1.2 Stream channel native fish habitat triggers:

- 1) Desired Outcome: Increase structure and diversity of in-channel form and microhabitats.

Trigger: Geomorphic and in-channel habitat elements do not achieve diversity within 3 years and 5 years, as compared to reference sites, with monitoring results showing trends of channel incision that create uniform channel form (i.e., lack of sinuosity and riffle-pool-run complexes, uniform depth).

- 2) Desired Outcome: Increase and maintain availability of gravel and cobble substrates.

Trigger: Substrates do not achieve gravel and cobble composition of comparable reference sites within 5 years.

Desirable geomorphic conditions would be evaluated using reference sites at the San Gabriel and/or Santa Ana Rivers or other sites of similar hydrologic character and gradient to determine quantitative thresholds for channel form and substrates.

In-channel fish habitat may not achieve the target composition due to improper geomorphic conditions caused by natural events or design. Channel incision could develop due to lack of upstream sediment inputs in a highly hydrologically altered system. Flood events may wash gravel and cobble substrates out of the study area.

Adaptive management actions that may be implemented to address problematic conditions and achieve project objectives are outlined in Section 6.2.

## 6.2 Potential Adaptive Management Measures

The results of monitoring will be used by the AMT to evaluate project status and adaptive management needs. Identified adaptive management actions for this project are described below. Prior to implementing adaptive management measures, the Corps and City shall assess whether supplemental environmental analysis is required.

Irrigation/Supplemental Water: Irrigation and/or supplemental water may be needed if triggers for vegetative cover and/or structure are met. Assessment of monitoring results may show that drought conditions are causing poor establishment or die off of planted vegetation. Adaptive management actions would include supplemental water to support achievement of percent cover criteria and successful restoration of target vegetation communities.

Replanting: Replanting may be needed if triggers for vegetative cover and/or structure are met.

Monitoring results should be used to assess the underlying cause of inadequate cover, which may require that additional adaptive management actions be implemented to support successful replanting. For instance, monitoring results may show that channel incision has prevented successful establishment of vegetative communities. Adaptive management would include actions to remedy the incision (i.e., re-grading as described below), which would be required for successful replanting.

Plant Protection: Plant protection may be needed if triggers for vegetative cover and/or structure are met. Monitoring results may show that plantings are failing due to predation or trampling from recreational use or homeless encampments. Adaptive management actions would include measures such as plant cages or protective fencing that could be installed to protect plantings.

Invasives Control: It is expected that invasives will be adequately controlled through O&M procedures. However, if monitoring results show that triggers for invasives are met, the Corps may recommend adjustments to invasive control methods under O&M.

Erosion Control: Erosion control may be needed if triggers for vegetative cover are met. Monitoring results may show that vegetative cover is inadequate due to slope erosion issues. Adaptive management actions would include erosion control measures such as installation of straw wattles or erosion mats. Additional information may be required to determine the cause of erosion, and additional adaptive management measures may be required to be implemented (i.e., re-grading as described below).

Importing of Substrates: Substrates may need to be imported if triggers for native fish habitat are met. Suitable substrates would be provided during construction, however monitoring results may show that substrates are not sufficient to support native fish (i.e., homogeneity). Adaptive management actions would include importing of additional gravel and cobbles. It is assumed that frequent or routine import of substrates would not be required as part of O&M. If monitoring shows that importing of substrates is required as adaptive management more than once during the monitoring period, adjustments to O&M may be made to require recurring substrate import based on appropriate triggers informed by monitoring results.

Re-grading: Re-grading or re-distribution of sediments may be needed if triggers for vegetative cover or native fish habitat are met. Monitoring results may determine that sedimentation, scour of soils, channel incision or erosion has impacted the successful establishment of target vegetative communities in habitat nodes and corridors or that channel incision has prevented establishment of in-channel diversity. Adaptive management actions would include re-grading or re-distributing sediments to support the appropriate geomorphic conditions for successful establishment of habitat.

### **6.3 Conclusion of Monitoring for Project Features**

Ecological success of a project feature will be confirmed when desired outcomes have been achieved, measured by meeting or exceeding the 5-year achievement thresholds identified in the triggers in Section 6.1 (e.g., for vegetative cover, 75 percent cover is achieved; for non-native cover, less than 5 percent is achieved; for native fish habitat, channel and substrate diversity is



achieved). Once ecological success has been documented by the District Engineer in consultation with the Federal and State resources agencies, and a determination has been made by the Division Commander that ecological success has been achieved, no further monitoring will be required. Ecological success will be documented through an evaluation of the predicted outcomes as measured against the actual results.

## **7.0 COSTS FOR IMPLEMENTATION OF MONITORING AND ADAPTIVE MANAGEMENT PROGRAMS**

The costs associated with implementing the monitoring and adaptive management plan were estimated based on currently available data, methods, and comparable projects. The potential adaptive management actions as described in Section 6.2 and potential expected frequency of need were used as a basis for cost estimating. Costs were estimated based on the overall area of monitoring over 8 reaches. Because uncertainties remain as to detailed designs and adaptive management needs and opportunities, the costs estimated in Table 1 may be refined in PED during the development of the detailed monitoring and adaptive management plans for each project phase/feature.

### **7.1 Costs for Implementation of Monitoring Program**

Cost calculations for monitoring are displayed as a five-year total. If ecological success is determined earlier, the monitoring program will cease and costs will decrease accordingly.

The current total estimate for implementing the monitoring plan is approximately \$4.9 million for the Recommended Plan and \$4 million for the NER Plan.

### **7.2 Costs for Implementation of Adaptive Management Program**

Costs for the adaptive management program were based on estimated level of effort and potential frequency of need, and include participation in the Adaptive Management Team and reporting. The current total estimate for implementing the adaptive management program is approximately \$3.8 million for the Recommended Plan and \$3.6 million for the NER Plan.

