

Arroyo Seco Watershed

Watershed Management Study

Los Angeles County, California

Feasibility Study

Feasibility Phase

Project Management Plan

U.S. Army Corps of Engineers

South Pacific Division

Los Angeles District

May 2005

CONCURRENCE PAGE

As members of the Los Angeles District Project Review Board, we the undersigned, concur with the contents of the Feasibility Phase Project Management Plan, dated May 2005, for the Arroyo Seco Watershed, Los Angeles County CA, Feasibility Study. We understand that the Project Management Plan is a living management document that will be updated throughout the course of the study.

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Arroyo Seco Watershed, Los Angeles County CA

Feasibility Phase Project Management Plan

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Arroyo Seco Watershed, Los Angeles County CA

Feasibility Phase Project Management Plan

CHAPTER I – PURPOSE AND SCOPE

1. Definition of a Project Management Plan (PMP):

a. The Project Management Plan for the feasibility phase, herein after referred to as the PMP, is an attachment to the Feasibility Cost Sharing Agreement (FCSA), which defines the planning approach, activities to be accomplished, schedule, and associated costs that the Federal Government and the local Sponsor will be supporting financially. The PMP was developed between the Corps and Sponsor, and reflects a project/study "buy in" for the activities described. The PMP describes the initial tasks of the feasibility phase, continues through the preparation of the final feasibility report, the project management plan for project implementation and design agreement, and concludes with support during the Washington Level Review of the final feasibility report.

b. The PMP is a basis for change. Planning is an iterative process without a predetermined outcome. Therefore, estimated time and cost can change. It may be necessary to revise the scope following reformulation and evaluations of the alternatives. The scope and assumptions, for this study effort, should be clearly outlined and stated so the Corps and the Sponsor understand the objectives and agree with the level of detail contained in the PMP. If study tasks are added or removed from the plan contained herein, and significantly impact cost or schedule beyond that allowable as stated in the FCSA, this PMP will be revised to reflect the required change. Any impact in time or cost can be assessed and an appropriate decision or recommendation can be made on how to proceed. The PMP provides the basis for change as well as allows the documentation of significant alterations.

c. The PMP is a basis for review and evaluation of the feasibility report. Since the PMP describes the work to be done during the feasibility phase, it will be used as the basis to determine if the resulting documents have been developed in accordance with established procedures and agreements. The PMP reflects the agreed upon scope between the Corps and the Sponsor and outlines the intent of the study to the Corps' District, Division, and Headquarters' management and to the Sponsor's management. It not only contains the scope but also critical assumptions, methodologies, and the level of detail for the studies that are to be conducted during the feasibility study. A review of the draft report will be completed to ensure that the study has been prepared consistent with the contents of this PMP. The objective is to provide early assurance that the study activities, tasks and documentation is preformed consistent with Corps policies and guidelines and will be supported by Corps Headquarters and the Sponsor's management.

d. The PMP is a study management tool. It includes scopes of work that are used for funds allocation by the project manager. It forms the basis for identifying commitments to the non-Federal sponsor and serves as a basis for performance measurement.

2. Summary of Project Management Plan Contents:

This PMP is comprised of the following chapters:

- Chapter 1 – Purpose and Scope. This chapter includes the definition of the PMP and a summary of the PMP requirements.
- Chapter 2 – Section 905(b) Analysis. This chapter includes the approved Section 905(b) Analysis that includes an overview of the reconnaissance study findings, the plan formulation rationale and proposed streamlining initiatives. This chapter also documents any deviations from the approved Section 905(b) Analysis that have occurred during the negotiations of the FCSA.
- Chapter 3 – Work Breakdown Structure. The study tasks are assigned a Work Breakdown Structure (WBS) Number. These numbers each have corresponding titles or tasks descriptions that separate the tasks into project deliverables or products. The WBS numbers and corresponding titles provide the basic outline for the feasibility phase. Each task and subtask will be related to a specific WBS number.
- Chapter 4 – Scopes of Work. This chapter includes a detailed scope and listing of tasks and activities that are to be accomplished during the feasibility phase. The scopes define what needs to be answered to successfully complete this effort.
- Chapter 5 – Responsibility Assignment. This chapter describes who will do what. A Responsibility Assignment Matrix (RAM) summarizes which functional organization is responsible for each parent task.
- Chapter 6 – Feasibility Study Schedule. This chapter contains a summary of the schedule for the major milestones. Detailed schedule information is found in the network analysis system (NAS).
- Chapter 7 – Feasibility Cost Estimate. This chapter contains the baseline cost estimate for the feasibility phase of this study.
- Chapter 8 – Quality Management Plan: This chapter supplements the district’s Quality Management Plan. It highlights any deviations to the district’s plan and lists the members of the study team.
- Chapter 9 – Identification of Procedures and Criteria. This chapter identifies and references regulations and other guidance for the planning process and reporting procedures.
- Chapter 10 – Coordination Mechanisms. This chapter describes the public involvement program and methods to be carried out during this study.

CHAPTER II – Section 905(b) (WRDA) Analysis

ARROYO SECO WATERSHED, LOS ANGELES COUNTY, CA
SECTION 905(b) (WRDA 86) ANALYSIS

Approved: November 2002

ARROYO SECO WATERSHED, LOS ANGELES COUNTY, CA
SECTION 905(b) (WRDA 86) ANALYSIS
September 2002

1. STUDY AUTHORITY

This study is authorized through utilization of the Los Angeles County Drainage Area (LACDA) Review flood control study, Senate Resolution approved 25 June 1969, states, specifically reviewing "...the report of the Chief of Engineers on the Los Angeles and San Gabriel Rivers and Ballona Creek, California, published as House Document Number 838, Seventy-sixth Congress, and other pertinent reports, with a view to determining whether any modifications contained therein are advisable at the present time, in the resources in the Los Angeles County Drainage Area."

2. STUDY PURPOSE

The purpose of the reconnaissance study is to determine if there is a Federal interest in conducting a cost-shared feasibility study that will develop information and analytical tools to define water, and related resource problems and opportunities within the Arroyo Seco Watershed. The reconnaissance phase effort includes an inventory of problems and opportunities for the watershed and an estimate of the costs for preparing a feasibility study.

3. DESCRIPTION OF STUDY AREA, NON-FEDERAL SPONSOR, AND CONGRESSIONAL DISTRICT

A) Description of Study Area

Arroyo Seco Watershed

The Arroyo Seco Watershed is located in northeast Los Angeles, between the San Gabriel Mountains and the Los Angeles River. Lying partially within the watershed are the cities of Los Angeles, South Pasadena, Pasadena and La Cañada Flintridge, as well as the unincorporated area of Altadena. The headwaters of the Arroyo Seco and nearly half of its 35 kilometers (22 miles) drain steep mountainous terrain located within the Angeles National Forest. The Arroyo Seco Watershed is a sub-watershed of the Los Angeles River watershed and is located partially within the coastal zone. The upper watershed is largely undeveloped and primarily managed for recreation, watershed protection, and wildlife conservation by the Angeles National Forest. The San Gabriel Mountains, which are part of the Angeles National Forest, are among the most erodible mountains in the world, releasing large amounts of sediment into the Arroyo every year. The lower half of the watershed is distinctly different from the upper watershed. Devil's Gate Dam is located at the point where the stream emerges from the mountains into the alluvial plain. The stream is mostly channelized downstream of the dam to the confluence with the Los Angeles River. Generally, the lower watershed is highly urbanized, but a series of regional and local parks preserve areas of native habitat and open space.

Water Resources

The Arroyo Seco (Arroyo) stretches 35 kilometers (22 miles) from its headwaters in the Angeles National Forest to its confluence with the Los Angeles River just south of the I-110 Freeway bridge over the Los Angeles River. The channel is natural above Devil's Gate Dam but is channelized below the dam for a distance of eleven miles. The Arroyo Seco currently has 20 main tributaries. Upstream of Devil's Gate Dam the main Arroyo Seco tributaries (listed from upstream to downstream) include Colby Canyon, Little Bear Canyon, Bear Canyon, Long Canyon, Dark Canyon,

Brown Canyon, Pine Canyon, Falls Canyon, Fern Canyon, El Prieto Canyon, and Millard Canyon. Just north of Devil’s Gate gorge, Ivey Springs on the west and Thibbet Springs on the east bubble to the surface. The presence of a continual stream flow in the upper watershed even during the driest years reveals a significant contribution of groundwater (spring) supplies to the Arroyo Seco stream where these subsurface flows intersect with the surface. Mean low and high flow in the Arroyo Seco at its confluence with the Los Angeles River is indicated in Table 1.

The watershed supports the Raymond Basin Aquifer, a 40-square mile groundwater basin that provides half of the local water supply for the City of Pasadena and other local communities and sustains a water flow in the Arroyo through most of the year.

TABLE 1
Mean Monthly High and Low Flow from USGS Gauge at Arroyo Seco and the Confluence with the Los Angeles River

	Mean Monthly Flow (m ³ /s)	Rough Calculation of Mean Monthly Flow (m ³ /s)	Mean Monthly High Flow (m ³ /s)	High-Flow Month	Mean Monthly Low Flow (m ³ /s)	Low-Flow Month	Calculations Based on the Following Gauges
Arroyo Seco near Pasadena		Flow = 0.28 (10.1 cfs)	0.945 (33.4 cfs)	February	0.02 (1.0 cfs)	August	USGS11098000
Arroyo Seco-Los Angeles River Confluence	2.4 (85.9 cfs)	Flow = 2.4 (85.9 cfs)	7.1 (251.8 cfs)	February	0.3 (11.57 cfs)	July	USGS11097500

Biological Resources

Vegetation. The Arroyo Seco watershed spans a diversity of habitat types and conditions ranging from relatively intact, but in some cases threatened ecosystems within Angeles National Forest, to highly degraded and fragmented habitats in urban areas. The vegetation of the upper watershed (Angeles National Forest) is characterized by Bigcone Spruce-Canyon Oak Forest, Southern Sycamore-Alder Riparian Woodlands, and Southern Mixed Chaparral. The alluvial fan deposits upstream of Hahamongna Dam support ecologically significant Alluvial Sage Scrub habitat. Near the confluence with the Los Angeles River, the Arroyo Seco is flanked by Mount Washington and the Montecito Hills, which still support Southern California Black Walnut Woodlands. Relict stands of native grasses occur in patches associated with other native plant associations, such as the walnut woodlands at Debs Park and Elyria Canyon. A California Natural Diversity Database (CNDDDB) search indicates that native grassland and scrub habitats on adjacent hills support special-status species, including Parish’s gooseberry (*Ribes divaricatum* var. *parishii*), Plummer’s mariposa lily (*Calochortus plummerae*), and Davidson’s saltscale (*Atriplex serenana* var. *davidsonii*).

Wildlife. Historically, the Arroyo Seco and greater Los Angeles River supported a highly diverse assemblage of freshwater fishes. However, the rainbow trout (*Oncorhynchus mykiss*) may be the only native fish species that still occurs in the Arroyo Seco. The arroyo has received stocked rainbow trout of different strains and the genetic makeup of the current population is unknown. The southern steelhead (*Oncorhynchus mykiss irideus*) is a federally endangered, anadromous form of the rainbow trout. While anadromous steelhead can no longer return to the Arroyo Seco, it has been observed that individuals from the existing rainbow trout population migrate downstream during typical steelhead outmigration times. It is unknown if any of these individuals ever enter the ocean alive, become steelhead, and/or attempt to return to the Los Angeles River or other coastal streams. The unarmored

threespine stickleback (*Gasterosteus aculeatus williamsoni*) is a state and federally listed endangered species that is thought to have been extirpated from the watershed in the 1940's. The 1985 USFWS Recovery Plan for the unarmored threespine stickleback calls for reestablishing two viable populations of stickleback in the Los Angeles River watershed. While each native fish species exhibits unique habitat preferences, many of these species co-occur in the same aquatic habitat and have similar requirements. Restoration efforts geared towards rainbow trout, southern steelhead, and unarmored threespine stickleback would also likely benefit other species including: pacific lamprey (*Lampetra tridentata*), pacific brook lamprey (*Lampetra pacifica*), Santa Ana sucker (*Catostomus santaanae*), Santa Ana speckled dace (*Rhinichthys osculus*), and arroyo chub (*Gila orcutti*).

A six mile stretch of the Arroyo Seco extending from Hahamongna reservoir to Long Canyon has now been formally designated as critical habitat for the endangered southwestern arroyo toad (*Bufo microscaphus californicus*). Arroyo toad breeding habitat is created and maintained by fluctuating hydrological, geological, and ecological processes operating in riparian ecosystems and adjacent uplands. Such disturbance is primarily responsible for creating the friable, typically sandy soils needed by the species for burrowing, as well as for structuring its riparian and upland vegetative cover.

The southwestern pond turtle (*Clemmys marmorata pallida*) is listed as a California Species of Special Concern that prefers habitat in pools of perennial, slower moving streams. Because of its historical distribution in the Arroyo Seco watershed, habitat restoration opportunities may exist along the upper watershed tributaries (e.g., Fern or Millard Canyons).

The yellow warbler (*Dedroica petechia*) breed within the Arroyo Seco watershed in native deciduous forest with a high, contiguous canopy that is typically located along streams. The species utilizes white alder, willow, and sycamore for breeding. The yellow warbler is a fairly common summer resident in the Arroyo Seco above the Jet Propulsion Laboratory (JPL) (e.g., Switzer's Camp), but downstream may only occur in the willow forest at Hahamongna. A number of other wildlife species utilize riparian woodland habitat in the Arroyo Seco watershed including arboreal salamander (*Aneides lugubris*) and oak titmouse (*Baeolophus inornatus*). California quail (*Callipepla californica*) also utilize these riparian woodland areas, but can occur in shrub and grassland habitats provided there is an abundance of thick cover near permanent water.

A CNDDDB search indicates that native alluvial fan scrub, coastal sage scrub, and non-grassy chaparral in the Arroyo Seco may support the coast horned lizard (*Phrynosoma coronatum blainvillei*). The species was once abundant in the area, inhabiting fine soils with high sand fraction for burrowing. The species feeds on native ant species that in some cases have been displaced by red imported fire ants (*Solenopsis invicta*), which the lizard does not appear to eat. Native ant displacement and habitat destruction are among the greatest threats to the horned lizard. A number of other wildlife species may utilize alluvial fan scrub, coastal sage scrub, and chaparral habitat in the Arroyo Seco watershed including: lesser nighthawk (*Chordeiles acutipennis*), Plummer's mariposa lily (*Calochortis plummerae*), Behr's metalark (*Apodemia mormo virgulti*), square-spotted blue butterflies (*Euphilotes battoides*), cactus wren (*Campylorhynchus brunneicapillus*), greater roadrunner (*Geococcyx californianus*), and California gnatcatcher (*Polioptila californica*).

Recreation

There are significant park and natural areas in the upper watershed within Angeles National Forest. Elysian Park at the southern tip, across from the confluence with the Los Angeles River also provides open space and park in the lower Arroyo. The Arroyo Seco Watershed contains parks operated by the Cities of Los Angeles, South Pasadena, and Pasadena, the Santa Monica Mountains Conservancy, and the U.S. Forest Service. The Angeles National Forest provides the most significant open space and recreational opportunities in the watershed as well as the Los Angeles Region. The Angeles National

Forest comprises over 80 percent of the open space in the Los Angeles Region. The Arroyo contains a number of hiking, biking, and equestrian trails that converge in the arroyo and lead to the Angeles National Forest. In addition to the existing trail systems, there are also plans to create a regional bikeway to link the San Fernando Valley and the Arroyo Seco to the Pacific Ocean via new bikeways along the Los Angeles River. In the channelized lower Arroyo Seco, the channel is bordered by parks, golf courses, parking lots, residential areas, the Rose Bowl, limited industrial areas, and the Arroyo Seco Parkway, also known as the Pasadena Freeway.

Land Use

Land use in the upper watershed is primarily composed of the Angeles National Forest, which is owned by the U.S. Forrest Service. Devil's Gate Dam and the National Aeronautics and Space Administration's (NASA) JPL are located at the point where the arroyo emerges from Angeles National Forest. Below the Devil's Gate Dam, the majority of the land is covered with residential development, which range from low density single family homes to high density multi-family housing tracts. There are commercial districts within the watershed in Pasadena, South Pasadena, and Highland Park. The watershed near its confluence with the Los Angeles River is bordered by the Lincoln Heights and Cypress Park (City of Los Angeles) communities. This area is highly industrial and commercial in nature. The communities along the Arroyo include some of the oldest neighborhoods in northeast Los Angeles.

B) Non-Federal Sponsor

The non-Federal sponsor for the feasibility phase of the study is the Los Angeles County Department of Public Works (LACDPW).

LACDPW is an agency authorized by the State of California, whose responsibilities include the design, construction, operation, maintenance, and repair of roads, bridges, airports, sewers, water supply, flood control, and water conservation facilities; and for the design and construction of capital projects. Additional responsibilities include regulatory and ministerial programs for the County of Los Angeles, Los Angeles County Flood Control District, other special districts, and contract cities that request services. The LACDPW is responsible for all of the unincorporated areas of Los Angeles County. The County of Los Angeles covers an area of 10,574 square kilometers (4,083 square miles) and measures approximately 106 km (66 miles) in the east - west and 117 km (73 miles) in the north - south directions.

The LACDPW owns and operates Devil's Gate Dam and maintains a flood control easement to 328 m (1,075 feet) above mean sea level (msl). The LACDPW Flood Maintenance Division is responsible for maintaining everything within the 328 m (1,075 foot) easement related to flood control and debris removal, and the City of Pasadena is responsible for maintaining recreation-related features within and outside that easement.