### **7.3 Total Costs for Monitoring and Adaptive Management**

The cost figures above are provided at October 2014 price levels and prior to contingency. The monitoring and adaptive management costs at October 2015 price levels, as included in the certified total project cost summary, total \$12.25 million for the Recommended Plan and \$10.4 million for the NER Plan including contingency.



## **8.0 REFERENCES**

Gore, J. A. 2007. Discharge Measurements and Streamflow Analysis. Pages 51-78. In R. F. Hauer and G.A. Lamberti (Eds.). *Methods in Stream Ecology*. 2nd ed. Academic Press, San Diego, CA.

TABLE 1: PRELIMINARY COST ESTIMATES FOR MONITORING AND ADAPTIVE MANAGEMENT

Task	Assumed Tasks for Recommended Plan	Frequency	Cost Assumptions for Recommended Plan	Total Cost RP for 5 years	Total Cost NER for 5 years	Cost Differential
<b>Monitoring</b>						
<i>Vegetation Monitoring</i>	Assume monitoring of project area and 1 reference site, including transects for percent cover of natives, non-natives, structural diversity, canopy cover over water using transect/plot monitoring. Assume vegetation mapping, inventories of general wildlife, and observations of damage to habitat would be recorded. Assume monitoring of all parameters would be done concurrently during each monitoring event.	annually for 5 Years	<u>Monitoring</u> : Assume 3 hours/plot/2 biologists. Assume 12 plots per reach/site on avg, with 8 reaches and 1 reference site. <u>Mapping</u> : Assume 2 biologists over 4 days (2 reaches/day), plus GIS work of 1 person over 5 days	\$ 470,000.00	\$ 436,250.00	Costs for the NER plan were slightly decreased due to a decreased area of monitoring, as the NER plan does not include the Verdugo Wash site or in-channel reformation in Reach 8. The number of monitoring plots is therefore slightly reduced based on the reduced monitoring area.
<i>Native Fish Habitat Monitoring</i>	Assume monitoring of geomorphology, in-channel habitat elements, and substrates (i.e., composition and distribution of cobble, gravel, sands; riffle/pool/run complexes; stream gradient; channel form). Assume need for this monitoring in widened areas such as Verdugo Wash, Taylor Yard, LATC, and Arroyo Seco, and in-channel soft bottom areas.	annually for 5 Years	Costs referenced from similar existing monitoring contract on the Santa Ana River	\$ 2,694,000.00	\$ 2,216,000.00	Costs for the NER plan were slightly decreased due to a decreased area of monitoring, as the NER plan does not include the Verdugo Wash site.
	Assume monitoring of topography/bathymetry to assess widespread geomorphic changes. Assume need for this monitoring in widened areas such as Verdugo Wash, Taylor Yard, LATC, and Arroyo Seco, and in-channel soft bottom areas.	Years 1 and 5	assume \$1500-\$2000/acre	\$ 1,300,000.00	\$ 966,000.00	Costs for the NER plan were slightly decreased due to a decreased area of monitoring, as the NER plan does not include the Verdugo Wash site.
<i>Supporting Information Need - Hydrologic Monitoring</i>	Assume monitoring of flow, hydroperiod seasonally (i.e., 4 times per year, plus at storm events (assume 4 times per year on avg)) to evaluate suitability of habitat for native fish. Assume monitoring of depth to groundwater seasonally (i.e., 4 times per year) to evaluate ability to support riparian vegetation.	seasonally for 5 Years	Assume 16 piezometers (2 per reach on avg), 16 stream gages (2 per reach on avg). Assume installation by 2 people over 2 days. Assume 1 biologist monitoring data per event times 12 events per year.	\$ 200,000.00	\$ 200,000.00	costs are expected to be similar

TABLE 1: PRELIMINARY COST ESTIMATES FOR MONITORING AND ADAPTIVE MANAGEMENT

Task	Assumed Tasks for Recommended Plan	Frequency	Cost Assumptions for Recommended Plan	Total Cost RP for 5 years	Total Cost NER for 5 years	Cost Differential
<i>Supporting Information Need - Hydrologic Monitoring</i>	Assume monitoring of water quality seasonally (i.e., 4 times per year) to evaluate suitability of habitat for native fish.	seasonally for 5 Years	Assume 2 biologists over 4 days per year	\$ 40,000.00	\$ 40,000.00	costs are expected to be similar
<i>Supporting Information Need - Wildlife Surveys</i>	Assume that general wildlife observations would be performed during vegetation monitoring. Assume focused amphibian surveys with pitfall traps. Assume that data for large mammal use would be gathered from existing USGS movement studies.	annually	Assume 2 biologists over 5 days per survey, performed in time with vegetation monitoring.	\$ 240,000.00	\$ 192,000.00	Costs for the NER plan were slightly decreased due to a decreased area of monitoring, as the NER plan does not include the Verdugo Wash site or in-channel reclamation in Reach 8.
<b>TOTAL MONITORING</b>				<b>\$ 4,944,000.00</b>	<b>\$ 4,050,250.00</b>	

<b>Adaptive Management Actions</b>						
<i>Irrigation/Supplemental Water</i>	Assume 1/4 of the area needs supplemental water (approx. 3 river miles)	Assume twice in 5 years	Assuming \$50K per river mile per year to maintain.	\$ 300,000.00	\$ 250,000.00	Costs for the NER plan were slightly decreased due to a decreased area of monitoring, as the NER plan does not include the Verdugo Wash site or in-channel reclamation in Reach 8.
<i>Re-planting</i>	Assume that natural recruitment with invasives control will be the primary means of vegetation re-establishment post flood in widened areas. Assume that assume 25% of vegetation may require replanting over 5 years.		Cost of vegetation was estimated at \$16,500 per planted acre, based on project costs.	\$ 1,125,000.00	\$ 1,000,000.00	Costs for the NER plan were slightly decreased due to a decreased area of monitoring, as the NER plan does not include the Verdugo Wash site or in-channel reclamation in Reach 8.
<i>Plant Protection &amp; Fencing</i>	Assume 3000 plant cages, 3 miles fencing may be needed.		Assume \$8/plant cage; \$3/linear foot for fencing; plus \$50,000 installation. Costs referenced from existing restoration contracts.	\$ 121,520.00	\$ 109,600.00	Costs for the NER plan were slightly decreased due to a decreased area of monitoring, as the NER plan does not include the Verdugo Wash site or in-channel reclamation in Reach 8.
<i>Erosion Control</i>	Assume installation of erosion control such as straw waddles, erosion mats.	Assume annually for 5 Years	Assume \$10K/year as rough estimate.	\$ 50,000.00	\$ 50,000.00	costs are expected to be similar
<i>Importing substrates for fish habitat</i>	Assume importing cobbles/gravels in widened areas such as Verdugo Wash, Taylor Yard, LATC, and Arroyo Seco.	Assume once in 5 years	Costs referenced from similar existing contract on the Santa Ana River, which totaled \$50K for a smaller area.	\$ 250,000.00	\$ 200,000.00	Costs for the NER plan were slightly decreased due to a decreased area of monitoring, as the NER plan does not include the Verdugo Wash site.

TABLE 1: PRELIMINARY COST ESTIMATES FOR MONITORING AND ADAPTIVE MANAGEMENT

Task	Assumed Tasks for Recommended Plan	Frequency	Cost Assumptions for Recommended Plan	Total Cost RP for 5 years	Total Cost NER for 5 years	Cost Differential
<i>Regrading</i>	Assume 12 sites would need re-grading over 5 years.		Costs referenced from existing construction contracts, at \$20K for small fixes	\$ 240,000.00	\$ 200,000.00	Costs for the NER plan were slightly decreased due to a decreased area of monitoring, as the NER plan does not include the Verdugo Wash site or in-channel reformation in Reach 8.
<b>Adaptive Management Team &amp; Reporting</b>						
<i>Team Meetings</i>	Assume 1 meeting per year over 20 years (20 years accounts for some phased construction, needing 5 years of monitoring for each phase, staggered over time).	annually for 5 years	Assume \$3K per meeting	\$ 60,000.00	\$ 60,000.00	costs are expected to be similar
<i>Investigations (studies/surveys to determine cause of problems)</i>	As needed, assume over 20 years (20 years accounts for some phased construction, needing 5 years of monitoring for each phase, staggered over time)		Assume \$10K per year	\$ 200,000.00	\$ 200,000.00	costs are expected to be similar
<i>Annual Report</i>		annually for 5 years per reach	assume \$37,500 per report, annually for 5 years per reach, 8 reaches	\$ 1,500,000.00	\$ 1,500,000.00	costs are expected to be similar based on overall area of monitoring
<b>TOTAL ADAPTIVE MANAGEMENT</b>				<b>\$ 3,846,520.00</b>	<b>\$ 3,569,600.00</b>	
<b>PROGRAM TOTAL</b>				<b>\$ 8,790,520.00</b>	<b>\$ 7,619,850.00</b>	

\*Costs were referenced from current Southern California projects including Reach 9 Santa Ana River, Santa Maria, feedback from Prado Construction Division, Design Engineer, H&H, Environmental PDT members



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# **Los Angeles River Ecosystem Restoration Feasibility Study**

## **APPENDIX H, Part 3 Mitigation Monitoring and Reporting Program**

**May 2015**

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# Mitigation Monitoring and Reporting Program

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## **1.0 Introduction**

This Mitigation Monitoring and Reporting Program (MMRP) has been prepared pursuant to the California Environmental Quality Act (CEQA) and the State CEQA Guidelines. It provides for the monitoring of mitigation measures required of the U.S. Army Corps of Engineers (USACE) and the City of Los Angeles (City) in the Los Angeles River Ecosystem Restoration Project (proposed project), as set forth in the Environmental Impact Statement/Environmental Impact Report (EIS/EIR).

Section 21081.6 of the California Public Resources Code and Sections 15091(d) and 15097 of the State CEQA Guidelines require public agencies “to adopt a reporting or monitoring program for changes to the project which it has adopted or made a condition of project approval in order to mitigate or avoid significant effects on the environment.” An MMRP is required for the proposed project because the EIR identified potentially significant adverse impacts, and identified best management practices (BMPs)/mitigation measures to reduce some of those impacts to a less-than-significant level. All measures are intended to offset, to the degree possible, potential adverse effects under both CEQA and the National Environmental Policy Act (NEPA). Some thresholds for significant air quality impacts are different under the two statutes, but common measures were applied to all air quality impacts since those impacts cannot be mitigated to less than threshold values under either law.

This MMRP will be adopted by the City Council when it approves the project. It will be kept on file at the City of Los Angeles, Department of Public Works, Bureau of Engineering, 1149 S. Broadway, Suite 600, Los Angeles, CA 90015.

## **2.0 Purpose**

This MMRP has been prepared to ensure that all required BMP/mitigation measures are implemented and completed according to schedule and maintained in a satisfactory manner throughout implementation of the proposed project. The MMRP may be modified by the USACE or the City in response to changing conditions or circumstances. A summary table (attached) has been prepared to assist the responsible parties in implementing the MMRP. The table identifies individual BMP/mitigation measures, and for each measure identifies monitoring/mitigation procedures and timing, responsible agencies, and a record of implementation of the mitigation measures. Impacts for which BMP/mitigation measures are proposed are listed under the various resource categories in the EIS/EIR. The order in which BMP/mitigation measures are presented (by resource category) follows the sequence established in the EIS/EIR.