C) CONGRESSIONAL DISTRICT

There are three U.S. Congressional Districts within the watershed:

- 27th Congressional District of the State of California, represented by Congressman Adam B. Schiff
- 28th Congressional District of the State of California, represented by Congressman David Dreier
- 30th Congressional District of the State of California, represented by Congressman Xavier Becerra

4. PRIOR STUDIES, REPORTS, EXISTING WATER PROJECTS, AND ACTIVITIES OF OTHER AGENCIES

A) Prior Studies and Reports

There are a number of relevant documents that contain information regarding the Los Angeles River Watershed and its subwatershed the Arroyo Seco; these documents are listed below. However, a number of these documents have special relevance for the Arroyo Seco Watershed and are described in Table 1.

List of Prior Studies and Reports

Arroyo Seco Foundation/Northeast Trees. *Arroyo Seco Watershed Restoration Feasibility Study Project Report*. May 2002.

California Coastal Conservancy. *Wetlands of the Los Angeles River Watershed: Profiles and Restoration Opportunities*. May 2000.

California Department of Fish and Game. *The California Natural Diversity Database*. Last updated Spring 2001.

California Department of Transportation. *Arroyo Seco Corridor Management Plan*. 2002.

California Regional Water Quality Control Board, Los Angeles Region. *Basin Plan for the Coastal Watershed of Los Angeles and Ventura Counties*. November 1994.

———. *Total Trash Maximum Daily Loads for the Los Angeles River Watershed Draft Report*. November 2000.

California State Coastal Conservancy and Santa Monica Mountains Conservancy/Mountains Recreation and Conservation Authority. *Arroyo Seco Watershed Feasibility Study, Summary Report Phase I*. March 2001.

City of Pasadena. *Arroyo Seco Master Plan and Environmental Impact Report*. August 2002.

Cook, Jody. Keynote Address: *The Angeles National Forest: Past, Present, and Future, Los Angeles and San Gabriel Rivers Watershed Council Conference From Drain to Dream IV Habitat: Past, Present, and Future*. May 2001. Personal notes from conference.

Department of Landscape Architecture, California State Polytechnic University, Pomona. *Connecting the San Gabriel Valley: A Planning Approach for the Creation of Interconnected Urban Wildlife Corridor Networks*. June 2000.

Deverell, William and Greg Hise. *Eden by Design: the 1930 Olmsted-Bartholomew Plan for the Los Angeles Region*. 2000.

Friends of the Los Angeles River. *Proposed Flood Control Strategy for the Los Angeles and San Gabriel River Systems*. January 1995.

Garrett, Kimball. California Department of Fish and Game. *The Biota of the Los Angeles River: An Overview of the Historical and Present Plant and Animal Life of the Los Angeles River Drainage*. March 1993.

Los Angeles and San Gabriel Rivers Watershed Council. *Current Water Quality Improvement, Land Acquisition and Restoration Projects in Los Angeles County*. August 1999.

Los Angeles County Department of Public Works. *Final Master Environmental Impact Report: Los Angeles County Drainage Area Project*. Prepared by Woodward-Clyde Consultants. 1995.

_____. *Los Angeles River Master Plan*. June 1996.

_____. *Los Angeles River Master Plan Update*. July 1996.

_____. *1999-2000 Hydrologic Report*. June 2001.

_____. *Watershed Hydrology Study*. March 2001.

Los Angeles County Departments of Public Works, Parks and Recreation, Regional Planning. *National Parks Service Rivers, Trails and Conservation Assistance Program*. Los Angeles River Advisory Committee. Los Angeles River Master Plan. Los Angeles. 1996.

Mountains and Rivers Conservation Authority. *Arroyo Seco/Los Angeles River Confluence Park Plan*. 2001.

San Gabriel Mountains Regional Conservancy. *Application Part A: San Gabriel Mountains Regional Conservancy, A Watershed Management Plan for the San Gabriel River Above Whittier Narrows*. Submitted to State Water Resources Control Board. November 2000.

Simons, Li & Associates. *Los Angeles River Alternative Flood Control Study. Volume I: Baseline Conditions Report*. Los Angeles: Los Angeles County Department of Public Works. 1997.

_____. *Los Angeles River Alternative Flood Control Study. Volume II: Evaluation of Alternatives*. Los Angeles: Los Angeles County Department of Public Works. 1997.

_____. *Los Angeles River Alternative Flood Control Study. Volume III: Final Report Appendices*. Los Angeles: Los Angeles County Department of Public Works. 1997.

Southern California Associations of Government. *Draft Regional Transportation Plan, 2001*.

TABLE 1
Related Studies

Study	Agency	Description
Los Angeles and San Gabriel River Watersheds Feasibility Study, Phase I	Los Angeles County Department of Public Works/ U.S. Army Corps of Engineers	Major mapping study and survey of the Los Angeles and San Gabriel River Watersheds including the Arroyo Seco.
Arroyo Seco Corridor Management Plan	California Department of Transportation	Comprehensive master plan to restore the historic character of the Arroyo Seco Parkway.
Arroyo Seco/Los Angeles River Confluence Park Plan	Mountains and Rivers Conservation Authority	Park Plan for the confluence region just north of downtown Los Angeles.
Watershed Hydrology Study	Los Angeles County Department of Public Works	Watershed hydrology model of the Arroyo Seco watershed.
Arroyo Seco Master Plan and Environmental Impact Report	City of Pasadena	Master Plan for the Arroyo Seco including environmental documentation.
Angeles Forest Master Plan	U.S. Forest Service	The Forest Service master plan for the Arroyo Seco.
Arroyo Seco Watershed Restoration Feasibility Study	Northeast Trees/Arroyo Seco Foundation	A Study developing an environmentally sensitive and sustainable plan to manage and restore the Arroyo Seco watershed.
Wetlands of the Los Angeles River Watershed: Profiles and Restoration Opportunities	California Coastal Conservancy	A report that identified and described significant wetland restoration opportunities in the Los Angeles River watershed.
Los Angeles and San Gabriel River Watersheds Feasibility Study	U.S. Army Corps of Engineers, Los Angeles District	Feasibility study and data collection in support of developing a Watershed Management Plan for Los Angeles and San Gabriel River watersheds including preliminary identification and analysis of potential project sites.
Arroyo Southwestern Toad Critical Habitat Designation	U.S. Fish & Wildlife Service	A six mile stretch of the Arroyo Seco extending from Devil's Gate reservoir for seven miles to Long Canyon has now been formally designated as critical habitat for the endangered southwestern arroyo toad.

Upper Los Angeles River Area Watermaster. *Watermaster Service in the Upper Los Angeles River Area*, Los Angeles County: 1992-93 Water Year. Los Angeles. 1994.

———. *Watermaster Service in the Upper Los Angeles River Area, Los Angeles County: Relevant Data, 1968-69 Through 1992-93*. Los Angeles. 1995.

———. *Watermaster Service in the Upper Los Angeles River Area, Los Angeles County, 1998-99 Water Year*. May 2000.

U.S. Environmental Protection Agency. *Review of California's 1998 303(d) List*. 1998.

U.S. Fish & Wildlife Service. *Arroyo Southwestern Toad Critical Habitat Designation*. February 2001.

U.S. Forest Service. *Angeles Forest Master Plan*. 2002.

B) U.S. Army Corps of Engineers Studies and Projects

The U.S. Army Corps of Engineers, Los Angeles District has been involved in a number of recent planning and engineering studies for the Los Angeles River watershed. As a sub-watershed, hydrology and hydraulics information and environmental data for the Arroyo Seco are available in a number of documents including the Los Angeles County Drainage Area design reports and the Los Angeles and San Gabriel Rivers Watershed Feasibility Study.

List of Prior Studies and Reports

Los Angeles District, Corps of Engineers. *Operation and Maintenance Manual for the Los Angeles County Drainage Area Project, California*. December 1975.

———. *Los Angeles County Drainage Area System Recreation Study*. March 1980.

———. *Los Angeles County Drainage Area Review: Final Feasibility Study Interim Report and Environmental Impact Statement*. December 1991.

———. *Los Angeles and San Gabriel River Watershed Feasibility Study, Plan of Study*. December 1998.

———. *Los Angeles and San Gabriel Rivers Watershed Feasibility Study, First Phase Report*. July 2000.

———. *Los Angeles and San Gabriel Rivers Watershed Feasibility Study, Preliminary Draft Feasibility Report*. July 2001.

5. PLAN FORMULATION

During a study, six planning steps that are set forth in the Water Resource Council's Principles and Guidelines are repeated to focus the planning effort and eventually to select and recommend a plan for authorization. The six planning steps are:

1. Specify the problems and opportunities
2. Inventory and forecast conditions
3. Formulate alternative plans
4. Evaluate effects of alternative plans
5. Compare alternative plans
6. Select recommended plan

The iterations of the planning steps typically differ in the emphasis that is placed on each of the steps. In the early iterations, those conducted during the reconnaissance phase, the specifying problems and opportunities step is emphasized. That is not to say, however, that the other steps are ignored since the initial screening of preliminary plans that results from the other steps is very important to the scoping of the follow-on feasibility phase studies. The sub-paragraphs that follow present the results of the initial iterations of the planning steps that were conducted during the reconnaissance phase.

This information will be refined in the future iterations of the planning steps that will be accomplished during the feasibility phase.

A) National Objectives

- 1) The national or Federal objective of water and related land resources planning is to contribute to national economic development consistent with protecting the nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. Contributions to National Economic Development (NED) are increases in the net value of the national output of goods and services, expressed in monetary units. Contributions to NED are the direct net benefits that accrue in the planning area and the rest of the nation.
- 2) The U.S. Army Corps of Engineers has added a second national objective for Ecosystem Restoration in the response to legislation and administration policy. This objective is to contribute to the nation's ecosystems through ecosystem restoration, with contributions measured by changes in the amounts and values of habitat.

B) Public Concerns

A number of public concerns were identified during the course of the reconnaissance study for the Los Angeles and San Gabriel Rivers Watershed (Table 2). While initial concerns were expressed in the Plan of Study for the Los Angeles and San Gabriel Rivers Watershed Feasibility Study, additional input was received through coordination with local agencies. There were a number of Agencies contacted to solicit comments and concerns regarding the Arroyo Seco Watershed including:

- Angeles National Forest
- Arroyo Seco Foundation (ASF)
- City of La Cañada Flintridge
- City of Los Angeles
- City of Pasadena
- City of South Pasadena
- Los Angeles County Department of Public Works
- Northeast Trees (NET)

The public concerns that are related to the establishment of planning objectives and planning constraints are:

- Restore the natural hydrological functioning of the watershed.
- Restore the Arroyo Seco stream and tributaries through widening and lengthening of streams.
- Create floodplain system allowing for periodic overflow while providing the required level of public safety and flood hazard mitigation.
- Reduce volume and velocity of stormwater runoff.
- Better manage, optimize, & conserve water resources while improving water quality.
- Improve quality of surface water for aquatic habitat and human contact.
- Restore the quality and quantity of water recharge to the Raymond Aquifer.
- Develop groundwater management strategy for optimum use of local water resources.
- Reduce dependence on imported water.
- Reinstate sediment transport.
- Restore, protect, and augment habitat quality, quantity, and connectivity.
- Restore and protect missing linkages of fragmented habitat.

- Integrate fire management into native vegetation zones.
- Restore, protect, and augment terrestrial species habitat in existing open space of foothills and floodplains.
- Enhance and strengthen the urban interface zone.
- Restore aquatic species habitat.
- Improve recreational opportunities and enhance open space.
- Improve connectivity and public access from the Angeles National Forest to the coastal shore.
- Protect and interpret natural, community, cultural, and historic resources.
- Integrate natural resources management with recreational needs.
- Protect existing open space while augmenting open space network.
- Improve visual quality of the landscape.
- Mediate conflicts between recreation and conservation and opposing recreational users.

TABLE 2

Problems within the Los Angeles and San Gabriel Rivers Watershed

Continued Flooding Impacts	Adverse Conditions for Aquatic Species
Increasing Peak Discharges	Adverse Conditions for Riparian Species
Inadequate Recreational Facilities	Increasing Invasive Species
Adverse Conditions for Water Supplies	Piecemeal Treatment of Problems
Surface Water Quality Problems	Declining Local Aesthetic Quality
Loss of Floodplain Habitat	Increasing Litigation Potential Related to Resources
Loss of Riparian Habitat	Conflicting Regulatory Actions

C) Problems and Opportunities

The evaluation of public concerns often reflects a range of needs, which are perceived by the public. This section describes these needs in the context of the problems and opportunities that can be addressed through water and related land resource management.

Water Resources

Development and changes in land use have drastically altered the natural cover of the watershed by shifting from a permeable landscape to a largely impermeable one. This has resulted in increased runoff in the watershed, which is causing channel degradation and reductions in natural groundwater recharge. The Arroyo Seco watershed, located in Los Angeles County, covers an area of approximately 121 square kilometers (47 square miles) from the San Gabriel Mountains south to the Los Angeles River. The headwaters and nearly half of the watershed are located in the Angeles National Forest. This multiple-use open space area is relatively free from development but the area does have some roadways, camping facilities, and crib structures/check dams. Below the Angeles National Forest, the Arroyo Seco becomes a channelized urban stream, bordered by parks, golf courses, parking lots, residential areas, the Rose Bowl, limited industrial areas, and the Pasadena Freeway.

Surface water quality in the watershed is degraded due to the effects of development and land use. The upper watershed in the Angeles National Forest is generally free of human generated pollutants, but with steep slopes and natural cycles of fire, drought, and flooding, the upper watershed can

generate significant suspended solids. Below Angeles National Forest, water quality of the Arroyo Seco is impacted by horse corrals and golf courses that contribute nutrients from manure and fertilizers. In addition, development and installation of impervious materials has resulted in increased runoff from roads, commercial areas, industry, and residential neighborhoods that contains trash and a mixture of contaminants (e.g., pesticides, fertilizers, pathogens from small animal manure, and petrochemicals). Also, development within the watershed has increased runoff to receiving channels, creating high velocity, short duration peak discharges that erode banks and channel inverts. Development in the lower watershed has increased the inflow of nutrients and toxic substances from non-point source urban runoff and reduced sediment delivery and replenishment downstream. The seasonal, perennial, and intermittent riparian habitat within many watercourses has been disturbed or destroyed by channel modification projects. Also, crib structures/check dams in the upper watershed have reduced sediment delivery from the steep, highly erosive upstream reaches.

Natural groundwater recharge in the watershed has dramatically reduced due to development and installation of impervious materials. The Raymond Basin, a 104 square kilometer (40 square mile) groundwater basin aquifer, underlies the cities of La Cañada Flintridge, Pasadena, Altadena, Sierra Madre, Arcadia, and San Marino. Currently, there are at least 15 users of pumped groundwater from the Raymond Basin, including several in the City of Pasadena, and other cities throughout the San Gabriel Valley. The aquifer supplies 40 percent of local water supplies, with the remainder coming from imported water sources provided by the Metropolitan Water District of Southern California. Currently, the aquifer is partially fed by water being diverted from the Arroyo Seco to spreading basins for percolation. Pumping rights in the Raymond Basin were determined by a court order and are managed by the Raymond Basin Management Board. There are also problems with groundwater contamination in the watershed. Sources of contamination include the National Aeronautics and Space Administrations JPL Superfund Site and septic systems. The Jet Propulsion Laboratory Superfund Site is a concern due to early testing of rockets, missiles and aircraft that contaminated the groundwater at the site with volatile organic compounds (VOCs). The use of septic systems in the La Cañada Flintridge area is also a potential source for degradation of groundwater quality because leakage from old or impaired systems could potentially contaminate the groundwater.

Opportunity: Reduce channel degradation resulting from increased runoff by developing watershed management strategies. These strategies could include a management plan to monitor, control, improve water quality, and prevent habitat degradation. One important component of this is to investigate the changes in the sediment transport regime and identify impacts to the ecosystem that result. As part of this work a comprehensive hydrologic model, which incorporates all tributaries of the Arroyo Seco, could be developed including an update of existing hydrologic information. The model could include runoff from all forms of precipitation and any native water found in the watershed. In addition, Best Management Practices could be developed to assist in reducing peak discharges.

Opportunity: Identify measures to protect, preserve, and restore areas of riparian and wildlife habitat including stream restoration, “daylighting” of underground drainages, and water diversion for habitat creation and water quality improvement.

Opportunity: Develop a groundwater monitoring and control plan throughout the watershed to assist in management of water resources. One focus of this plan could be to develop and identify additional groundwater recharge potential for the Raymond Basin aquifer. Evaluate existing groundwater data and groundwater monitoring programs to determine informational needs in the management of groundwater. Also, groundwater maps should be generated utilizing the existing groundwater system model. As part of this effort, groundwater contaminant sources, including non-point

source pollution, should be identified and evaluated throughout the watershed. In addition, the necessary treatment required for surface waters should be identified prior to recharge into the groundwater basin to prevent degradation of the aquifer.

Opportunity: Identify and evaluate opportunities to provide treatment alternatives, including treatment wetlands, to improve the water quality of stormwater runoff and reduce non-point source pollution throughout the watershed. As part of this effort, monitoring and control plans for pollution minimization should be developed. These alternatives should include evaluation of treatment wetlands to provide ancillary benefits of groundwater recharge, habitat creation, recreation, and public education.

Opportunity: Investigate the potential multi-purpose operation of existing flood control facilities to maximize storage and groundwater recharge operations as well as environmental restoration in the Arroyo Seco. The Arroyo Seco Master Plan includes a seasonal flood management water conservation pool behind Devil's Gate Dam to allow year-round storage and groundwater recharge operations. This investigation should consider the potential of increasing groundwater recharge by constructing additional spreading basins. In addition, the investigation should consider the potential collection, storage, reuse, and improvement of the water quality of runoff to maximize recharge or percolation. The investigation should also focus on how to maximize supply of water to habitat.