## **3.0 Roles and Responsibilities**

Unless otherwise specified herein, the USACE and City are responsible for taking all actions necessary to implement the BMP/mitigation measures according to the provided specifications and demonstrating that each action has been successfully completed. The USACE and the City, at their discretion, may delegate implementation responsibility or portions thereof to a licensed contractor.



## **4.0 Changes to BMP/Mitigation Measures**

Any substantive change to the MMRP shall be documented in writing. Modifications to the best management practices/mitigation measures may be made by the USACE and the City subject to one of the following findings and documented by evidence included in the record:

1. The measure included in the EIS/EIR and the MMRP is no longer required because the significant environmental impact identified in the EIS/EIR has been found not to exist, or to occur at a level which makes the impact less than significant as a result of changes in the project, changes in conditions of the environment, or other factors.

OR

2. The modified or substitute BMP/ mitigation measure to be included in the MMRP provides a level of environmental protection equal to or greater than that afforded by the mitigation measure included in the EIS/EIR and the MMRP.

AND

3. The modified or substitute mitigation measures do not have significant adverse effects on the environment in addition to or greater than those which were considered by the USACE or City Council in its decisions regarding the EIS/EIR and the proposed project.

AND

4. The modified or substitute mitigation measures are feasible, and the USACE or City, through measures included in the MMRP or other established procedures, can assure their implementation.

Findings and related documentation supporting the findings involving modifications to mitigation measures shall be maintained in the project file with the MMRP and shall be made available to the public upon request.

## 5.0 Summary Table

The table that follows should guide the USACE and City in evaluating and documenting implementation of mitigation measures. The columns identified in the table are described below:

**Mitigation Measure or Best Management Practice** – Provides the text of the BMP/ mitigation measures identified in the EIR.

**Timing/Schedule** – Identifies the time frame or milestone at which the BMP/mitigation measure will be implemented.

**Implementation Responsibility** – Identifies the entity responsible for complying with BMP/ mitigation measure requirements.

**Implementation and Verification** – These fields are to be completed as the MMRP is implemented. The “Status/Verification” column describes the type of action taken to verify implementation, and is to be filled out by USACE or City staff based on the documentation provided by qualified contractors, or through personal verification.

Table 5-1. Mitigation Monitoring and Reporting Program Summary Table

<b>MITIGATION MONITORING AND REPORTING PROGRAM SUMMARY TABLE</b> (Includes Text for Best Management Practices and Mitigation Measures)				
BMPs / Mitigation Measures	Responsibility for Implementation	Schedule	Monitoring/Report Responsibility	Status/ Verification
<i>Geology, Seismology, Soils, and Minerals</i>				
<p><b>Construction</b></p> <p><b>GEO 1:</b> Minimizing the extent of areas to be cleared, graded, or recontoured,</p> <p><b>GEO 2:</b> Erecting construction fencing in all areas that require clearing, grading, revegetation, or recontouring,</p> <p><b>GEO 3:</b> Conducting all construction work in accordance with site-specific construction plans that minimize the potential for sediment to enter the stream,</p> <p><b>GEO 4:</b> Applying mulch or chemical stabilizers to disturbed areas as needed, and/or using a water truck to reduce fugitive dust,</p> <p><b>GEO 5:</b> Stabilizing and reseeding disturbed areas with native grasses after construction is complete,</p> <p><b>GEO 6:</b> Installing silt fences to prevent silt and sediment from entering the River channel,</p> <p><b>GEO 7:</b> Grading spoil sites to minimize surface erosion and prevent sediment from entering water courses or the stream channel to the maximum extent feasible,</p> <p><b>GEO 8:</b> Designing and implementing a dewatering plan to avoid operating equipment in flowing water by using temporary cofferdams or some other suitable diversion to divert channel flow around the channel and bank construction area, and</p> <p><b>GEO 9:</b> Limiting certain aspects of in-channel construction to the low-flow period between April 15 and October 31 (non-flood season) to minimize soil erosion.</p> <p><b>GEO 10:</b> Soils and all materials used for backfilling or stabilization must be certified to be free of contaminants.</p> <p><b>GEO 11:</b> In-channel work would be isolated from existing flows by the use of dewatering structures such as cofferdams constructed from k-rails and other suitable materials.</p> <ol style="list-style-type: none"> <li>a. Cofferdam construction will be adequate to prevent seepage into or from the work area.</li> <li>b. Cofferdams may be constructed from sand bags, concrete k-rails, sheet piles or other appropriate materials that would not leach contaminants into the water column or increase downstream turbidity.</li> <li>c. Ensure that dewatering structures and coffer dams are in place and functional prior to in-water work.</li> </ol>	USACE	Throughout project construction; In-channel construction limited to low-flow period between April 15 and October 15 (non-flood season)	USACE	USACE PM to verify compliance during construction. Considered complete after end of project construction.