Environmental Restoration

Alteration of the natural stream hydrology, removal of riparian vegetation, and invasion of exotic plant species has significantly impacted wildlife and plant diversity. Development and installation of impervious materials in the lower sections of the watershed has resulted in habitat and environmental degradation. The Arroyo Seco is mostly channelized from Devil's Gate Dam to the confluence with the Los Angeles River, a distance of eleven miles. Prior to channelization, stands of alder, willow, and sycamore lined much of the stream. The upper reaches of the Arroyo Seco watershed support a relatively high degree of native biological diversity in the Angeles National Forest. However, development downstream has degraded and fragmented habitats, resulting in extirpations of historically present wildlife species. The Arroyo Seco is a potential corridor for wildlife passage, which could connect the San Gabriel Mountains to the Elysian Hills in the southwest.

Habitat and stream degradation has occurred in the Arroyo Seco due to alternation of sediment transport in the watershed. The San Gabriel Mountains are among the most erodible mountains in the world, releasing large amounts of sediment into the Arroyo Seco. Prior to development by humans and alteration of the natural system, sediments were transported from the mountains to the sea while being deposited along floodplains. These sediments are now caught up behind crib dams throughout the Angeles National Forest and Devil's Gate Dam.

Opportunity: Develop a plan to link existing habitat fragments along the Arroyo Seco and tributaries to preserve the integrity of natural communities/ecosystems and provide a wildlife corridor. As part of this effort, opportunities to improve habitat for multiple species including steelhead trout and the federally endangered, southwestern arroyo toad could be identified. This evaluation would include implementation of Best Management Practices throughout the watershed. Another potential component of the plan would be to investigate the potential for creating wetlands using non-point source runoff and other sources to improve water quality and wildlife habitat. An example of creating wetlands for wildlife habitat and public recreation is the Browning Ferris Industries (BFI) Low Flow Diversion Project, which currently diverts Arroyo Seco flows to create wetland habitat adjacent to the concrete channel.

Opportunity: Identify methods to preserve and manage Flint Canyon, which could provide a connection between Verdugo Hills and the San Gabriel Mountains. The plan could also evaluate opportunities to restore the natural stream channel, without impacting flood protection along the Arroyo Seco.

Opportunity: Develop a basin-wide sediment management plan to protect and improve the health of the watershed and its ecosystems. As part of this management plan, an evaluation of the functionality of crib structures and operation of Devil's Gate Dam including the hydrologic flows, geomorphology, sedimentation, and potential areas of stream and floodplain restoration should be undertaken. In addition, the plan should investigate what measures can be developed for sediment erosion control that will provide opportunities for restoration of impacted native plant and wildlife species. Also, the plan should include an investigation of the potential for expanding existing floodways to allow creation of wildlife habitat along both the natural and improved channels.

Flood Control

The hydrologic, hydraulic, and sediment transport regime within the Arroyo Seco watershed has been drastically altered as a result of development, Devil's Gate Dam and other flood/sediment control structures, and improvements to the main channel and tributaries. In addition, flood control capacity in the Arroyo Seco has been reduced due to land use changes and infrastructure aging.

Channelization has increased the quantity and efficiency of runoff and sediment transport to the Los Angeles River, while dams/crib structures and development have decreased sediment supply.

Providing for flood control is essential in this urbanized watershed. One important component of flood control is the use of dams to lessen peak flows. A recent LACDPW study indicated that even after the rehabilitation of Devil's Gate Dam in 1998, portions of the downstream concrete channel may be under capacity due to increased runoff into the channel. In addition, the channel is aging and has serious maintenance issues.

Opportunity: Identify where flood control problems exist and where flood control mechanisms need to be put in place. As part of this effort, a comprehensive, hydrologic, hydraulic, and sediment transport analysis for the Arroyo Seco watershed could be developed. In addition, the watershed analysis must take into account existing and future development, as well as existing and future operation of flood control facilities, including channel improvements and restoration.

Recreation

There is inadequate open space and recreational opportunities in the Los Angeles area as well as fragmented open spaces within the Arroyo Seco watershed. Adequate open spaces exist within the Arroyo Seco watershed including, the Angeles National Forest, several City parks, Descanso Gardens, and undeveloped hillsides; however, these areas are unconnected and are in fragmented locations.

Opportunity: Investigate the potential for developing a comprehensive recreation plan and trail system for the watershed. This plan should also develop habitat opportunities that provide links with existing recreational and open spaces. This plan should expand upon and improve trail systems. The plan should identify recreation opportunities at existing or new basins and reservoirs, and other public lands. In addition, the plan should incorporate passive recreation uses such as wildlife viewing and hiking trails into environmental restoration projects.

Future Conditions

The future or without project condition of the Arroyo Seco Watershed is a serious concern to the public and the LACPW. The limited and fragmented open space and habitat along the Arroyo Seco corridor, especially in the lower watershed, will result in the continual decline of the environmental and aesthetic quality in the Los Angeles Region. In addition, natural groundwater recharge in the watershed is an important component to water conservation in the Raymond Basin. It is the goal of the watershed study to develop the necessary baseline data and analytical tools, and a realistic set of objectives, that will encourage management decisions that help reverse negative trends or enhance positive trends to maintain or improve the health of the watershed. Without environmental restoration in the Arroyo Seco Watershed the problems identified by the public and local sponsor will continue unabated, these problems include:

1. Water supply and water quality, both for surface and groundwater
2. Loss of water conservation in the Raymond Basin
3. Fragmented and degraded habitat along the Arroyo Seco corridor
4. Localized flooding
5. Erosion and sedimentation issues
6. Limited and fragmented open space and recreational opportunities in the lower portions of the watershed

The establishment of an environmental restoration and groundwater recharge in the Arroyo Seco Watershed will address the problems listed above.

D) Planning Objectives

The national objectives of National Economic Development and National Ecosystem Restoration (NER) are general statements and not specific enough for direct use in plan formulation. The water and related land resource problems and opportunities identified in this study are stated as specific planning objectives to provide focus for the formulation of alternatives. These planning objectives reflect the problems and opportunities and represent desired positive changes from the without project conditions. The planning objectives are specified as follows:

- To reduce urban flood damages and property loss
- To prevent further degradation and improve water quality (both surface and groundwater)
- To increase opportunities for water conservation
- To reduce further degradation of area ecosystem
- To develop opportunities for ecosystem restoration
- To improve recreation opportunities
- To improve riparian and wetlands habitat
- To improve the riverfront aesthetic quality of the Arroyo Seco

E) Planning Constraints

Unlike planning objectives that represent desired positive changes, planning constraints represent restrictions, which may include local general plan, local agency jurisdiction, community philosophy and applicable Executive Orders and other Government Regulations that may apply. The major restriction facing the Arroyo Seco Watershed is to maintain the level of flood protection provided by the existing flood control structures while incorporating opportunities for watershed enhancement such as, environmental restoration, water quality improvement or groundwater recharge.

F) Measures to Address Identified Planning Objectives

A management measure is a feature or activity at a site, which addresses one or more of the planning objectives. A wide variety of measures were considered, some of which were found to be infeasible due to technical, economic, or environmental constraints. Each measure was assessed and a determination made regarding whether it should be retained in the formulation of alternative plans. The descriptions and results of the evaluations of the measures considered in this study are presented below:

1) No Action

The U.S. Army Corps of Engineers is required to consider the option of “No Action” as one of the alternatives in order to comply with the requirements of the National Environmental Policy Act (NEPA). No Action assumes that no project would be implemented by the Federal Government or by local interests to achieve the planning objectives. No Action, which is synonymous with the Without Project Condition, forms the basis from which all other alternatives plans are measured.

Issues: The open space and recreation opportunities in the Arroyo Seco are limited and fragmented. In addition, there is a lack of riparian and wetland habitat along the lower Arroyo Seco corridor. Also, due to coverage of a large portion of the lower watershed with impervious material there is reduced natural groundwater recharge into the Raymond Basin. This development has degraded the channel corridor and habitat in the region. Therefore, if No Action is taken on this feasibility study a unique opportunity to provide environmental restoration, as well as, groundwater recharge will be lost.

2) Study Objective

Based on review of existing information and coordination with local interests, the desired approach to proceed with a feasibility phase study is to conduct a watershed management study to identify the problems and opportunities relative to water resources, environmental restoration, flood control, water quality and water conservation within the Arroyo Seco Watershed. The study’s objective would be to evaluate the existing conditions within the watershed, identify problems and opportunities, determine the needs and goals for watershed enhancement; and to identify candidate sites for further study. Items to consider in the study should include evaluation of watershed enhancement through the creation of wetlands to provide water treatment for stormwater runoff, integration of the trails and bikeways to provide continuity along the Arroyo Seco Watershed, and the overall development of the watershed to maximize environmental restoration while protecting the various functions and use of property.

If there are measures or plans found to be implementable within U.S. Army Corps of Engineers missions, a spin-off feasibility study for developing a site-specific project will be pursued subject to a non-Federal sponsor indicating their interest to support and provide necessary cost-sharing and other requirements for the study and project.

G) Preliminary Plans

Preliminary plans are comprised of one or more management measures that survived the initial screening. The descriptions and results of the evaluations of the preliminary plans that were considered in this study are presented below:

1) Preliminary Plans Eliminated from Further Consideration

No plans were eliminated from further consideration.

2) Preliminary Plans for further Consideration

Preliminary screening indicates that conducting a watershed management study to identify the problems and opportunities relative to water resources, environmental restoration, flood control, water quality and water conservation within the Arroyo Seco Watershed is the appropriate plan. The study's objective would be to evaluate the existing conditions within the watershed, identify problems and opportunities, determine the needs and goals for watershed enhancement; and to identify candidate sites for further study. As part of the watershed study, plans for environmental restoration through either development of riparian habitat or treatment wetlands to polish stormwater runoff will be evaluated as they likely have the greatest Federal interest in further study and potential implementation. In addition to environmental restoration; flood control, water conservation through groundwater recharge, and passive recreation opportunities could also be incorporated into a watershed plan that is implementable and has a Federal interest. The alternatives may be combined in different scenarios to develop and define the most optimal watershed plan. These items will be developed further and evaluated as part of the feasibility phase.

H) Conclusions from the Preliminary Screening

The preliminary screening indicated what alternatives listed above have the greatest potential for implementation. At this level of the investigation, these have the best potential for net environmental benefits though environmental restoration. Additional benefits would include local flood control and associated damage reduction, improvement of water quality through wetland treatment, groundwater recharge, and recreational opportunities.

While there are a number of identified problems in the Arroyo Seco Watershed, implementing solutions in the near future to address these problems will prevent further damage to the ecosystem and start a reversal of degradation.

All alternatives including the No Action alternative will be addressed during the feasibility phase of the study. The U.S. Army Corps of Engineers study team will prepare the PMP feasibility-level cost estimates based on the analysis of the No Action plan and alternative plans. The actual number of alternatives may vary, based on the plan formulation study plan formulation processes.

I) Establishment of a Plan Formulation Rationale

The conclusions from the preliminary screening form the basis for the next iteration of the planning steps that will be conducted in the feasibility phase. The likely array of alternatives that will be considered in the next iteration includes alternatives that do not significantly impact existing environmental habitat, but would improve the areas protection and provide restoration. Future screening and reformulation will be based on the following factors: water supply source, impacts to groundwater recharge, environmental restoration opportunities, safety issues, and optimum trade-off analysis.

6. FEDERAL INTEREST

In accordance with current administration policy, there is a federal interest in watershed based studies that provide a holistic approach to evaluating water resource problems and opportunities leading to the

development of a watershed management plan that effectively balances the need for sustainable economic development with the need for protection of watershed natural resources. Since environmental restoration is a likely output of the watershed study with a high budget priority and environmental restoration, water quality, flood control, and other related issues are integral to any comprehensive watershed plans that would be evaluated in the feasibility phase, there is a strong Federal interest in developing a feasibility study for the Arroyo Seco Watershed. There is also incidental Federal interest in other benefits resulting from the study such as recreation and water conservation/supply that could be developed within existing policy. Based on the preliminary screening of alternatives, there appears to be potential watershed plan alternatives that would be consistent with the U.S. Army Corps of Engineers policies, benefits, and environmental impacts.

7. PRELIMINARY FINANCIAL ANALYSIS

A local sponsor would be required to cost-share (50/50) the feasibility phase of the watershed planning effort. Up to 100 percent of this local share can be in the form of in-kind services. Knowing this requirement, Los Angeles County Department of Public Works has agreed to be the local sponsor for the feasibility study.

8. ASSUMPTIONS, EXCEPTIONS, AND QUALITY OBJECTIVES

A) Feasibility Phase Assumptions

The following critical assumptions will provide a basis for the feasibility study.

1) Without Project Conditions Assumptions

The without project condition assumptions are provided below:

- The limited, fragmented, and degraded habitat in the Arroyo Seco Watershed will continue to lower the aesthetic quality of the watershed.
- Natural groundwater recharge will continue to decline and water levels/elevations in the Raymond Basin will drop.
- Localized flooding will continue to occur and may be increased due to increased runoff as a result of development.
- Inadequate open space and recreational opportunities along the Arroyo Seco corridor will continue to exist. A unique opportunity to provide environmental restoration in a heavily urbanized setting will be lost.

2) With Project Conditions Assumptions

The major initial assumptions used to define the scope of the feasibility study are presented below. These assumptions will be further developed upon receipt of additional funds needed to develop the PMP for the Study. The assumptions are:

- a. The resulting output of this study will be a document that will provide a watershed management plan for local interests to use in directing improvements to the watershed for the purposes of future land use decision, improving flood and drainage control, water quality improvements, environmental restoration, recreation use, and water conservation and groundwater improvement.
- b. An initial step in conducting the feasibility study will be to develop the Project Management Plan based on gathering and review of all pertinent reports and information

associated with defining baseline conditions; problems, needs and opportunities; and applicable alternative measures and plans. This effort will include mapping using GIS data base of relevant data, identifying additional data needs, and developing scopes of work to be performed in coordination with the various stakeholders interested in the Arroyo Seco watershed.

- c. The development of alternative plans will be limited to conceptual designs, and evaluation of costs, benefits, and impacts considering environmental quality, regional economic development, and other social effects.
- d. The study will include identifying and reviewing procedures required for obtaining Federal, State, and local programs available for implementation of measures formulated and selected as part of the watershed management plan.
- e. If there are measures or plans found to be implementable within U.S. Army Corps of Engineers missions, a spin-off feasibility study for developing a site-specific project will be pursued subject to a non-Federal sponsor indicating their interest to support and provide necessary cost-sharing and other requirements for the study and project.
- f. LACDPW will be the primary local sponsor for the study, and will coordinate the desired direction and funding of other stakeholders participating in the study to the U.S. Army Corps of Engineers.
- g. The cost estimate is a generalized estimate for the study. The actual cost estimate may increase or decrease depending on the level of detail of study identified in the PMP. The study will be 50/50 cost-shared with the local sponsor. Up to 100 percent of the local sponsor's share can be in-kind services or some combination of in-kind services and cash.
- h. Details of the PMP will be identified based on development of the study program and coordination with local interests.

B) Policy Exceptions and Streamlining Initiatives

The Study will be conducted in accordance with the Principles and Guidelines (P&G) and the U.S. Army Corps of Engineers regulations. There are currently no anticipated or identified exceptions to established guidelines for streamlining the study process that will not adversely impact the quality of the feasibility phase of study.

C) Quality Objectives

The Feasibility Phase Study will be accomplished to meet the following quality objectives:

1. Information developed and thus project recommendations will be adequately described for the local project sponsor to make an informed decision on future participation.
2. Quality Control through the feasibility study phase will be in compliance with the U.S. Army Corps of Engineers Quality Control Plan as documented in the Los Angeles District OM 1100-1-2.

9. FEASIBILITY PHASE MILESTONES

Table 3 presents an estimate of the milestone schedules for the feasibility study. The milestone schedule will be further defined upon further development of the PMP.

TABLE 3
FEASIBILITY PHASE MILESTONES

Milestone	Description	Duration (month)	Cumulative (month)	Date
Milestone F1	Initiate Study	0	0	Jan-03
Milestone F2	Public Workshops/Scoping	5	5	Jun-03
Milestone F3	Feasibility Scoping Meeting	11	16	May-04
Milestone F4	Alternative Review Conference	9	25	Feb-05
Milestone F4A	Alternative Formulation Briefing (AFB)	5	30	Jul-05
Milestone F5	Draft Feasibility Report	3	33	Oct-05
Milestone F6	Final Public Meeting	1	34	Nov-05
Milestone F7	Optional IRC	1	35	Dec-05
Milestone F8	Final Report to SPD	3	38	Mar-06

10. FEASIBILITY PHASE COST ESTIMATE

Table 4 presents an initial estimate of the cost for the feasibility study. LACDPW has agreed to be local sponsor for the project and cost-share 50 percent of the feasibility study. The LACDPW is continuing to work with local, State, and Federal officials to gain support for the project. The current estimated total study cost is \$3,696,000 with the Los Angeles County Department of Public Works as the non-Federal sponsor. The breakdown of the Federal and non-Federal cost is included in this PMP.

TABLE 4
Arroyo Seco Watershed Project Study
Preliminary Study Cost Estimate

	Work Activity	Total \$ X1000
JAAOO	Feas – Survey and Mapping except Real Estate	200
JABOO	Feas – Hydrology and Hydraulics Studies/Reports	950
JACOO	Feas – Geotechnical Studies/Reports	70
JAEOO	Feas – Engineering and Design Analysis Report	150
JBOOO	Feas – Socioeconomic Studies	150
JCOOO	Feas – Real Estate Analysis Report	100
JDOOO	Feas – Environmental Studies/ Report	450
JFOOO	Feas – HTRW Studies/Report	70
JHOOO	Feas – Cost Estimating	50
JIOOO	Feas – Public Involvement	120
JJOOO	Feas – Plan Formulation	100
JLOOO	Feas – Report Documentation	90
JLDOO	Feas – Technical Review Document	80
JPAOO	Feas – Project Management and Budget Documents	90
JPBOO	Feas – Supervision and Administration	270
JPCOO	Feas – Contingency	70
	Washington Level Review	70

SUBTOTAL	3,080
CONTINGENCY (20%)	616
TOTAL	3,696

11. VIEWS OF OTHER RESOURCE AGENCIES

Resource agencies including the U.S. Forest Service, U.S. Army Corps of Engineers, California Coastal Conservancy, California Department of Fish and Game, Metropolitan Water District of Southern California, and the Cities of South Pasadena, Pasadena, and Los Angeles have actively participated in for the development and preparation of the Arroyo Seco Watershed Restoration Feasibility Study and the Arroyo Seco Master Plan. These agencies participated during the identification of issues, problems, and opportunities within the watershed. During this process the agencies weighed addressing the need for economic development while protecting and enhancing natural resources. In addition, NET and the Arroyo Seco Foundation (ASF) have worked with local stakeholders and environmental groups to prepare the Arroyo Seco Watershed Restoration Feasibility Study. In general, all of the interested groups support a watershed planning approach to addressing the problems and opportunities within the watershed.

12. POTENTIAL ISSUES EFFECTING INITIATION OF FEASIBILITY PHASE

Currently, there are no potential issues effecting initiation of the feasibility phase.

13. PROJECT MAP AREA

See Enclosure A in 905(b) report in Chapter II of this document.

14. DISTRICT ENGINEER'S RECOMMENDATION

I recommend that the Arroyo Seco Watershed study proceed into the feasibility phase. The feasibility phase will continue the investigation of environmental restoration, water quality, flood control, and related issues. The Los Angeles County Department of Public Works has agreed to be the local sponsor for the feasibility study and will execute the Feasibility Cost Sharing Agreement (FCSA) upon completion of the PMP.

Date

John V. Guenther
Lieutenant Colonel,
Corps of Engineers
Acting District Engineer

15. CHANGES TO THE APPROVED SECTION 905(B) ANALYSIS

A) Corps Headquarters approved the Section 905(b) Analysis in November 2002. This approval was not conditioned on any revisions.

B) The following revisions to cost, schedule and scope have been made from the approved Section 905(b) Analysis as a result of final negotiations of the PMP and FCSA:

1) Changes to Cost – Estimated cost for the feasibility study has changed twice since the original estimate contained in the 905(b) report. The original estimate cost in the 905(b) was denoted at \$3,696,000. The first revised cost contained within the first draft of the Project Management Plan (PMP) was not significantly dissimilar at \$3,761,000. The local sponsor and the project’s stakeholder group requested, however, that the scope of the study be significantly reduced, with a corresponding reduction in cost (see “Changes in Scope”, Section 3, below). The revised feasibility study cost is now reduced to \$2,682,000. As a result of the changes in scope and effort, there has also been a corresponding reduction in schedule, as seen immediately below.

2) Changes to Schedule – Reduction of the scope of study resulted in a shortening in the study schedule as denoted in the original 905(b) report. The original schedule, shown in Section 9, page 2-20, above, has been revised. The revisions are depicted in Table 3A, below. As may be seen by a comparison between Tables 3 and 3A, there is an overall schedule reduction of four months from the original.

TABLE 3A
REVISED FEASIBILITY PHASE MILESTONES

Milestone	Description	Duration (month)	Cumulative (month)	Date
Milestone F1	Initiate Study	0	0	Jul-05
Milestone F2	Public Workshops/Scoping	5	5	Dec-05
Milestone F3	Feasibility Scoping Meeting	11	16	Nov-06
Milestone F4	Alternative Review Conference	9	25	Aug-07
Milestone F4A	Alternative Formulation Briefing (AFB)	5	30	Jan-08
Milestone F5	Draft Feasibility Report	n/a	n/a	n/a
Milestone F6	Final Public Meeting	1	31	Feb-08
Milestone F7	Optional IRC	n/a	n/a	n/a
Milestone F8	Final Report to SPD	3	34	May-08

3) Changes to Scope – As briefly mentioned above, there have been significant changes (reductions) made to the proposed scope of study for the feasibility report that have resulted in a corresponding reduction to both cost and schedule. Following the completion of the initial draft PMP for a watershed management plan, the local sponsor, Los Angeles County Department of Public Works, in conjunction with the study area’s stakeholder group, the Council of Arroyo Seco Agencies (CASA), requested a significant revision to the original scope of work. Specifically that, due to time and cost restraints, they no longer wished to undertake and complete a watershed management plan as originally envisioned. The new objective is to study the Arroyo Seco on a watershed basis with the goal of identifying likely candidate spin-off site locations for environmental restoration. It is envisioned that up to, but not more than, six (6) sites will be recommended for future feasibility-level study (each treated as a separate document). Each of the recommendations would be accompanied by its own environmental documentation, following the current Corps of Engineers policy of an integrated feasibility study/EIS/EIR. All candidate sites

in this feasibility level document will be evaluated on their merits for restoration, including, but not limited to, suitability of envisioned habitat quality, attractiveness for reestablishment of rare and endangered species, connectivity with other native habitat zones - which would further the reestablishment of viable habitat, availability of the resources needed to maintain the viability of the habitat, etc. One very important note to make here that has been made on numerous previous publications, is that, within the context of the Los Angeles County Drainage Area (LACDA) flood control system, which services a highly urbanized environment, the Arroyo Seco has a wealth of resources and public ownership of land along its course, thus making it a prime regional candidate for restoration activities.

CHAPTER III – WORK BREAKDOWN STRUCTURE

1. LEVELS OF THE WORK BREAKDOWN STRUCTURE

The work breakdown structure is divided into the following four levels.

A) Level 1: The Project.

B) Level 2: The Subprojects are established by the phase that is appropriated by Congress – in this case the feasibility phase of the study. This level includes the major products generated in the feasibility phase: the Feasibility Report, the Project Management Plan and the Planning Engineering and Design (PED) Agreement, which are identified by the first character of the work breakdown structure code. “J” denotes the Feasibility Report, “L” denotes the Project Management Plan and “Q” denotes the Planning Engineering and Design Agreement.

C) Level 3: The Parent Tasks are generally identified as separate products that go into the final feasibility phase documentation. Examples of these subprojects include such items as the real estate report, the Hydraulics and Hydrology (H&H) report, etc. These parent tasks are normally identified with the responsibility of a particular functional organization. This level is generally identified in the second and third characters of the Work Breakdown Structure code.

D) Level 4: The Tasks are major separable elements of the subprojects that are keyed to separately identifiable products that are developed for the major feasibility study milestones. These tasks are elements of work resulting in a deliverable product which have a beginning and an end, may be accomplished within one functional organization, can be described at a work order of detail and are the lowest level that will be specifically tracked with respect to cost and schedule. The cost estimate for the draft feasibility report is an example of a task. Tasks can be described as the summation of activities that would be accomplished by a particular functional organization between two of the milestone events. The milestones are defined in Enclosure B and are outlined below.

<u>Label</u>	<u>Description</u>
F1:	Initiate Feasibility Phase
F2:	Feasibility Study Public Workshop
F3:	Feasibility Study Conference, #1: Existing and future without project conditions, screening of potential plans, changes to the PMP, identify potential “spin-off” projects.
F4:	Feasibility Study Conference, #2: Refined without project condition, evaluation of measures and plans, including recommendation of plans, and draft PMP for “spin-off” study(s).
F4A:	Alternative Formulation Briefing (AFB)
F5:	Public Review of Draft Report
F6:	Final Public Meeting
F7:	Feasibility Review Conference
F8:	Feasibility Report with NEPA documentation
F9:	Division (SPD) Commander’s Public Notice

E) Level 5: The Activities are separate elements of work that are managed by the functional managers to whom the tasks are assigned and which may not necessary result in a deliverable work product to another organization. These activities are not tracked separately in terms of cost and schedule but may be described in the scopes of work to the extent required to provide a clear understanding of the work required.

2. LISTING OF TASKS - WORK BREAKDOWN STRUCTURE

In accordance with the levels described above, the following Work Breakdown Structure (WBS) indicates the relationship between the subprojects, parent tasks and subordinate tasks. The tasks in bold type are parent tasks and the regular types are subtasks. All tasks listed below may occur during the feasibility phase. The “J” leading the WBS numbers denotes the feasibility report subproject, the “L” denotes the Project Management Plan subproject and the “Q” denotes the Planning Engineering and Design Agreement subproject.

Table 1: Work Breakdown Structure (WBS) Number and Description

WBS#	Description
J0000	Feasibility Report (Feas)
J0000	Milestones
	Initiate Feasibility Phase
	Feas Study Pub Wkshp (F2)
	Feas Study Conf #1 (F3)
	Feas Study Conf #2 (F4)
	Date of AFB
	Public Review of Draft Report
	Final Public Meeting
	Feasibility Review Conference
	Feasibility Report w\NEPA
	MSC Commander's Public Notice
	Filing of Final EIA/EA
	Chief's Report to ASA (CW)
	ROD Signed or FONSI Signed
	President Signs Authorization
JA000	Engineering Appendix
JAA00	Feas - Surveys and Mapping except Real Estate
	Surveys and Mapping - Without Project Conditions
	Mapping - With Project Conditions
	Mapping - AFB documentation
	Mapping - Draft Report
	Mapping - Final Report
JAB00	Feas - Hydrology and Hydraulics Studies/Report (Coastal)
	H&H - Without Project Conditions & Preliminary Plans
	H&H - With Project Conditions for Final Plans
	H&H - AFB documentation
	H&H - Draft Report
	H&H - Final Report
JAC00	Feas - Geotechnical Studies/Report
	Geotech - Without Project Conditions & Preliminary Plans
	Geotech - With Project Conditions for Final Plans
	Geotech - AFB documentation
	Geotech - Draft Report
	Geotech - Final Report
JAE00	Feas - Engineering and Design Analysis/Report
	Engr & Design - Without Project Conditions & Preliminary Plans
	Engr & Design - With Project Conditions for Final Plans
	Engr & Design - AFB documentation
	Engr & Design - Draft Report
	Engr & Design - Final Report
JB000	Feas - Socioeconomic Studies

WBS#	Description
	Socioecon – Without Project Conditions & Preliminary Plans
	Socioecon – With Project Conditions for Final Plans
	Socioecon – AFB documentation
	Socioecon - Draft Report
	Socioecon - Final Report
JC000	Feas - Real Estate Analysis/Report
	Real Estate - Without Project Conditions & Preliminary Plans
	Real Estate - With Project Conditions for Final Plans
	Real Estate - AFB documentation
	Real Estate - Draft Report
	Real Estate - Final Report
JD000	Feas – Environmental Studies/Report (Except USF&WL)
	Environ - Without Project Conditions & Preliminary Plans
	Environ - With Project Conditions for Final Plans
	Environ - AFB documentation
	Environ - Draft Report/EIA
	Environ - Final Report/EIA
JE000	Feas - Fish and Wildlife Coordination Act Report
	USFWS - Planning Aid Letter
	USFWS - Draft Coordination Act Report
	USFWS - Final Coordination Act Report
JF000	Feas - HTRW Studies/Report
	HTRW - Without Project Conditions & Preliminary Plans
	HTRW - With Project Conditions for Final Plans
	HTRW - AFB documentation
	HTRW - Draft Report Coordinate with Environmental
	HTRW - Final Report/ Coordinate with Environmental
JG000	Feas - Cultural Resources Studies/Report
	Cultural - Without Project Conditions & Preliminary Plans
	Cultural - With Project Conditions for Final Plans
	Cultural - AFB documentation
	Cultural - Draft Report
	Cultural - Final Report
JH000	Feas - Cost Estimates
	Cost Estimates – Without Project Conditions & Preliminary Plans
	Cost Estimates – With Project Conditions for Final Plans
	Cost Estimates – AFB documentation
	Cost Estimates - Draft Report
	Cost Estimates - Final Report
JI000	Feas - Public Involvement Documents
	Initial Public Meeting\NEPA Scoping
	Public Workshops in Support of Plan Selection
	Public Involvement Support to AFB
	Final Public Meeting
	Public Involvement Support to FRC
JJ000	Feas - Plan Formulation and Evaluation
	Plan Formulation of Preliminary Plans
	Plan Formulation for Final Plans
	Plan Formulation - AFB documentation
	Plan Formulation - Draft Report
	Plan Formulation - Final Report
	Plan Formulation - Support to Division Commander's Notice
JL000	Feas - Final Report Documentation

WBS#	Description
	Reproduction and Distribution of F3 Documentation
	Reproduction and Distribution of F4 Documentation
	Reproduction and Distribution of AFB Documentation
	Reproduction and Distribution of Draft Report
	Reproduction and Distribution of Final Report
JLD00	Feas - Technical Review Documents
	Independent Technical Review - F3 Documentation
	Independent Technical Review - F4 Documentation
	Independent Technical Review - AFB Documentation
	Independent Technical Review - Draft Report
	Independent Technical Review - Final Report
JM000	Feas - Washington Level Report Approval (Review Support)
JP000	Feas – Management Documents
JPA00	Project Management and Budget Documents
	Programs and Project Management to F3 Milestone
	Programs and Project Management to F4 Milestone
	Programs and Project Management - AFB documentation
	Programs and Project Management - Draft Report
	Programs and Project Management - Final Report
	Programs and Project Management – DE's Notice
JPB00	Supervision and Administration
	S&A - Planning Division
	S&A - Engineering Division
	S&A - Real Estate Division
	S&A – PPMD
	S&A - Contracting Division
JPC00	Contingencies
L0000	Project Mangement Plan (PMP)
	PMP - Draft PMP
LA000	PMP - Final PMP
Q0000	PED Cost Sharing Agreement

CHAPTER IV – SCOPES OF WORK

1. DETAILED SCOPES OF WORK

The feasibility phase has been divided into a number of separable work activities. Each work activity is organized under a corresponding task and/or parent task. The scopes of work defined in this chapter are organized in the same manner as the Work Breakdown Structure (WBS) that is presented and listed in chapter III. The study team, including representatives from the Sponsor, has developed the scopes of work. The scopes also reflect the policy exceptions and streamlining initiatives that have been approved in the Section 905(b) Analysis.

The purpose and focus for these tasks described below are to prepare an environmental restoration plan and a feasibility report.

2. DURATIONS OF TASKS

The task durations were combined to establish the project's schedule. The durations are based on negotiations between the Study Manager and the responsible study team member and their respective supervisor.

3. COSTS OF TASKS

The estimated cost for the study is the summation of all task and activity costs negotiated between the Study Manager and the responsible study team member and their respective supervisor.

4. TASK DESCRIPTIONS

The following sections provide a discussion of the work tasks with the corresponding activities, grouped by the appropriate WBS number.

The following activities and assumptions are included in the scopes contained below as well as their respective costs.

- Study team members will participate in study team meetings.
- Study team members will participate in site visits.
- Study team members, when appropriate, will attend public and/or outreach meetings.
- Study team members will prepare their respective documents prior to each milestone requiring documentation (which would normally be F3, F4, F4A, F5, F8, and F9).
- Formal technical review costs are not included as part of the documents preparation costs. They are included in their separable WBS number. However, informal technical review or seamless review is included in each task and activity estimate.
- Supervision and Administration costs are included in the task and activity scopes and estimates.
- Inflation and nominal cost changes are included in the study cost. If the national inflation rate is in excess of 3.5% in any year or significant cost changes occur, the PMP may need to be revised.

The work descriptions in their appropriate WBS number are included below. The WBS number is included in the parentheses ().

A) Feasibility Report (J0000)

The Feasibility Report WBS number encompasses all tasks to be performed during the preparation of the feasibility report documentation. Its primary function is for cost accounting and separating tasks from other phases of project implementation (i.e. from Reconnaissance, Planning Engineering and Design, and Construction).

B) Milestones (J0000)

The milestones are defined in Chapter III paragraph 1.d. of this document. They all share the same WBS number as the Feasibility Report, discussed above. All milestones have zero duration, no cost and a specific end date. The milestones will be used to keep the study schedule on track and will be the primary focus for the Executive Management Committee.

C) Engineering Studies (JA000)

Engineering studies are comprised of Surveys and Mapping, Hydrology and Hydraulics, Geotechnical and Engineering Design and Cost Estimating. Each organization's tasks and activities are described below. The feasibility study, engineering appendix, will contain sufficient engineering detail to support recommendations and enhance decisions making ability related to watershed management plans, projects and other issues.

1) Surveys and Mapping (except real estate) (JAA00)

- a. Collection of Existing Mapping and Aerial Photography - This task will include the collection of existing aerial photographs, topographic, and Geographical Information System (GIS) mapping and Land Information System (LIS) mapping for use by the study team to define the baseline condition. Existing mapping will be reviewed to determine additional aerial photography and mapping needs for the environmental efforts.

New Aerial Photography and Contour Mapping - New aerial photography will be used for habitat mapping and real estimate investigations. Aerial photography and contour mapping will be used for Hydrologic and Hydraulic modeling and for the conceptual design of the alternatives. The aerial photographs will be ortho-corrected to ensure that they correspond with topographic mapping and can be easily added to the GIS database.