**MITIGATION MONITORING AND REPORTING PROGRAM**  
**SUMMARY TABLE**  
(Includes Text for Best Management Practices and Mitigation Measures)

<b>BMPs / Mitigation Measures</b>	<b>Responsibility for Implementation</b>	<b>Schedule</b>	<b>Monitoring/Report Responsibility</b>	<b>Status/ Verification</b>
<ul style="list-style-type: none"> <li>d. Visually inspect all cofferdam components on a regular basis.</li> <li>e. Check for water seepage under the dam and general integrity of the dam.</li> <li>f. Fix all leaks immediately.</li> <li>g. If turbid water is discharged from the work area despite the cofferdam, place wattles, filter fabric, silt fencing across the flow stream downstream of the work area as appropriate.</li> <li>h. All cofferdams and associated structures will be removed upon completion of work.</li> </ul> <p><b>GEO 12:</b> Require the construction contractor to prepare a storm water pollution prevention plan (SWPPP) consistent with State Water Board policy and guidelines. At a minimum, the SWPPP would include the following elements:</p> <ul style="list-style-type: none"> <li>a. Work areas, staging areas, or stockpile areas that could be subject to erosion during storm events would be stabilized with erosion control measures as appropriate. These measures could typically include silt fencing, straw bales, sand bags, filter fabric, coir rolls or wattles.</li> <li>b. Erosion control methods used to prevent siltation would be monitored weekly and maintained as needed.</li> <li>c. Stabilize and reseed disturbed upland areas with native grasses, shrubs, and trees upon completion of construction.</li> <li>d. Stationary equipment such as motors, pumps, generators and welders located within or adjacent to the channel or basin will be positioned over drip pans.</li> <li>e. Any equipment or vehicles driven and/or operated within or adjacent to the channel or basin should be checked and maintained daily, to prevent leaks. All maintenance will occur in a designated offsite area. The designated area will include a drain pan or drop cloth and absorbent material to clean up spills.</li> <li>f. Fueling and equipment maintenance will be done in a designated area removed from the area of the channel or basin such that no petroleum products or other pollutants from the equipment may enter these areas via rainfall or runoff. The designated area will include a drain pan or drop cloth and absorbent materials to clean up spills.</li> <li>g. Materials for the containment of spills (i.e., absorbent materials, silt fencing, filter fabric, coir rolls) will be identified and be available onsite prior to commencement of construction or maintenance activities.</li> <li>h. Any accidental spill of hydrocarbons or coolant that may occur within the</li> </ul>				

**MITIGATION MONITORING AND REPORTING PROGRAM**  
**SUMMARY TABLE**  
(Includes Text for Best Management Practices and Mitigation Measures)

<b>BMPs / Mitigation Measures</b>	<b>Responsibility for Implementation</b>	<b>Schedule</b>	<b>Monitoring/Report Responsibility</b>	<b>Status/ Verification</b>
<p>work area will be cleaned immediately. Absorbent materials will be maintained within the work area for this purpose.</p> <p>i. No wet concrete product will come into contact with any flowing or standing water at any time. Areas where raw cement or grout are applied or where concrete curing or finishing operations are conducted will be separated from any ponded or diverted water flows by a cofferdam or silt-free, exclusionary fencing. All equipment involved with the concrete or grouting operations will be located within a contained area while using any slurry or concrete product. A protective berm or other structure will be in place prior to maintenance and/or repair activities.</p> <p><b>GEO 13:</b> Any spill of the grout, concrete, concrete curing or wash water adjacent to or within the work area will be removed immediately.</p>				
<b><i>Air Quality and Greenhouse Gases</i></b>				
<p><b>AQ 1:</b> Tier 4 equipment and haul trucks no older than 2010 would be utilized to the extent practicable during construction years when emissions are expected to exceed Local Significance Thresholds.</p> <p><b>Mobile Emission Attenuating Measures</b></p> <p><b>AQ 2:</b> Provide temporary traffic controls such as a flag person, during all phases of construction to maintain smooth traffic flow.</p> <p><b>AQ 3:</b> Provide dedicated turn lanes for movement of construction trucks and equipment on-and off-site.</p> <p><b>AQ 4:</b> Reroute construction trucks away from congested streets or sensitive receptor areas.</p> <p><b>AQ 5:</b> Utilize electricity from power poles rather than temporary diesel or gasoline power generators to the extent practicable.</p> <p><b>Fugitive Dust Attenuating Measures</b></p> <p><b>AQ 6:</b> Appoint a construction relations officer to act as a community liaison concerning on-site construction activity including resolution of issues related to PM<sub>10</sub> generation.</p> <p><b>AQ 7:</b> Suspend all excavating and grading operations when wind speeds (as instantaneous gusts) exceed 25 miles per-hour.</p> <p><b>AQ 8:</b> Require frequent street sweeping surrounding the project site to minimize fugitive dust emissions from track-out. All street sweeping shall use alternatively</p>	USACE	Prior to and throughout project construction	USACE	USACE PM to verify compliance during construction. Considered complete after end of project construction.

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<p>fueled sweepers that are equivalent to those specified in SCAQMD Rules 1186 and 1186.1.</p> <p><b>AQ 9:</b> Install wheel washers where vehicles enter and exit the construction site onto paved roads or wash off trucks and any equipment leaving the site each trip.</p> <p><b>AQ 10:</b> Apply water three times daily, or non-toxic soil stabilizers according to manufacturer's specifications, to all unpaved parking or staging areas or unpaved road surfaces.</p> <p><b>AQ 11:</b> Replace ground cover in disturbed areas as quickly as possible.</p> <p><b>AQ 12:</b> Apply non-toxic soil stabilizers according to manufacturers' specifications to all inactive construction areas (previously graded areas inactive for ten days or more).</p>				
<b>Water Resources</b>				
<p><b>Construction</b></p> <p><b>WR 1:</b> Limiting most in-channel construction to the low-flow period between April 15 and October 31 to minimize soil erosion.</p> <p><b>WR 2:</b> Soils and all materials used for backfilling or stabilization must be certified to be free of contaminants.</p> <p><b>WR 3:</b> All sites with known and suspected HTRW soil contamination will be investigated and remediated prior to project construction. All groundwater contamination that cannot be remediated prior to project construction will be subject to appropriate handling, treatment and disposal ensured by the non-Federal sponsor. All work shall be consistent with Engineering Regulations 1165-2-132.</p> <p><b>WR 4:</b> In-channel work would be isolated from existing flows by the use of dewatering structures such as cofferdams constructed from k-rails and other suitable materials.</p> <ol style="list-style-type: none"> <li>a. Cofferdam construction will be adequate to prevent seepage into or from the work area.</li> <li>b. Cofferdams may be constructed from sand bags, concrete k-rails, sheet piles or other appropriate materials that would not leach contaminants into the water column or increase downstream turbidity.</li> <li>c. Ensure that dewatering structures and coffer dams are in place and functional prior to in-water work.</li> <li>d. Visually inspect all cofferdam components on a regular basis.</li> <li>e. Check for water seepage under the dam and general integrity of the dam.</li> <li>f. Fix all leaks immediately.</li> <li>g. If turbid water is discharged from the work area despite the cofferdam, place</li> </ol>	USACE	Throughout project construction; In-channel construction limited to low-flow period between April 15 and October 15 (non-flood season)	USACE	USACE PM to verify compliance during construction. Considered complete after end of project construction.

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<p>wattles, filter fabric, silt fencing across the flow stream downstream of the work area as appropriate.</p> <p>h. All cofferdams and associated structures will be removed upon completion of work.</p> <p><b>WR 5:</b> Require the construction contractor to prepare a storm water pollution prevention plan (SWPPP) consistent with State Water Board policy and guidelines. At a minimum, the SWPPP would include the following elements:</p> <p>a. Work areas, staging areas, or stockpile areas that could be subject to erosion during storm events would be stabilized with erosion control measures as appropriate. These measures could typically include silt fencing, straw bales, sand bags, filter fabric, coir rolls or wattles.</p> <p>b. Erosion control methods used to prevent siltation would be monitored weekly and maintained as needed.</p> <p>c. Stabilize and reseed disturbed upland areas with native grasses, shrubs, and trees upon completion of construction.</p> <p>d. Stationary equipment such as motors, pumps, generators and welders located within or adjacent to the channel or basin will be positioned over drip pans.</p> <p>e. Any equipment or vehicles driven and/or operated within or adjacent to the channel or basin should be checked and maintained daily, to prevent leaks. All maintenance will occur in a designated offsite area. The designated area will include a drain pan or drop cloth and absorbent material to clean up spills.</p> <p>f. Fueling and equipment maintenance will be done in a designated area removed from the area of the channel or basin such that no petroleum products or other pollutants from the equipment may enter these areas via rainfall or runoff. The designated area will include a drain pan or drop cloth and absorbent materials to clean up spills.</p> <p>g. Materials for the containment of spills (i.e., absorbent materials, silt fencing, filter fabric, coir rolls) will be identified and be available onsite prior to commencement of construction or maintenance activities.</p> <p>h. Any accidental spill of hydrocarbons or coolant that may occur within the work area will be cleaned immediately. Absorbent materials will be maintained within the work area for this purpose.</p> <p>i. No wet concrete product will come into contact with any flowing or standing water at any time. Areas where raw cement or grout are applied or</p>				

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<p>where concrete curing or finishing operations are conducted will be separated from any ponded or diverted water flows by a cofferdam or silt-free, exclusionary fencing. All equipment involved with the concrete or grouting operations will be located within a contained area while using any slurry or concrete product. A protective berm or other structure will be in place prior to maintenance and/or repair activities.</p> <p><b>WR 6:</b> Any spill of the grout, concrete, concrete curing or wash water adjacent to or within the work area will be removed immediately.</p>				
<b>Biological Resources</b>				
<p><b>Construction</b></p> <p><b>BIO 1:</b> To the maximum extent practicable, vegetation clearing activities would not occur during the breeding season, which generally runs from March 1-August 31.</p> <p><b>BIO 2:</b> If vegetation removal must occur during the avian breeding season, a qualified biologist will perform nesting bird surveys following established protocol prior to construction. If nests are detected during these surveys, a 300-foot no construction buffer will be delineated around the nest (500-foot buffer for raptors).</p> <p><b>BIO 3:</b> Construction will be monitored by a qualified biologist.</p> <p><b>BIO 4:</b> Construction will be phased to minimize impacts to wildlife species, so that the entire study area will not be under construction at the same time.</p> <p><b>BIO 5:</b> Pre-construction surveys for special-status plants and wildlife would be performed as needed in coordination with USFWS.</p> <p><b>BIO 6:</b> Protocol level surveys for least Bell's vireo would be performed during the detailed design phase and prior to construction to avoid impact to this species. If paired and potentially nesting vireo or other listed species are found, the Corps will coordinate with USFWS and consult as applicable, if it is later determined that the project would affect the species.</p> <p><b>BIO 7:</b> Trails and other recreational features will be designed and located to be compatible with restoration features and goals. For instance, trails may be placed around the perimeter, rather than through restored areas.</p>	USACE	Throughout project construction; Moratorium on vegetation clearing from March 1-August 31 will be maintained if feasible	USACE	USACE PM to verify compliance during construction. Considered complete after end of project construction.
<p><b>Operations</b></p> <p><b>BIO 8:</b> Invasives control or maintenance of vegetation to maintain restoration success and comply with constraints would be performed outside of the bird nesting season,</p>	City (maintenance)	In perpetuity. Moratorium on vegetation clearing from March 1-August 31 will be maintained if	City (maintenance)	USACE and City PMs to verify compliance. No completion date has