- b. GIS/LIS - Incorporate existing GIS/LIS data and new spatial data (discharges, floodplains, habitat areas, project alternatives, etc.) generated by the study into a project GIS. The new aerial photographs should be geo-referenced to serve as a backdrop. The GIS will serve as a central repository for project spatial data, and can be made available to public and private agencies during and after the study.

The detailed mapping task will be scoped and a cost will be developed at the time the alternatives are selected. However, this task will likely include the following items:

Mapping will be prepared at a scale of one inch equals two hundred feet (1"=200') with a two foot (2') contour interval for the project sites in accordance with engineering criteria and project maps.

- i. Mapping Services. Prepare Aerial Mapping at a scale of one-inch equals two hundred feet (1"=200') with a two foot (2') contour interval, and a sheet index, in .TIN Arcview, and .DGN Microstation file formats.
 - Mapping will show culture, including berms, levees, buildings, bridges, fences, walls, trees, shrubbery, labeled streets and access roads, sidewalks, railroads, dirt roads, paths, and courses and ways of travel. Mapping will include all other standard map features.
 - Label all culture, including berms, levees, buildings, bridges, fences, walls, trees, shrubbery, labeled streets and access roads, sidewalks, railroads, dirt roads, paths, and courses and ways of travel. Labeling will include types of material for culture, and all other standard mapping labeling.
- ii. Quality Assurance/Quality Control Report. Quality Assurance/Quality Control Report will be generated and submitted with project.
- iii. General Specifications.
 - Data Storage on Computer-Aided Drafting System: Full size drawings will be prepared, using a computer-aided drafting system. The complete drawings will be three-dimensional and fully operational and compatible on the Corps system. The Los Angeles District is presently utilizing Intergraph MicroStation and Inroads. All drawings for the Corps will be stored in Intergraph or MicroStation file format on Compact Disk(s) (CD). Each drawing will have a separate file name and be stored individually on the disk(s).
 - Digital mapping will be compiled in such a manner that hard copy manuscripts may be plotted directly from digital files.
- iv. Digital Mapping. Final digital map materials will be prepared in accordance with criteria and applicable publications and manuals listed herein and are hereby made a part of this Scope of Work. The following technical references will be used for the work and services:
 - EM 1110-1-1000, "Photogrammetric Mapping" dated 1 July 2002.
 - EM 1110-1-1002, "Survey Markers and Monumentation dated 14 September 1990.
 - EM 1110-1-1003, "NAVSTAR Global Positioning System Surveying" dated 1 July 2003.
 - EM 1110-1-1005, "Topographic Surveying" dated 31 August 1994.
 - ERDC/ITL TR-01-6 "U.S. National CADD Standards".
 - SDS (Spatial Data Standard), as described by CADD/GIS Technology Center, Federal Government.
- v. Final Submittal. The final submittal consists of the following originals:
 - Four (4) sets of .TIN files in Arcview file format.
 - Four (4) sets of .DTM files of aerial mapping.
 - Four (4) sets of .DGN files with contours generated from the .DTM.

- Four (4) sets of mass points file and break line file used to create surface.
 - Four (4) sets of digital color orthophotography in .TIF file format.
 - One (1) Quality Assurance/Quality Control Report.
 - All original field notes, calculations, sketches and directive prints.
 - All monuments set-found-used described on DA Form 1959.
- vi. Horizontal Control. Horizontal control will be established by traverse or GPS for third order accuracy or better using electronic distance measuring equipment and based on control furnished by the Corps of Engineers or the National Geodetic Survey, based on California state plane coordinate system NAD83.
- vii. Vertical Control. Vertical Control: Vertical control will be of third order accuracy or better based on bench marks provided by the Corps of Engineers or the National Geodetic Survey, based on California state plane coordinate system NAVD88.

This task includes the collection, organization and creation of surveys and maps to aid in defining the baseline condition within the watershed. One product of this study is the creation of a map designating the subject watershed and associated study areas. The existing and future without project conditions define the baseline condition. The data will be assembled utilizing a Geographical Information System (GIS) and Land Information System (LIS). Following a review and assessment of the available data, minor gaps will be identified and plans will be made to fill those gaps. It is expected that there are gaps and existing needs for additional surveys, maps or photos to effectively define the baseline (existing and future without project conditions).

Total estimated cost of this task is \$190,000.

2) Hydrology and Hydraulics Studies/Report (includes coastal) (JAB00)

Work Breakdown Structure No. JAB00: Hydrology, Groundwater, Water Quality, Hydraulic, and Sedimentation Studies

Subaccount No.: 09

Schedule Duration: 36 months

Estimated Total Task Cost: \$536,000

General Considerations

This section describes the hydrologic, groundwater, water quality, hydraulic, and sedimentation studies required for the Arroyo Seco Watershed Management Feasibility Report. As indicated in the reconnaissance report, the goal of the watershed study is "to develop the necessary baseline data and analytical tools, and a realistic set of objectives, that will encourage management decisions that help reverse negative trends or enhance positive trends to maintain or improve the health of the watershed". Specific planning objectives for the subject study are:

- Reduce urban flood damages.
- Improve water quality (both surface and groundwater).
- Increase opportunities for water conservation.
- Reduce further ecosystem degradation.
- Improve recreation opportunities.
- Improve riparian and wetlands habitat.

- Improve riverfront aesthetic quality.

The watershed management feasibility report will be prepared in sufficient detail to adequately delineate water resource-related problems, identify potential conceptual solutions, and justify separate "spin-off" feasibility studies for individual site-specific projects. Plan formulation activities will be mostly limited to evaluating selected alternatives in a cursory manner, without developing associated benefit and cost data. Activities to assist in identifying environmental impacts will be deferred to future studies

Because Subaccount 09 encompasses the majority of the necessary technical evaluations for this study, it is broken into four major subtasks: (A) Hydrology, (B) Groundwater, (C) Water Quality, and (D) Hydraulics. Formal documentation will be provided at the major milestones of the study. All pertinent information and results will be converted insofar as possible into suitable geographic information system (GIS) format. In addition, the resulting watershed hydrologic and hydraulic models will be provided to the local sponsor with sufficient documentation to further evaluate changed watershed conditions should the need arise.

The total estimated cost of the five major subtasks is \$536,000, and the total effort equates to 37 engineer-months.

09.A: Hydrology.

The hydrologic work effort will include a review of previous studies on this watershed. Information developed previously for the Corps of Engineers (Corps) Los Angeles County Drainage Area (LACDA) Review Feasibility Study will be used extensively for the subject study. Current streamgage data from the United States Geological Survey (USGS) and the Los Angeles County Department of Public Works (LACDPW) will be updated and compared to existing flood frequency relationships. The effort also will include expanding rainfall-runoff models for the Arroyo Seco watershed, incorporating the most current information available. N-year (2-, 5-, 10-, 25-, 50-, 100-, and 500-year) peak discharges and hydrographs for existing (baseline) and future without-project conditions will be developed for key locations on the Arroyo Seco and tributaries. Qualitative information from historic sources, such as written histories, anecdotes from long-time local residents, old photographs, and aerial photographs, will be used to supplement this analysis. Balanced hydrographs will be generated for sediment transport studies. Report review, response to comments, and support to the Study Manager are included in the work effort. **The total estimated cost of the hydrologic work is \$215,000**, with a duration of 15 months.

09.A.1: Research, collect, and review hydrologic information from the Corps of Engineers, USGS, LACDPW, other public agencies, and private consultants. The goal is to avoid duplicating previous or on-going efforts.

09.A.2: Collect and review current rainfall-frequency data for Los Angeles County watersheds. Update and modify, as appropriate, existing depth-duration-frequency relations, or aerial reduction of point rainfall depths.

09.A.3: Collect all available stream gage data for the Arroyo Seco watershed and update the peak and volume frequency analyses. Produce discharge-frequency curves for gaged locations using Water Resources Council Bulletin 17B guidelines. Include computed probability and the 5% and 95% confidence limits.

09.A.4: Determine low flows and seasonal daily flows for selected locations in the watershed.

09.A.5: Determine appropriate rainfall input, watershed losses, unit hydrograph parameters, and channel routing parameters for use in hydrologic models. Construct rainfall-runoff models for the entire Arroyo Seco watershed using the Corps HEC-1, HEC-HMS, or WMS computer programs. Construct without-project discharge-frequency curves for existing (baseline), and future conditions. Develop 2-, 5-, 10-, 25-, 50-, 100-, and 500-year synthetic hydrographs for selected locations on Arroyo Seco, at the major tributaries, and potential project sites. Calibrate the models to adequately reproduce the n-year peak discharges from the available gages in the area, and/or regional relationships, if practical.

09.A.6: Develop balanced hydrographs at designated concentration points. The balanced hydrographs will also be used for sediment transport analyses and evaluation of potential project alternatives involving storage of flood flows.

09.A.7: Perform hydrologic design of proposed alternatives. Prepare qualitative concept hydrologic design data with sketches and narrative. Modify without-project rainfall-runoff models and determine with-project discharge-frequency relationships. Coordinate with other study team members to provide hydrologic input to design alternatives.

09.A.8: Convert all hydrologic information into appropriate GIS format compatible with ArcInfo/ArcView format.

09.A.9: Attend meetings and conferences, coordinate with other study team members as required, and assist in plan formulation.

09.A.10: Prepare hydrologic documentation in a formal technical appendix to the feasibility report, presenting discharge-frequency results for without-project conditions and for each of the alternatives evaluated in the feasibility phase. The documentation will be comprehensive enough to enable the local sponsor to independently use the model(s) in the future.

09.A.11: Prepare independent technical review comments and attend review conferences. Address review comments and prepare final appendix. File study material.

09.B: Groundwater.

Groundwater studies will include hydrogeologic data collection and data analysis. The results of the data analysis will include the estimations of hydrogeologic parameters, groundwater elevation contours, and groundwater flow directions. Additional monitoring wells may be installed for the study. **The total estimated cost for the groundwater analysis is \$87,000**, and the estimated duration is 6 months.

09.B.1: Research, collect, and review groundwater and hydrogeologic information from the Corps, USGS, LACDPW, other agencies, and private consultants. Coordinate with the LACDPW, other agencies, and consultants to identify and obtain all relevant water quality studies previously or currently being conducted. The goal is to avoid duplicating efforts.

09.B.2: Estimate hydraulic conductivity, transmissivity, and storage coefficient for the aquifers.

09.B.3: Develop groundwater elevation or hydraulic head contours for the aquifers.

09.B.4: Estimate groundwater flow directions and flow velocities.

09.B.5: Convert all groundwater information into appropriate GIS format compatible with ArcInfo/ArcView format.

09.B.6: Prepare documentation of the groundwater analysis in a formal technical appendix for the feasibility report.

09.B.7: Attend meetings and conferences, coordinate with other study team members as required, and assist in plan formulation.

09.B.8: Prepare independent technical review comments and attend review conferences. Address review comments and prepare final appendix. File study material.

09.C: Water Quality.

The water quality evaluation will include collection of existing information and quantification of impacts. The work will address surface water quality as well as groundwater quality. The documentation will include topics such as: existing and planned pipelines, well locations, existing and planned treatment plant locations, average daily flows of reclaimed water and wastewater effluent, beneficial uses, water rights, water sources, groundwater recovery, salt water intrusion, groundwater overdraft protection, pollutants, point of source and non-point sources, listing of current Best Management Practices (BMPs), and the total maximum daily load (TMDL) program of the Environmental Protection Agency (EPA). **The total estimated cost of the water quality modeling is \$87,000**, with a duration of 6 months.

09.C.1: Research, collect, and review all water quality information from the Corps, LACDPW, California Regional Water Quality Control Board, other public agencies, and private consultants. Coordinate with LACDPW, other agencies, and consultants to identify and obtain all relevant water quality studies previously or currently being conducted. The goal is to avoid duplicating efforts. Compile all surface water quality and groundwater quality information for existing or past conditions into a detailed narrative with supporting tables, graphs, and figures. Document the history of wastewater plant effluent.

09.C.2: Convert water quality information into appropriate GIS format compatible with ArcInfo/ArcView format.

09.C.3: Qualitatively evaluate water quality impacts of selected project plans.

09.C.4: Attend meetings and conferences, coordinate as required with other study team members, and assist in plan formulation.

09.C.5: Prepare documentation of the water quality analysis in a formal technical appendix for the feasibility report.

09.C.6: Prepare independent technical review comments and attend review conferences. Address review comments and prepare final appendix. File study material.

09.D: Hydraulics.

Hydraulic models of the study area will be used to evaluate the flood capacity of the major channels within the watershed under existing and future without-project conditions. **The total estimated cost of the hydraulic modeling is \$147,000**, with an estimated duration of 10 months.

09.D.1: Research, collect, and review hydraulic information from Corps, LACDPW, other public agencies, and private consultants. Coordinate with LACDPW, other agencies, and consultants to identify and obtain all relevant hydraulic engineering studies previously or currently being conducted, including flood insurance studies. The goal is to avoid duplicating efforts.

09.D.2: Collect and review as-constructed plans for flood control structures, bridges, utilities, topographic mapping; and field survey data to determine channel and overbank configuration and geometry. Prepare a list of all plans and surveys available with the dates, and a map locating all plans and surveys along the watercourse.

09.D.3: Perform a field reconnaissance of the Arroyo Seco watershed and prepare field notes, sketches, and photographs of bridges, utility crossings, confluences, transitions, and other areas as needed to verify channel geometry, stability, roughness values, debris trapping problems, and river morphology.

09.D.4: Prepare a detailed hydraulic analysis of the Arroyo Seco watershed for without-project conditions using the Corps HEC-RAS computer program. Insofar as possible use the Corps Geo-RAS software to prepare the geometric data for the channel and overbanks directly from digital terrain model (DTM) topographic mapping.

09.D.5: Prepare qualitative and limited-quantitative concept hydraulic design data, with sketches and narrative, of potential projects identified in plan formulation.

09.B.6: Attend meetings and conferences, coordinate as required with other study team members, and assist in plan formulation.

09.B.7: Prepare documentation of the hydraulic analysis and design in a formal technical appendix for the feasibility report. The documentation will be comprehensive enough to enable the local sponsor to independently use the model(s) in the future.

09.B.8: Prepare independent technical review comments and attend review conferences. Address review comments and prepare final appendix. File study material.

3) Geotechnical Studies/Report (JAC00)

Geotechnical studies will be presented in a geotechnical appendix to the feasibility study report. Pertinent geologic and geotechnical information characterizing the project site will be provided and support given in the development and evaluations of alternatives, including design and constructability recommendations to aid in costing alternatives. It is not anticipated that subsurface drilling and sampling investigations will be conducted. If during the feasibility study these investigations are required, they can be accomplished by the Geotechnical Branch with additional funding. Geotechnical project delivery team members will participate in project coordination meetings and review feasibility documents at key milestones.

Geology Section

- a) Geology – Without Project Conditions: F3
 - i. Collect, review and summarize Geotechnical information to describe historic and existing conditions within the study area.
 - ii. Research, collect and summarize existing information regarding geology, faulting, seismic hazards, and other geologic considerations including excavatability, groundwater and bank stability.
 - iii. Document study results as a technical text. Use tables, figures and plates in geotechnical appendix.

- b) Geology – With project Conditions: F4
 - i. Participate with study team to develop measures and plans.
 - ii. Assess the impacts of potential conceptual alternatives. Some alternative may include detention, sediment trapping, and/or constructed wetlands for pollutant and contaminant removal for environmental sustainability.
 - iii. Update report documentation.

- c) Geology – AFB Documentation
 - i. Update report documentation.

Geology and Investigations Section Estimate

F3	Tasks Between F1 and F3	
a	Record and Literature Search	\$ 6,000
b	Attend and Participate in Meetings	\$ 2,550
c	Draft Geology report Existing Conditions	\$ 10,000
d	ITR review	\$ 1,050
	All task between these milestone above this line	
	Subtotal	\$ 19,600
F4	Tasks Between F3 and F4	
a	Draft Geology Report Alternatives	\$ 7,500
b	Attend and Participate in Meetings	\$ 2,550
c	Participate in alternative development F4A	\$ 1,300
d	Draft Geology Report Preferred Alternatives F4A	\$ 2,350
e	ITR review	\$ 1,050
	All tasks between these milestone above this line	
	Subtotal	\$ 14,750
Total Study		\$ 34,350
Total Study (Rounded)		\$ 35,300

Soils Section

- a) Soils – With Project Conditions: F4
 - i. Serve as geotechnical engineering consultant to study manager and designers. Assess site material sources, foundation and groundwater conditions in support of alternative development. Provide preliminary geotechnical analyses and designs for alternatives and evaluate geotechnical constraints, feasibility, functionality and constructability. Provide material sources and construction considerations for costing alternatives. Participate in study team meetings.
 - ii. Prepare F4 geotechnical appendix and perform PDT review of F4 document.
- b) Soils – AFB Documentation: F4A
 - i. Provide geotechnical analyses and design for alternatives. Assess geotechnical considerations including groundwater diversion and control, excavation and grading, allowable temporary excavation slopes, erosion control, sources of earthfill or pondliner design as applicable, foundation design recommendations for recreation structures, operation and maintenance and construction considerations. Provide construction methodology needed to formulate cost estimate. Participate in study team meetings.
 - ii. Prepare F4 geotechnical appendix and perform PDT review of F4 document.
 - iii. Review report document and update geotechnical appendix as necessary. Participate in study team meetings.

Geology Estimate: \$35,000

Soils Estimate: \$48,000

ED-G Branch Oversight: \$10,000

Total Geotechnical Studies/Report (JAC00): \$93,000

4) HTRW Studies/Report (JF000)

Geology will coordinate information related to HTRW issues developed during the Feasibility study and present findings in the Geotechnical Appendix. Published information regarding HTRW related issues will be researched and the potential for HTRW related impacts to conceptual project alternatives will be discussed in the Geotechnical Appendix. During the course of the Feasibility Study, if specific project sites are identified which require additional study, site specific Phase I Environmental Site Assessments can be accomplished by the Geotechnical Branch with additional funding.

- a) HTRW – Without Project Conditions: F3
 - i. Perform literature research.
 - ii. Contract for HTRW corridor database search along the Arroyo Seco channel; evaluate and summarize findings.
 - iii. Coordinate information with study team.
 - iv. Summarize and document findings in Geotechnical Appendix.
- b) HTRW – With Project Conditions: F4
 - i. Address HTRW potential related to specific conceptual project alternatives.
 - ii. Recommend additional, site specific, Phase I Environmental Site Assessments if warranted.

- iii. Update documentation.
- c) HTRW – AFB Documentation
 - i. Update report documentation.

Total HTRW Studies/Report (JF000): \$19k

Geology and Investigation Section HTRW Estimate

F3	Tasks Between F1 and F3	
a	Record and Literature Search	\$ 2,400
b	Attend and Participate in Meetings	\$ 1,000
c	Summarize Findings in Geologic Appendix	\$ 3,500
d	Contract HTRW Database Search	\$ 3,500
	All task between these milestone above this line	
	Subtotal	\$ 10,400
F4	Tasks Between F3 and F4	
a	Address HTRW Related to Project Alternatives	\$ 3,000
b	Attend and Participate in Meetings	\$ 1,000
c	Propose Additional Site-Specific Assessments if Warranted	\$ 2,000
d	Update Documentation	\$ 2,000
	All task between these milestone above this line	
	Subtotal	\$ 8,000

Total Study	\$ 18,400
Total Study (Rounded)	\$ 19,000

5) Engineering and Design Analysis/Report (JAE00)

The Civil Design Section A will be involved with the development of the design plates (drawings) with layouts and narrative of the project features. The plates will provide a visual illustration of the alternatives and recommended plan. The quantity take-offs will be performed and supplied to Cost Engineering Section for their estimates. This project may require design services for mechanical and electrical design. The costs for services are not included in the budget. If the alternatives dictate services for mechanical and electrical design during the study, Design branch will solicit their services through contract with architect engineering firms at additional cost. The design services for Cost Engineering and Structural design are provided separately and not included. The following describes the general tasks that are planned for Engineering and Design.

- a) Engineering and Design – Without Project Conditions: F3
 - i. Attend and participate meetings with study team in development of preliminary conceptual measures and plan.
 - ii. Assist in preliminary development of measures and plans.

- iii. Perform field survey to identify preliminary impacts to existing utilities, drainage and access.
 - iv. Review and compile existing available and/or new topographical maps to prepare project drawings.
 - v. Prepare layout for without project conditions.
- b) Engineering and Design – With Project Conditions: F4
- i. Assist in defining expected performance of the potential plans.
 - ii. Prepare quantities for cost estimates for alternatives.
 - iii. Assist in plan formulation, in-house review, respond to comments, and support to the study manager and other study team members.
 - iv. Develop design features and quantities for cost estimates.
 - v. Draft plans for expected recommended plan.
 - vi. Prepare F4 documentation. Layout details for project alternatives and recommended plan (prepare project drawings).
 - vii. Attend F4 conference.
- c) Engineering and Design – AFB Document: F4A
- i. Update plans and designs.
 - ii. Respond to comments, review and revise documents
 - iii. Revise quantity estimate.
 - iv. Attend meetings and coordination.
 - v. Prepare final design report, revise and respond to ITR comments.

Design Branch Total: \$194,000

D) Socioeconomic Studies (JB000)

Below is a description of Economics Group tasks by major milestone.

**Work Breakdown Structure No. JB000: Economic (Socioeconomic) Studies
Estimated Total Task Cost: \$75,000**

F3 Milestone (Without Project Conditions)

Recreation Analysis

Passive recreation features consistent with the primary goal of environmental restoration will be formulated for this feasibility study. Economic analyses required for this element and milestone will include:

- 1) Define the recreation market area for the study area, based upon interviews with local experts and research. Develop an inventory of existing recreation resources in the study area.
- 2) Determine recreation demand in the study area under without project conditions for the types of recreation that could be provided as part of a recommended plan.

Development Projections

Demographic projections will be developed to support projections of impacts on environmental values and demand for recreation.

- 1) Population Projections: Population projections for the study area will be assessed based upon a number of sources, including the US Census, state, county and city government agencies and state universities. Projections will be made at aggregate levels such as county and city, as well as for the study area specifically.
- 2) Land Use Projections: Aerial photography, land use plans and general plans will be analyzed to determine land available for development in the study area and its designation (residential by density, commercial, industrial, public, parks, etc.) Future land use over the period of analysis will be projected in the study area based upon population projections for the study area, land available for development and land use designations.

Meetings & Coordination

Close coordination will be required between the Project Economist and the Study Manager, as well as other Study Team members. The Project Economist will attend Study Team meetings, site visits and meetings with local officials, if necessary. In addition, the Project Economist will meet regularly with the Economics Group Leader regarding study progress. The Project Economist will receive assistance in the study effort from other Economic Section staff, necessitating additional meetings and coordination. The Project Economist and the Economics Group Leader will attend the F3 milestone conference.

Report Documentation

Internal documentation will consist of notes on meetings, telephone conversations, methodology, field trips, assumptions, etc., which will become part of the project files. External documentation consists of preparing the Economic Appendix to be included in the overall Feasibility Report submission for the F3 milestone.

Total cost effort for above is \$65,000

F4 Milestone (Alternatives Analysis)

Response to Comments

Responses will be prepared to address Independent Technical Review comments, as well as comments received from the Local Sponsor and other interested parties. Economic analysis will be revised in accordance with comments, and the Economic Appendix will be updated.

Recreation Analysis

- 1) Forecast potential recreation use/visitation for proposed recreation plans, based upon demand for the type of recreation in the study area, accessibility and location, projected changes in demographics, etc. In addition account for potential transfers of recreation from existing facilities.
- 2) Determine recreation values for the proposed recreation features using the Unit Day Value methodology outlined in the Planning Guidance Notebook (ER 1105-2-100).

- 3) Project recreation benefits based upon forecast usage and recreation values by activity type.
- 4) Analyze project cost estimates and complete benefit/cost analysis for recreation plans.

Environmental Benefit/Cost Analysis

Benefits for environmental projects are quantified in non-monetary terms (typically in terms of “habitat units” or “functional capacity units”). Since the benefits and costs for environmental projects are not measured in consistent terms, a direct benefit/cost analysis is not possible. Therefore, Corps policy requires completion of a Cost Effectiveness (CE) and Incremental Cost Analysis (ICA) to assist in the plan evaluation and selection process.

However, given that the scope of this Feasibility Study is only aimed at identifying some number of most preferred alternatives for future study and possible implementation – and will not include the level of detail that would be necessary to, for example, conduct a full ICA for a particular restoration plan – this section will be limited to an evaluation and description of the likely separable restoration measures and their respective costs.

Economic Tasks

- 1) Cost Analysis – Coordinate with Cost Engineering and Environmental Resources to determine the likely costs of possible separable management measures and increments, including construction and operation and maintenance. This will include determining annualized costs for alternatives/measures based upon construction costs, periods of construction and the current federal discount rate.

Meetings & Coordination

See description above for F3 Milestone. The Project Economist and the Economics Group Leader will prepare for and attend the F4 milestone conference.

Report Documentation

See description above for F3 Milestone. Documentation will include the Economic Appendix to be included in the overall Feasibility Report submission for the F4 milestone.

Total cost effort for above is \$10,000

Total cost for Economics: \$75,000

E) Real Estate Analysis/Report (JC000)

F1-F4 Coordination

Internal coordination with the PM and other appropriate District disciplines, including Real Estate Division elements to formulate the Real Estate Plan (REP). Meeting with Civil Design and/or planning Branch Contractor to scope most efficient approach of relating project design to real estate information. Duration is not consecutive, but precedes most of real estate work product efforts.

F3/F4 Attend Feasibility Study Meetings

Real Estate participation with the Project Manager and other District disciplines in feasibility study. Meetings with Non-Federal Sponsor to discuss the general real estate process, and attend project status meetings with the PM and other study team members. Duration of effort spread over feasibility phase.

F2/F4 Rights-Of-Entry (ROE) [If needed for ground disturbance activities.]

If land access is needed to evaluate potential sites, this is a valid task. Prepare standard ROE documents. Obtain ROE's wherever our study activities take place, such as, HTRW investigations, geotechnical investigation, cultural resources, reconnaissance, environmental evaluations, survey work etc. The ROE estimate amount may increase or decrease depending on the actual number of ROE's identified as required. A list of minimum information requirements will be provided by separate cover upon request.

F3/F4 Identify public and private owners of parcels within possible project boundaries.

F4 Real Estate Requirements

To initiate this task, Real Estate Division must receive preliminary design drawings showing project feature locations and general descriptions. Establish specific real estate requirements, including identifying standard estates, as necessary. This estimate assumes the estates will be approved with the report approval. Coordination of appropriate environmental estates with PM.

Prepare Land Cost Estimate

This effort typically includes a two-step process that is performing a 10% evaluation effort for the proposed project alternatives; and second performing the land cost estimate task for the preferred plan.

Total estimated cost for this task: \$42,000

F) Environmental Studies/Report (JD000)

Project Management Plan for Environmental Coordinator, Biology And Cultural Resources Studies

Work Breakdown Structure No. JD000: Environmental Studies/Report

Schedule Duration: 15 Months

Estimated Total Task Cost: \$329,400

JD002a: An Environmental Coordinator and Biologist will prepare for, attend, and participate in scoping meetings. They will provide environmental and biological input into the Plan Formulation process, as necessary.

JD002b: An Environmental Coordinator and Biologist will review scoping meeting comments and provide responses.

JD003a: A literature search will be conducted including review of existing environmental studies, biological studies, documents, maps and other pertinent data for the project area. Literature will be collected from agencies including, but not limited to the cities of Los Angeles, Pasadena, South Pasadena, La Canada Flintridge, USDA Forest Service (USFS), U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Game (CAFG), other public and private institutions

and professional resources. If other agency data is used, reconnaissance-level surveys may be conducted to confirm the resources are correctly identified and the information is accurate. Information based on literature searches, reconnaissance, species-specific surveys, existing environmental and biological conditions will be documented, compiled and incorporated into an Environmental Evaluation (EE).

Maps showing existing vegetation will be necessary to identify sensitive, non-sensitive and exotic habitat types surrounding the study area. Necessary maps include, but are not limited to, aerial photos, topographic maps, geologic maps, soil surveys, location of threatened and endangered (T&E) species, National Wetland Inventory maps, jurisdictional delineation documents and other relevant documentation. Existing maps may be used if they meet the needs of the Feasibility study. Field truthing will be required. New maps may be acquired if existing materials do not meet those needs. If extensive new maps are needed and if technical resources are not available in-house, this work will be contracted.

This EE will include informal consultation with USFWS. Formal coordination will occur as part of future plan formulation processes, should this EE proceed beyond a No-Federal-Action plan. Endangered Species Act of 1973, as amended, Section 7 Consultation and Biological Assessment preparation process will ensue in future specific Federal Interest projects. Additional coordination will occur as part of Coordination Act Report, and comment review period. A scope of work will be provided to USFWS to obtain a Planning Aid Letter, Draft Coordination Act Report, and Final Coordination Act Report in future Federal Interest projects.

JD003b: Data collected in task JD003a will be organized, pertinent information will be utilized to prepare the draft report.

JD003c: The Environmental Coordinator and Biologist will visit the study area to do a reconnaissance survey.

JD003d: The Environmental Coordinator and Biologist will attend and participate in Planning Development Team (PDT), sponsor and public meetings, as necessary.

JD003e: Environmental Resources Branch (ERB) staff will document the existing and future without-project conditions. The Environmental Coordinator will prepare sections on air; noise; water pollution; aesthetics; general settings (topography, etc.); water resources; current land use; socioeconomics of the study area; current traffic conditions; and recreation. A biologist will conduct a Habitat Evaluation Procedure (HEP) analysis. HEP will be used to identify quantity and quality of habitat types using habitat units (HU). This information will then be used to develop the existing biological conditions. The existing HUs will be compared to Future without-project HU projections.

Presence/absence surveys may be conducted for federal and state-listed threatened, endangered, candidate or proposed species as determined necessary by USFWS and CAFG. These survey results will be used to form the baseline biological conditions and may be repeated in future site-specific Federal Interest projects. These surveys will be contracted.

JD003f: The Environmental Coordinator and Biologist will review and revise the existing and future without-project conditions portion of the report based on comments from the PDT, other federal, state and resources agencies.

JD003g: The Environmental Coordinator and Biologist will prepare input for their technical field for the F3 document and draft appendices. Since the local sponsor is County of Los Angeles Department

of Public Works, the EE will be written to easily adapt to future site-specific Federal Interest Projects. This general study will not be required to meet compliance with the National Environmental Policy Act of 1969, as amended (NEPA), or the California Environmental Quality Act (CEQA), and other applicable environmental regulations since there is no site-specific Federal Interest Project being proposed, at this time. Should future Federal Interest projects begin, they will comply with NEPA.

JD003h: The Environmental Coordinator will participate in the F3 conference.

JD004a: Impact and benefits of the conceptual plan will be identified and written into the appropriate sections of the report. The Environmental Coordinator will evaluate and prepare the general sections on air; noise; water pollution; aesthetics; general settings (topography, etc.); water resources; current land use; socioeconomics of the area; current traffic conditions; and recreation. The biologist will evaluate impacts and benefits to federally listed T&E species or state listed species of concern, potentially occurring in the project area will be conducted. Should any significant critical habitat or listed species be located within the study area, surveys will be conducted for those species to confirm their existence and population size, should a site-specific Federal Interest project emerge from the EE evaluation. A generalized Biological Assessment will be prepared to evaluate potential impacts on T&E species within the study area and submitted to USFWS to initiate Section 7 Consultation, during any future EA process.

JD004b: An evaluation of biological resources for existing conditions, future with- and without-project conditions, and all viable alternatives will be conducted and incorporated into the Feasibility Report. These evaluations will also be used as part of any future EIS, as required under NEPA, should a Federal Interest Project be proposed. The existing HUs will be compared to Future with- and Future without-project HU projections. This comparison helps to identify project related impacts.

JD004c: The Environmental Coordinator and Biologist will visit the site to analyze impacts of the alternatives.

JD004d: The Environmental Coordinator and Biologist will attend and participate in team meetings.

JD004e: Task deleted because there are no Federal-Interest projects.

JD004f: The Environmental Coordinator and Biologist will participate in the conceptual plan development for the project area.

JD004g: The Environmental Coordinator will describe existing recreational resources conditions and opportunities in the study area. A descriptive overview of local resources and settings in the vicinity will also be provided, and regulations, plans, goals, and policies related to said resources by the local sponsor.

JD004h: Task deleted because there are no Federal-Interest projects, therefore no plans to revise.

JD004i: The Environmental Coordinator will participate in the F4 conference.

JD004j: The Environmental Coordinator and Biologist will respond to F4 technical review and internal review comments and make the necessary changes to the report.

JD005: Prepare for public review of Draft EE.

JD006: Prepare for and attend public meeting.

JD008: Review and respond to public meeting and ITR comments.

**JG000: Cultural Resources Studies/Report
Work Breakdown Structure No. JG000; Cultural Resources Studies/Report
Estimated Total Task Cost: \$ 58,000**

General Considerations

This section describes the effort required for the cultural resources studies to support the feasibility study of environmental restoration for the Arroyo Seco watershed. The cultural resources investigations and reports required for this feasibility study remain the same as for other studies. The time and cost estimates for the tasks described below include allowances for coordinating with other study team members, attending meetings and sites visits, and preparing responses for independent technical review comments.

F3 Milestone - Without Project Conditions

JG001. Baseline conditions for Cultural Resources will be established based on review of existing information (Records and Literature. Review) including, but not limited to published and unpublished reports on previous archival and archeological investigations specific to the project area, known/recorded sites, and general culture history for the project area based upon previous research. The records and literature search will be conducted at the South Central Coastal Information Center, and involve review of archeological resources maps, historic topographic maps, and historic register lists. Historical registers include the National Register of Historic Places (2000), the *California State Historic Resources Inventory* (2000), the *California Points of Historical Interests* (1992) and the *California Historical Landmarks* (1996). A review will be conducted of local historical information (the Cities of Los Angeles, Pasadena, South Pasadena, La Canada Flintridge and Los Angeles County) housed in museums, schools, city records, etc. All the searches are for data on cultural resources, including prehistoric, historic, cultural, and spiritual/religious sites within the project area. A search will be requested from the Native American Heritage Commission (NAHC) determined that no sacred sites are recorded within the project area.

JG002. On-the-ground surveys will be conducted of areas to verify existing information, and to determine presence or absence of properties (cultural resources) within a specific portion or portions of the project area that have not been previously investigated. New Historic Properties - ID new historic properties and evaluation for eligibility for National Register of Historic Places.

JG003. Document Preparation - A report will be prepared to include the results of all investigations noted above, documenting existing conditions and without-project conditions.

F4 Milestone - With Project Conditions

JG004. Analysis of presence/absence and significance of known cultural resources within recommended alternatives, and the effect of the project on the properties, and notifies SHPO of the determinations.