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<p><b>BIO 9:</b> Sensitive habitat types will be avoided to the maximum extent practicable during maintenance. Designated access points for maintenance vehicles will be created to reduce impacts to restored areas.</p> <p><b>Construction and Operations</b></p> <p><b>BIO 10:</b> Informational signs will be installed to educate the public regarding the restored habitat, sensitive resources, and the impact that human intrusion may have. Exclusionary fencing will also be installed where and if necessary, as part of the Adaptive Management program (see Appendix H).</p>		feasible		been set, as maintenance is assumed to continue for the life of the project.
<b>Cultural Resources</b>				
<p><b>CR 1:</b> An archeologist meeting the Secretary of the Interior's Qualification Standards shall monitor all construction activities in areas where there is a potential for buried resources. The monitor shall immediately notify the USACE's on-site construction supervisor of any discovery. The USACE on-site construction supervisor shall temporarily stop construction in the area of the discovery. The discovery area and a surrounding buffer zone shall then be clearly delineated. Ground disturbing activities can resume outside of the delineated buffer zone. Should previously unknown historic or archaeological remains be discovered, the USACE would comply with 36 CFR 800.13. At the conclusion of monitoring activities, a detailed letter report shall be prepared. This report shall be submitted to the SHPO for review and comment.</p> <p><b>CR 2:</b> When construction crews are working within 50 meters of an eligible or unevaluated cultural resource, the edge of the site, including a 25 meter site buffer will be fenced off, thus ensuring that no construction equipment inadvertently strays into the culturally sensitive area.</p> <p><b>CR 3:</b> Cultural resource block inventories and evaluations shall be conducted early in the next design phase so that avoidance and impact minimization measures for cultural resources can be incorporated in project design.</p> <p><b>CR 4:</b> Recordation and evaluation of the constructed features of the flood risk management system on the river and lower tributaries within the APE will be prioritized in PED. The recordation and evaluation shall be conducted in one effort and in reference to and in the context of the entirety of the flood risk management system constructed on the Los Angeles River and lower tributaries.</p> <p><b>CR 5:</b> Comply with the terms and conditions of the PA executed by and between the Corps and SHPO, and any amendments thereto.</p>	USACE	Prior to and throughout project construction	USACE	USACE PM to verify compliance during construction. Considered complete after end of project construction.

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<b>Traffic and Circulation</b>				
<p><b>Construction</b></p> <p><b>TRAF 1:</b> The location and duration of any lane or street closures, including impacts on public transit, railroads, bicycle lanes, sidewalks, and parking will be fully coordinated with local cities and nearby residents.</p> <p><b>TRAF 2:</b> Detour routes will be provided if needed (including detour routes for public transit, bicycles, and pedestrians when affected).</p> <p><b>TRAF 3:</b> Local traffic and emergency vehicle access will be maintained or accommodated.</p> <p><b>TRAF 4:</b> Traffic protective devices and control measures will be implemented such as barricades, cones, flaggers, lights, warning beacons, temporary turning restrictions, temporary traffic signals, and warning signs.</p> <p><b>TRAF 5:</b> Advance notice will be provided to affected residents, businesses, emergency services providers (police, fire, ambulance), and public transit providers.</p> <p><b>TRAF 6:</b> Temporary bus stops will be located within a reasonable walking distance of any displaced bus stops when public transit stops are affected.</p> <p><b>TRAF 7:</b> Safety improvements would be made to existing at-grade street-rail crossings where traffic increases would be expected.</p> <p><b>TRAF 8:</b> The project will coordinate with railroad companies to ensure continuous operation and appropriate safety measures</p>	USACE	Prior to and throughout project construction	USACE	USACE PM to verify compliance during construction. Considered complete after end of project construction.
<b>Noise</b>				
<p><b>Noise 1:</b> Develop and implement a project noise control plan that identifies when construction activities would occur and where and how avoidance measures shall be used. Construction activities would generally occur between the hours of 8 a.m. and 6 p.m. Monday through Friday, and 8 a.m. and 5 p.m. Saturday. Construction and operations would not occur on Sunday or a national holiday. The plan will require the identification of a Noise Control Coordinator, who will be available to receive and respond to any concerns from residents regarding construction noise. Residents shall be notified prior to the start of construction activities and informed of the Coordinator's contact information. Signage will also be posted on the construction site with Noise Control Coordinator's contact information.</p> <p><b>Noise 2:</b> Use power construction equipment with state-of-the-art noise shielding and muffling devices.</p>	USACE	Throughout project construction.	USACE	USACE PM to verify compliance during construction. Considered complete after end of project construction.

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<p><b>Noise 3:</b> Whenever construction occurs within 500 feet of occupied residences, temporary barriers shall be constructed around the construction sites to shield the ground floor of the noise-sensitive uses. These barriers shall be of ¾-inch medium density plywood sheeting, or equivalent, and shall achieve a Sound Transmission Class of 30 or greater, based on certified sound transmission loss data taken according to American Society for Testing and Materials Test Method E90 or as approved by the City of Los Angeles Building Department.</p> <p><b>Noise 4:</b> Construction equipment staging areas shall be located as far as practicable from residential areas.</p> <p><b>Noise 5:</b> Quieter “sonic” pile drivers shall be used as necessary, unless engineering studies are submitted to the City of Los Angeles showing this is not feasible and cost effective, based on geotechnical considerations.</p> <p><b>Noise 6:</b> Routes for heavy construction site vehicles shall be identified to minimize noise impacts to residences and noise-sensitive receptors.</p> <p><b>Noise 7:</b> Impose construction hours that are more restrictive than those set forth in the LAMC if necessary and when practical.</p> <p><b>Noise 8:</b> Require vehicle parking and deployment activities to be separated and buffered from sensitive uses.</p> <p><b>Noise 9:</b> Limit haul truck or other vehicle speed on roads adjacent to residences and on unpaved roadways.</p> <p><b>Noise 10:</b> Notify residents about type and schedule of construction.</p>				
<b>Recreation</b>				
<p><b>Construction</b></p> <p><b>Rec 1:</b> Public media/meetings to provide clear information on the types and durations of disruptions to the River and adjacent resources.</p> <p><b>Rec 2:</b> Signed detour routes for affected roads as well as pedestrian, bicycle, and equestrian trails, and river access points.</p> <p><b>Rec 3:</b> Signage at construction areas with information relevant to recreation users (length of closure, alternative access points, etc.).</p> <p><b>Rec 4:</b> Work with park representatives on timing of park and golf club closures to minimize effects on recreational access and use.</p> <p><b>Rec 5:</b> Consult with park maintenance personnel prior to implementation of measures to coordinate maintenance during construction and operations.</p>	USACE and City	Throughout project construction	USACE and City	USACE PM to verify compliance during construction. Considered complete after end of project construction.