F4A Milestone - Selected Alternative

JG005. Cultural Resources Final Draft Report & NEPA document input. Cultural Resources Final Report incorporating response to comments.

Cultural Resources Studies/Report Estimate

WBS #	Description	Federal Cost	Non-Federal Cost	Total Cost
JG000	Cultural Resources (Rounded)			\$58,000.00
JG001	Record & Literature Search (F3)			\$ 18,900.00
JG002	Misc. on-the-ground Surveys (F3)			\$ 4,200.00
JG003	Cultural Resources Report (F3)			\$ 15,750.00
JG004	Analysis of Data & Alternatives (F4)			\$ 12,900.00
JG005	Completion of Draft and Final reports (F4A)			\$ 6,000.00

G) Cost Estimates (JH000)

- 1) Cost Engineering shall prepare and furnish comparative cost estimates of the viable alternatives in a spreadsheet format (Excel) and clearly identify the National Economic Development (NED) Plan. Initially, a screening process shall be used to review all the alternatives. Different levels of cost estimating detail may be appropriate at each level of screening. This screening process will narrow the number of alternatives to a final list, i.e., two to five viable alternatives for a more detailed assessment. The cost estimate for each viable alternative shall include appropriate comments describing the method of construction, assumptions used in developing the estimate, and the technical/design data available.
- 2) Upon completion of the comparative analysis, Cost Engineering shall develop the Total Current Working Estimate (CWE) to support NED Plan. The Total CWE is developed to support the recommend scope and schedule and shall be prepared and furnished using the Microcomputer Aided Cost Estimating System (MCACES) software. The Total CWE in the Feasibility Report is defined as the project Baseline Cost Estimate (BCE) and it includes construction features; lands and damages; Planning, Engineering and Design (PED); Construction Management; and contingencies.
- 3) On occasions, the sponsor may request a plan different from the NED Plan. When this occurs, Cost Engineering shall prepare a cost estimate for both the NED Plan and the Locally Preferred Plan. The NED Plan and the Locally Preferred Plan shall be prepared and furnished using the MCACES software.
- 4) The Total CWE and the Locally Preferred Plan shall be formatted in accordance with the Current Work Breakdown Structure (CWBS) and an identified price level.
- 5) On the Total CWE and the Locally Preferred Plan, descriptive statements regarding methods of construction, material sources and prices, type of equipment required, access, haul distances, estimated production rates, placement procedures, environmental restrictions, crew sizes and labor rates, dewatering, job conditions, and other assumptions shall be included as appropriate in MCACES as notes.
- 6) Quantity “take-off” must be as accurate as possible and based on all available engineering and design data. Provide detail quantities in support of details such as flow calculations for

- dewatering and formwork for concrete structures. Quantity calculations shall be indexed, divided with numerical tabs, and bounded in a 3-ring binder. Calculation worksheets shall make reference to drawings sheet numbers and details.
- 7) The cost engineer is encouraged to use the Unit Price Book (UPB) database as a pricing source. However, all data must be refined to reflect site-specific situations and costs. Material unit costs shall be justified with various pricing sources and quotes. Quotes shall be submitted. Labor unit costs shall come from the labor database in MCACES. The labor database must be updated with the latest Davis-Bacon Rates for the area. Equipment unit costs are obtained from the regional equipment database in MCACES.
 - 8) Estimate submittals for review shall occur at each stage of the design process (i.e., pre-final, final and back-check final submittals). The cost estimate submittals shall include as a minimum: quantity calculations; quotes from material suppliers and subcontractors; a narrative defining the parameters upon which the cost estimate has been prepared to support the project scope and schedule; miscellaneous supporting documentation such as backup data, brochures on special equipment, working drawings, production calculations; telephone conversations; a print out of the MCACES estimate including direct, indirect and owner summary sheets, detail sheets and backup; and a floppy disk containing the complete MCACES estimate and all associated databases.
 - 9) A construction schedule must be developed using the _____ Scheduling Software. The schedule must identify the sequence and duration of the tasks.
 - 10) Contract services for the preparation of quantities and/or cost estimates shall be provided by competent firms specializing in Cost Engineering. Cost engineers assigned to the project shall have MCACES training, cost engineering experience and field experience in civil construction projects. In all cases the procedures and requirements of the following regulations shall apply:
 - a. ER 1110-2-1302 "Civil Works Cost Engineering",
 - b. ER 1110-3-1301, "HTRW Cost Engineering",
 - c. ER 1110-3-1300, "Military Programs Cost Engineering", and
 - d. EI 01D010, "Construction Cost Estimates".
 - 11) The COE and the sponsor must be kept aware of the current and forecasted total cost of the project.

Estimated Task Cost: \$ 60,700

H) Public Involvement (JI000)

This task will include public meetings, workshops, hearings, and briefings, as well as the preparation and distribution of fact sheets and information papers to interested parties and local news agencies. One initial public meeting, with two additional outreach meetings per year and one final public meeting will be held. The goals of this task are: 1) promote understanding of the planning process, and to a lesser extent, the design and construction processes in terms of potential projects; 2) obtain public input regarding problems, opportunities, constraints, alternatives, outputs, impacts, and costs; and 3) coordinate the Arroyo Seco watershed planning effort with the efforts of other Federal, state, and local agencies. Input and cooperation with interested agencies is a main goal. A preliminary list of interested agencies follows:

The end product of the Coordination and Public Involvement Task will be to summarize the information obtained from the following subtasks into a Public Involvement section to the final feasibility report.

- 1) Public Involvement - Initial Public Meeting/NEPA Scoping: and
- 2) Public Involvement - Public Workshop in Support of Plan Selection: F3, F4
 - a. The Corps and LACDPW's study managers will develop and implement a series of public involvement outreach efforts. The first will be the official public meeting for NEPA Scoping. The successive periodic public outreach meetings will be organized primarily by the County. These are designed to ensure the public and other interested parties have ample opportunity to participate and get involved in the planning process.
 - b. Other public outreach methods will be employed, such as meetings, workshops, and newsletters or via the Internet. These efforts will be determined during the study. A mailing list will be updated to include all potentially interested parties. Strategies to maximize public outreach will be developed.
 - c. An initial public meeting will be held early in the feasibility schedule to serve to introduce the study to interested parties. Scoping issues, concerns, and opportunities will be discussed. The following will be required:
 - i. Meeting facility
 - ii. Stenographer
 - iii. Audio/visual equipment
 - iv. Meeting announcement/advertising
 - v. Presentation materials/handouts
 - vi. Record of meeting/follow-up mailing to interested parties
 - d. The County of Los Angeles Department of Public Works Study Management Team meetings will be held on at least an annual basis, and will be used to brief the public on the status of the restoration study efforts.
 - e. All interested parties will continue to be informed of the progress of the study through periodic news releases and/or electronic newsletters. Prior to the Final Public Meeting, the Draft Feasibility Report will be released for review and comment to the public.
 - f. Review and update report documentation.
- 3) Public Involvement Support to AFB:
 - a. Continue public involvement activities.
 - b. Review and update project documentation.
- 4) Public Involvement – Final Public Meeting:
 - a. A Final Public Meeting will be held to present the findings of the Draft Feasibility Report. Direct input from the public will be obtained for incorporation into the Final Report. A professional recorder will prepare a final public meeting transcript.
 - b. Prepare report documentation.
- 5) Public Involvement – Support to FRC:
 - a. Respond as needed.

I) Plan Formulation and Evaluation (JJ000)

Plan formulation and evaluation includes all efforts performed by study management at the Corps and the Sponsor. It includes attendance and participation at meetings, coordination between study team members and other interest groups, report writing and organization, evaluation and effectiveness assessment of six-step planning process defined below, as well as other tasks and activities. Plan formulation continues from beginning to end of the feasibility phase.

The planning process will follow these six steps:

1. Identification of problems and opportunities within the study area.
 2. Inventory and forecast conditions of water and related land resources within the planning area relevant to the problems and opportunities.
 3. Formulate alternative plans.
 4. Evaluate alternative plans including impacts and effectiveness.
 5. Compare alternative plans.
 6. Select a plan to recommend.
- 1) Plan formulation is an iterative process. Early iterations involve problem identification and resource inventories and forecasts. At least three iterations of plan development and evaluation will be performed.
 - 2) The report will be prepared in accordance with ER 1105-2-100, ER 5-7-1, EC 1105-2-206, EC 1105-2-208, P&G, NEPA, and other pertinent engineering, environmental, and economic guidance and regulations.
 - 3) All plan formulation activities will be conducted in close coordination with the Sponsor and other agencies. The public and interested agencies will be involved in public workshops and management meetings to ensure open communication is maintained throughout the study.
 - 4) Technical input for plan formulation tasks is included in the respective scopes of work. Costs associated with these tasks reflect the coordination efforts of study management for the Corps and the Sponsor
 - 5) Regulatory Branch will be involved early in the planning process, as a necessary component in preparing an integrated watershed management plan and restoration projects.
 - 6) Encourage participation of interest groups and ensure they are aware of this study effort.
 - 7) Specific activities to be accomplished during the planning process are described below:
 - a. Update and detail assessment of present conditions for the Arroyo Seco watershed. Provide a baseline condition for comparison with future with-project conditions.
 - b. Future, without-project conditions will be forecasted. Time periods for future without-project forecasting will be defined during the course of the study. This condition will represent the “no-action” alternative.
 - c. Objectives, opportunities, and constraints will be defined for the following Watershed Plan purposes:
 - i. Ecosystem Restoration

- ii. Flood Peak/ Damage Reduction
 - iii. Water Supply and Re-Use
 - iv. Passive Recreation
 - v. Surface & Ground Water Quality
 - vi. Public Education
- d. The primary area of investigation is the mainstem of the Arroyo Seco within the overall watershed, located within the city limits of the Cities of Los Angeles, Pasadena, South Pasadena, La Canada Flintridge, Los Angeles County and Angeles National Forest, with consideration given to immediately adjacent areas upstream and downstream of the city limits as they may affect the project purpose(s).
 - e. Criteria will be established and alternatives screened to eliminate those alternatives which may not be technically feasible, do not meet established objectives, or which violate physical, economic, and institutional constraints. Alternatives will not be eliminated solely because they violate an objective or constraint.
 - f. Alternatives passing the screening process will be evaluated according to completeness, technical feasibility, effectiveness, efficiency, acceptability, environmental effects, ability to meet objectives, and other evaluation criteria as developed during the course of the study. Conformance with Corps guidelines will be a consideration, but will not necessarily be grounds for rejecting an alternative that otherwise fit into the overall project purpose.
 - g. Costs, benefits, and environmental outputs for the final array of alternatives will be assessed. Costs will include construction costs, land acquisition, and operation and maintenance. Environmental outputs will be measured in terms of habitat units using the U.S. Fish and Wildlife Services Habitat Evaluation Procedures (HEP) or other defensible scientific method. Tradeoffs between monetary and non-monetary project outputs will be evaluated.
 - h. Consultations with the U.S. Fish and Wildlife Service, the U.S. Environmental Protection Agency, the California Fish and Game Department, and the California Regional Water Quality Control Board will be done regarding maintenance and other regulated activities (public and private).
 - i. Up to three (3) potential recommended environmental restoration spin-off sites will be selected and justified according to established criteria. Responsibilities will be clearly defined. Individual components of the management plan will be separable to the maximum extent possible to permit their implementation.
 - j. The decision-making framework leading to the recommended candidate sites will consist of 1) early and continued close coordination between the Corps, the Sponsor and other interested agencies, 2) development and evaluation of alternative sites using an incremental and cost effectiveness approach, and 3) public involvement and stakeholder buy-in.

1. INSTITUTIONAL ASSESSMENT

- A) The Institutional Studies Task involves determining the financial and legal arrangements required to implement the recommended plans, including methods of financing the projects and operating and maintaining existing projects in a manner that will ensure long term restoration of the watershed ecosystem. A financial capability analysis will examine whether or not the Sponsor has the organizational, legal, and financial capability to undertake the required financial obligations for implementing and maintaining the project(s) after it is authorized for construction by Congress. The financing plan will determine the Federal, state and local interests in the financing and maintenance of elements of the recommended

watershed plan. The information obtained from the following subtasks will be provided in a financial, legal, and cost recovery analysis section of the feasibility report.

- B) **Financial Analysis and Planning.** This subtask will begin with a review of the current financial agreements in place for operation and maintenance of water resource related infrastructure, including an assessment of long-term local financial interest and capability. Cost sharing, alternative repayment options for any incidental project purposes, and other financial options will be defined. Financial discussions will be coordinated between the Sponsors, other interested agencies, and the public. The collected data will be evaluated, and a financial capability analysis will be performed. A draft and final financial and cost recovery section of the feasibility report will be prepared. Interim status reports will be developed and fully coordinated with local, state and federal agencies during the course of the study. An authorized, local committee representing all legal entities will work closely with the Corps in the analysis, documentation, and drafting of this sub-report.
- C) **Water Rights, Regulations, and Legal Considerations.** Research will be conducted into water rights for surface and groundwater in the study area, to determine the potential for use of water at the ecosystem restoration site(s) identified in the study. Potential alternatives involving groundwater, treated wastewater, and surface water will be reviewed for compliance with local, state, and federal water quality regulations and water rights issues. Existing information can be obtained from Los Angeles County, the Cities of Los Angeles, Pasadena, South Pasadena, Los Angeles County, Angeles National Forest and other special districts.
- D) **Legal Responsibility for Remediation by Other Parties.** EC 1105-2-210, par. 6(c), prohibits the Corps of Engineers from participating in ecosystem restoration activities that would principally result in treatment of pollution problems caused by others who may still have a legal responsibility for remediation. District counsel will prepare a determination of potential liability for the remediation for present and past owners for project sites that appear to have federal interest for implementation and which may be impaired with pollution problems.

2. STUDY MANAGEMENT

The feasibility study will be managed as follows:

- A) The Study Manager will track and control the study to meet the established milestones dates.
- B) The manager will ensure that defined work is completed as agreed in this PMP.
- C) The study will be performed according to the milestones as described in Enclosure B. See Enclosure B for descriptions of milestones.
- D) Study management includes study, project, and program activities, in accordance with current guidelines outlined in ER 1105-2-100, ER 5-7-1, EC 5-1-48, EC 1105-2-206 and EC 1105-2-208, providing detailed information for the work done for others; establishing study milestones; assisting the development of networks to include work activities, task schedules, critical path networks, and funding schedules; directing, monitoring, and modifying assigned work items as required and agreed upon by the Sponsor; reviewing results and reports provided by the technical support staff; correspondence; report preparation and review; inter-organization coordination; and conference preparation and presentation. Coordination with the Project Manager involves

periodic meetings held with the Sponsors to report on technical issues and the status of the study and in-kind services.

E) The Study Manager will provide direction to members of the technical study team. Technical coordination and inter-disciplinary planning are the responsibilities of the Study Manager. This will include monitoring the scope and progress of activities to ensure that the study is consistent with relevant planning and engineering guidelines and policy. Deviations in scope, that affect schedule and cost, will be coordinated with the Sponsor.

F) The Study Manager, Corps and Sponsor, shall meet quarterly or as needed to discuss study progress, direction, data collection/ analyses, additional information needs, local community concerns, in-kind deliverables, Corps and A/E contractor deliverables, product acceptance, and financial commitments.

G) Executive Committee: The executive committee, defined in the FCSA, will meet as needed to focus project direction and resolve issues that cannot be resolved by the SMT, Study Manager or Project Managers.

J. Report Documentation (JL000)

Report Documentation will be in accordance with ER 1105-2-100, EC 1105-2-206, EC 1105-2-208 and ER 110-2-1150, Report preparation includes the compilation of all study team products into an initial draft report and a final report. The work will include collection and assembly of pertinent data, editing, typing, drafting, reproducing, and distributing the draft and final Feasibility Reports. The joint Environmental Impact Statement/Environmental Impact Report (EIS/EIR) will be reproduced and distributed with funds shown in the Environmental WBS code, shown in Chapter II.

The study manager will be responsible for reproduction and dissemination of the draft and final reports for appropriate review and revision. All study team members will be involved in the formulation and review of the reports. Each draft report will have a comment and review period to ensure that findings and recommendations are coordinated and consistent.

1) Reproduction and Distribution of F3 Documentation

- a. F3 Report. The report contents include a description of baseline conditions, current and likely future without project conditions, and a discussion of preliminary restoration alternative sites and potential environmental restoration spin-off feasibility studies.
- b. Gather, assemble and edit report and appendices.
- c. Reproduce documents.
- d. Distribute documents.

2) Reproduction and Distribution of F4 Documentation

- a. F4 Report. This draft includes the revised baseline, development and evaluation of alternatives and a preliminary recommended plan and a draft EIA.
- b. Gather, assemble and edit report and appendices.
- c. Reproduce documents.
- d. Distribute documents.

3) Reproduction and Distribution of Alternative Formulation Briefing (AFB) Documentation

- a. Gather, assemble and edit report and appendices.
 - b. Reproduce documents.
 - c. Distribute documents.
- 4) Reproduction and Distribution of Draft Report
- a. Public Draft. This draft report will include revisions based on comments received during review of the F4 documents. The F5 report will be released to the public and resource agencies for comment. A formal public meeting will be held during the public review period.
 - b. Gather, assemble and edit report and appendices.
 - c. Reproduce documents.
 - d. Distribute documents.
- 5) Reproduction and Distribution of Final Report.
- a. Final Report. The final report includes revisions based on comments received during the public review period. These final report documents are sent to Corps Headquarters for review and approval. They contain the final baseline condition, alternative development, evaluation and recommendation with supporting documentation including the EIS/EIR.
 - b. Gather and assemble report and appendices.
 - c. Reproduce documents.
 - d. Distribute documents.