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<i>Public Health and Safety, Including Hazardous, Toxic, and Radioactive Waste</i>				
<p><b>PHS 1:</b> A rigorous review of the HTRW sites identified as those with potential impacts on the project would be conducted. The review would include obtaining and reviewing regulatory files, site visits, and discussions with regulators and others about the severity of the contamination. Following this review, Phase I or II environmental site assessments would be conducted as necessary. In areas where existing information is limited, environmental investigations shall follow industry approved protocols for conducting Phase I and Phase II investigations as needed. The sponsor shall not provide lands for project construction without first ensuring that it has undertaken adequate investigation and determined there is no contamination of concern for the relevant parcel or, where contamination is identified, has remediated or ensured remediation of the parcel to the standards necessary to support the restoration project, as agreed by the relevant regulatory agency and USACE. Coordination and consultation with the appropriate regulatory agencies, including the USEPA and California lead agency (usually the LARWQCB or the DTSC), and responsible parties, as necessary, would begin as early as possible regarding investigation and remediation at the San Fernando Valley Superfund Site and Taylor Yard G1 and G2 sites, as well as the LATC site as needed. The City would conduct remediation at contaminated sites prior to construction of restoration features at those sites.</p> <p><b>PHS 2:</b> A new ecological risk assessment would be performed for the Taylor Yards G1 and G2 properties. The risk assessment would include risk calculations and analyses for recreational human health standards.</p> <p><b>PHS 3:</b> Prior to the start of construction, the USACE will develop engineering specifications and plans that will include a written environmental protection plan. This plan will include a written pollution prevention plan that outlines the actions needed to respond to spills or release of hazardous materials during construction or maintenance activities. The environmental protection plan will describe hazardous materials management and spill prevention and response methods. The plan will be reviewed with all site workers.</p>	USACE and City	Prior to construction of each phase	USACE and City	USACE and City PMs to verify compliance prior to construction.
<p><b>Construction</b></p> <p><b>PHS 4:</b> City will request increased police presence within the project area, particularly during episodes of increased water levels and flow velocities.</p> <p><b>PHS 5:</b> Fire extinguishers or other firefighting equipment (such as drums of water) will be close at hand during construction, regularly inspected, and maintained in proper</p>	USACE and City	Throughout project construction	USACE and City	USACE and City PMs to verify equipment requirements as of first day of construction.

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<p>working condition.</p> <p><b>PHS 6:</b> Equipment with internal combustion engines will be placed so that exhaust is not near combustible materials.</p> <p><b>PHS 7:</b> Combustible or flammable materials will be properly stored and proper clearance around these materials would be maintained.</p> <p><b>PHS 8:</b> A site-specific health and safety plan will be prepared and reviewed with all workers detailing methods of compliance with occupational health and safety regulations, emergency response actions, and include the route to the nearest emergency medical facility.</p> <p><b>PHS 9:</b> Relevant paperwork such as material safety data sheets and chain-of- custody documents recording the transport and disposal of hazardous materials and waste will be maintained and available for inspection.</p> <p><b>PHS 10:</b> All hazardous materials would be removed from the site when construction or maintenance activities were completed if not before.</p> <p><b>PHS 11:</b> Construction sites will be fenced to prevent unauthorized access.</p> <p><b>Post-Construction</b></p> <p><b>PHS 12:</b> Operations of the project would include public education on hazards associated with the river channel, including risk of water-related injury and drownings.</p> <p><b>PHS 13:</b> City will coordinate as needed with vector control agencies after completion of construction.</p>				<p>USACE and City PMs to verify delivery of environmental protection plan to workers on first day of construction.</p>
<b>Utilities and Public Services</b>				
<p><b>Construction</b></p> <p><b>UPS 1:</b> Develop a utility management plan.</p> <p><b>UPS 2:</b> Obtain a Private Solid Waste Hauler Permit from the City’s Bureau of Sanitation prior to collecting, hauling and transporting waste.</p> <p><b>UPS 3:</b> Recycle/reuse construction debris to the extent possible.</p> <p><b>UPS 4:</b> Dispose of excess debris to City-certified waste processing facility.</p> <p><b>UPS 5:</b> Stagger construction of daylighting outfalls in order to minimize reduction in capacity of the stormwater system.</p>	USACE	Prior to and during project construction	USACE	<p>USACE PM to verify compliance during construction. Considered complete after end of project construction.</p>

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<i>Socioeconomics and Environmental Justice</i>				
<b>SEJ 1:</b> Carry out acquisition and compensation of affected businesses in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended, Pub. L. 91-646, 42 U.S.C. 4601. As a component of the acquisition, businesses would have the opportunity to participate in the relocation assistance program. USACE will actively participate in relocation of these businesses to ensure fair and equitable compensation.	City	Prior to project construction	USACE	USACE PM to verify compliance during construction. Considered complete after end of project construction.