H. Technical Review Documents (JLD00)

- 1) Corps, CESPL-PD OM 1105-1-1, Independent Technical Review Guidelines will be followed.
- 2) Internal Seamless Peer Review will occur throughout the study phase and is the responsibility of each study team member's supervisor.
- 3) Corps Internal Independent Technical/Policy Review.
 - a. A Review meeting to establish the Quality Control Plan (QCP) will be held early in the study. The meeting agenda will include a review of milestones and schedules for reviews, identification of the key study tasks and activities and selection of the review team. The Review Team will perform their review prior to the specific milestones and document their comments. Division representatives will aid in resolving technical issues as needed.
 - b. The Quality Control Plan will include the following items:
 - i. Establish goals for the QC process. These include:
 - Provide enhanced quality through timely review of decision and implementation documents.
 - Integrate policy review into technical review of decision documents.
 - ii. Utilize guidelines to complete this review These guidelines include the following CESPL OM publications:

- Independent Technical Review Guidelines for Planning, Engineering, Construction, Operations, and Real Estate.
 - Standard Operating Procedure for Independent Technical Review.
 - Checklist for Single Discipline Peer Review.
 - Guidelines for Independent Technical Review of Pre-Authorization Decision Documents.
 - Review Checklist for Reconnaissance, Feasibility and Reevaluation Reports.
 - Index to Minimum Report Content.
 - Independent Technical Review Management Checkpoint System for Reconnaissance, Feasibility, and Reevaluation Reports.
- iii. Review Team Members. The Review Team members will have technical expertise in their respective fields.
- iv. Review Schedule. This can include a schedule for periodic review and a time to update of the QC plan.
- v. Other items: The QC plan can include a discussion of known policy questions needing clarification, a list of major technical issues that may require Headquarters' technical guidance, a statement of manpower and financial resources to be committed to the review, and views of the local Sponsor on the QC process.
- c. Technical review team members prepare independent technical review comments and attend and participate in review conferences.

D) Washington Level Report Approval (Review Support) (JM000)

- 1) There may be final comments and questions from Washington Level Review. This task will address general comments from Washington. If successful response to comments require substantive change to the report or will require additional work by support elements, a cost increase may need to be negotiated. The general assumption is that there will not be major comments from this review.

J. Management Documents (JP000)

Project Management and Budget Documents (JPA00)

1) Project Management

Project management tasks and activities include tracking, controlling and reporting on overall project schedule and cost. The project manager also develops and negotiates the Project Management Plan for Planning Engineering and Design (PED) and negotiates and prepares Project Cooperation Agreements (PCAs). Meetings between the Corps and the Sponsor will be held periodically to coordinate and report on the status of the study tasks and activities and determine in-kind services and credits. The Project Manager (PM) will:

- a. Coordinate with the Sponsor's representative early in the study process to determine appropriate financial and performance measurements per the FCSA. The determined metrics will be coordinated and reported at determined times throughout the study process.
- b. Maintain study network.
- c. Coordinate with the Sponsor and negotiated status of in-kind services; coordinate cost-sharing procedures, management of budgets and schedules.

- d. Review reports and participate in meetings to ensure study is on track and is being prepared in accordance with Corps and Sponsor guidelines and requirements.

2) Budget Documents

Program Management activities include preparation of budget and financial reports, coordination of Congressional fact sheets and similar documents. Budgetary management responsibilities include:

- a. Interpret budgetary guidance.
- b. Submit project data sheets, justification sheets and other testimonial fact sheets as required;
- c. Monitor study funds, report budget forecasts, track obligations and expenditures, monitor project financial performance and coordinate with study and project managers.

3) Supervision and Administration (JPB00)

Supervision and administration costs are included in each of the work elements. A key component of this task is the involvement of the Executive Committee. The Executive Committee is defined in the FCSA. They will meet periodically to guide and direct overall study direction.

4. Contingencies (JPC00)

A contingency has been included in the feasibility study cost. The contingency amount applies to all work described in this PMP. It applies to all Corps efforts and Sponsor efforts. The contingency can be used to cover cost overruns or additional work to help ensure that the study progresses and remains on schedule.

K. PED Project Management Plan (L0000)

- 1) If an alternative has potential Federal interest, the PM will initiate work efforts to prepare a Project Management Plan (PMP) for the Planning Engineering and Design phase of the project. The PM will work with the study team and the Sponsor to ensure that the PMP will outline requirements during the PED phase. The PED PMP will be attached to and reference in the Project Cooperation Agreement (PCA).
- 2) In the case of the Arroyo Seco watershed feasibility study, there will be no direct PED Project Management Plan, since the primary purpose of the study will be to identify likely candidate sites for spin-off feasibility studies for the purpose of environmental restoration. The PED PMP will be done for each of those successive documents, as they will likely lead to actual implementation.

L) PED Cost Sharing Agreement (Q0000)

- 1) The PM is responsible to prepare and complete a negotiated Project Cooperation Agreement (PCA), which will reference the Project Management Plan for the Planning Engineering and Design phase of the recommended project. This task is for the PM and the Sponsor to develop and finalize a PCA.

- 2) As with the PED Project Management Plan, discussed above in paragraph K 2), there will be no direct PED Cost Sharing Agreement, since the primary objective of the study will be to identify likely candidate sites for spin-off feasibility studies for the purpose of environmental restoration. A PED Cost Sharing Agreement will be done for each of those successive documents, as they will likely lead to actual implementation.

CHAPTER V – RESPONSIBILITY ASSIGNMENT

1. ORGANIZATIONAL BREAKDOWN STRUCTURE

The scopes of work represent agreements between the Project Manager and first line supervisors of functional organizations. The functions of these organizations in support of the project are defined by the work that is assigned. All organizations responsible for tasks, including the local Sponsor and other agencies, are included with their organization codes in the following Organizational Breakdown Structure (OBS).

Table 2 - OBS: USACE LAD

Division/Branch/Section	Organization Code
	CESPL-
Engineering//	ED-
Engineering/Design/Civil Design A/	ED-DA
Engineering/Design/Structural/	ED-DC
Engineering/Design/Cost/	ED-DS
Engineering/Geotechnical/Geology	ED-GG
Engineering/Geotechnical/Soils	ED-GD
Engineering/Hydraulics & Hydrology/	ED-HH
Engineering/Survey & Mapping/	ED-GS
Planning//	PD-
Planning/Economics/	PD-E
Planning/Environmental/Cultural	PD-RL
Planning/Environmental/	PD-RN
Planning/Water Resources/	PD-W
Planning/Water Resources/Watershed Studies Group	PD-WW
Project Management//	PM-
Project Management/Civil/	PM-C
Project Management/Programs/	PM-P
Real Estate//	RE
Real Estate/Planning/	RE-P

Table 3 - OBS: Sponsor

Sponsor	Code
County of Los Angeles Department of Public Works	LACDPW

Table 4 - OBS: Other Agencies and Interests

Name	Code
U. S. Fish and Wildlife Service	USFWS
Other Agencies/Counties/Cities and other Interest Groups stated in the Public Involvement section (JI000) in Chapter IV.	OTHER

2. RESPONSIBILITY ASSIGNMENT MATRIX

Task responsibility is assigned based on the Work Breakdown Structure (WBS). Each main task has been assigned to an organization. For example: WBS JJ000 – Public Involvement is assigned to PD-WW, which is the Watershed Studies Group in the Planning Division. The Responsibility Assignment Matrix (RAM) is shown below.

Table 5 - Responsibility Assignment Matrix

WBS#	Description	Organization Code*	Sponsor**	Other
JAA00	Feas – Surveys and Mapping except Real Estate	ED-GS		
JAB00	Feas – Hydrology and Hydraulics Studies/Report (Coastal)	ED-H		
JAC00	Feas – Geotechnical Studies/Report	ED-G		
JAE00	Feas – Engineering and Design Analysis/Report	ED-D		
JB000	Feas – Socioeconomic Studies	PD-E		
JC000	Feas - Real Estate Analysis/Report	RE-P		
JD000	Feas – Environmental Studies/Report (Except USF&WL)	PD-R		
JE000	Feas - Fish and Wildlife Coordination Act Report			USFWL
JF000	Feas – HTRW Studies/Report	ED-G		
JG000	Feas – Cultural Resources Studies/Report	PD-R		
JH000	Feas - Cost Estimates	ED-DS		
JI000	Feas – Public Involvement Documents	PD-WW		
JJ000	Feas - Plan Formulation and Evaluation	PD-WW		
JL000	Feas - Final Report Documentation	PD-WW		
JLD00	Feas – Technical Review Documents	PD-W		
JM000	Feas – Washington Level Report Approval (Review Support)	PD-W		
JPA00	Project Management and Budget Documents	PM		
JPB00	Supervision and Administration	All		
JPC00	Contingencies	Not Assigned		
L0000	Project Management Plan (PMP)	PM-C		
Q0000	PED Cost Sharing Agreement	PM-C		

*Names for organizations codes are shown on Tables 2, 3, and 4.

**The Sponsor is not responsible for any of the tasks but is involved in the preparation and development of most of them.

CHAPTER VI – FEASIBILITY STUDY SCHEDULE

1. SCHEDULE DEVELOPMENT

The schedule was prepared based on the tasks and Work Breakdown Structure listed in Chapter III and IV. All tasks were coordinated with the study team members and approved by their respective supervisors.

2. FUNDING CONSTRAINTS

Funding for the first Fiscal Year of the feasibility study is normally limited because of the uncertainty in the initiation of the feasibility phase. Initiating this study is tied to receipt of funds from the Federal Government and from the Sponsor. Study initiation dates can be delayed due from delays in receipt of funding from either study partner. Budget prioritizes can and do change. The schedule is based upon unconstrained funding. Any changes from expected funding can cause schedule impacts.

3. LOCAL SPONSOR COMMITMENTS

The Project Manager and the Sponsor's representative will meet at the beginning of each Fiscal Year and identify two to five tasks that are important for the district to complete during the Fiscal Year. These commitments will be flagged in the PROMIS database and monitored and reported on accordingly. These commitments can coincide with the Milestones identified in the study schedule.

4. UNCERTAINTIES IN THE SCHEDULE

The reconnaissance study contains limited evaluation. As the study proceeds, the intended tasks and activities will be evaluated and refocused if necessary. A contingency has been included to account for small unintended, additional, tasks and activities necessary to complete an acceptable Feasibility Study. Changes to tasks and activities or adding other ones may require the schedule and cost to be readdressed.

5. MILESTONE SCHEDULE

The original milestone schedule that was indicated in the 905(b) Analysis, Chapter II, Section 9, page 2-21, has been revised; the current milestone schedule is now shown at the end of Chapter II, Section 15, page 2-24.

CHAPTER VII – FEASIBILITY COST ESTIMATE

1. BASIS FOR THE COST ESTIMATE

- A) The feasibility cost estimate is based on the costs that were identified for the individual tasks developed by the study team members and negotiated with the Sponsor. Study cost estimates include allowances for inflation, product cost increases, and other incidental increases in cost pressure. Significant inflation or increases in product costs could require the schedule and cost to be renegotiated.
- B) Contingency is included to adequately respond to uncertainty in the study tasks and activities. A relatively small amount of contingency has been planned as part of this study. Significant increases in cost will require cost and schedule renegotiations.
- C) Cost for Independent Technical Review (ITR) is separated by its own Work Breakdown Structure (WBS) Number. Seamless review and informal reviews for each task is included in the respective WBS estimate.
- D) Supervision and administration costs are included in each WBS estimate.
- E) Inflation and cost changes are assumed to be incidental. If either is significant this PMP will be revised and the associated costs negotiated.

2. COSTS FOR FEDERAL AND NON-FEDERAL ACTIVITIES

- A) The Sponsor and the Government will each contribute 50 percent of the study cost. The Sponsor's share can be in-kind work and/or cash. The cost estimate shows the Federal and Sponsor Cash and In-Kind credit by major Work Breakdown Structure Number described in Chapter III. The costs are shown in Enclosure C.

Feasibility Phase Cost Estimate by Work Task (\$X1000s)

<u>WBS#</u>	<u>Task Description</u>	<u>Total</u>
JAA00	Survey and Mapping	190,000
JAA00	Hydrology and Hydraulics Studies/Reports	536,000
JAC00	Geotechnical Studies	93,000
JAE00	Engineering Design	194,000
JB000	Socioeconomic Studies	75,000
JC000	Real Estate Analysis/Report	42,000
JD000	Environmental Studies/Report	329,400
JDF000	HTRW Studies/Report	19,000
JG000	Cultural Resources Studies/Report	58,000
JH000	Cost Estimates	60,700
JI000	Public Involvement	80,000
JJ000	Plan Formulation	230,000
JL000	Report Documentation	80,000
JLD00	Technical Review	135,000
JM000	HQUSACE Report Approval	50,000
JPA00	Project Management and Budget	140,000
JPB00	Quality Management Assurance	20,000
L0000	Project Implementation Phase PMP	0
Q0000	PED Cost-Sharing Agreement	0
	Sub-total	2,332,100
JPC00	Contingencies (@15%)	349,815
	TOTAL	2,681,915
	TOTAL (Rounded)	2,682,000

CHAPTER VIII – QUALITY CONTROL PLAN

1. QUALITY CONTROL PLAN OBJECTIVE

The quality control plan objective is to prepare and complete the feasibility phase while meeting or exceeding the customer’s requirements and expectation, and maintaining consistency with Corps policies, guidelines and regulations.

2. TECHNICAL REVIEW GUIDELINES

The guidelines for Independent Technical Review are set forth in the South Pacific Division Quality Management Plan, CESP R 1110-1-8, and in the corresponding District Quality Management Plan, CESPL-OM-1105-1-2.

3. STUDY TEAM MEMBERS

Organization	Name	Address	Phone
Planning/ Study Management	Brian Whelan	915 Wilshire Blvd. Los Angeles, CA 90017	(213) 452-3795
Environmental/ Coordinator	Tim Kennedy	915 Wilshire Blvd. Los Angeles, CA 90017	(213) 452-3878
Environmental/ Biological	Gale Campos	915 Wilshire Blvd. Los Angeles, CA 90017	(213) 452-3874
Environmental/ Cultural Resources	Pam Maxwell	915 Wilshire Blvd. Los Angeles, CA 90017	(213) 452-3877
Economics/ Economist(s)	Mark Bierman	915 Wilshire Blvd. Los Angeles, CA 90017	(213) 452-3827
Hydraulics and Hydrology/ H&H Coordinator	David Cozacos	915 Wilshire Blvd. Los Angeles, CA 90017	(213) 452-3555
Hydraulics and Hydrology/ Water Quality Specialist	James Chieh	915 Wilshire Blvd. Los Angeles, CA 90017	(213) 452-3571
Geotechnical/ Geologist	Ken Raabe	915 Wilshire Blvd. Los Angeles, CA 90017	(213) 452-3596
Geotechnical/ Soils Engineer	Theodore Ingersoll	915 Wilshire Blvd. Los Angeles, CA 90017	(213) 452-3586
Civil Design	Karsan Gohil	915 Wilshire Blvd. Los Angeles, CA 90017	(213) 452-3647
Structural Design	N/A		
Cost Engineering	Nathaniel Govan	915 Wilshire Blvd. Los Angeles, CA 90017	(213) 452-3739
Real Estate	Pete Garcia	915 Wilshire Blvd. Los Angeles, CA 90017	(213) 452-3131
Project Management	Darrell Buxton	915 Wilshire Blvd. Los Angeles, CA 90017	(213) 452-4007
County of Los Angeles Department of Public Works	Dan Sharp	900 S. Fremont Avenue 11 th Floor Alhambra, CA 91803-1331	(626) 458-4345
County of Los Angeles Department of Public Works	Vik Bapna	900 S. Fremont Avenue 11 th Floor Alhambra, CA 91803-1331	(626) 458-4312

4. TECHNICAL REVIEW TEAM MEMBERS:

The first review to be done by the review team is scheduled prior to the F3 milestone, which is about one (1) year into the study. Approximately three months prior to the F3 milestone a technical review team will be assembled. Invariable promotions and/or job changes require this action. However, the assembled team members will be experienced in their respective areas, sufficient to perform the review for the desired outcome as defined in guidelines.

5. DOCUMENTS TO BE REVIEWED AND SCHEDULE FOR REVIEW ACTIVITIES

- A) All the products listed in the detailed scopes of work in Chapter IV, will be subject to independent technical review. Seamless single discipline review will be accomplished prior to the release of materials to other members of the study team or integrated into the overall study. Section chiefs shall be responsible for their respective areas study input accuracy. Section chiefs will assure that the seamless review has occurred prior to any independent technical review.
- B) Independent technical review will occur prior to the CESP milestones that include product documents; the F3 (without project condition), F4 (with project condition), issue resolution conferences, F5 (draft document), and F8 (final document). These products shall be essentially complete before review is undertaken. Since this quality control will have occurred prior to each milestone conference, the conference is free to address critical outstanding issues and set direction for the next step of the study, since a firm technical basis for making decisions will have already been established. In general, the independent technical review will be initiated at least two weeks prior to each milestone and at least two weeks prior to any HQUSACE issue resolution conference.
- C) Independent Technical Review is the responsibility of the contractor for all contracted work. Quality assurance of the contractor's quality control will be the responsibility of the contract issuing organization.

6. DEVIATIONS FROM THE APPROVED QUALITY MANGEMENT PLAN

No deviations from the Quality Management Plan are proposed.

7. COST ESTIMATE FOR QUALITY MANAGEMENT

The cost for conducting independent technical review is shown in Chapter III. Supervision and Administration costs as well as seamless review costs related to Quality Management is included in each individual estimate grouped by Work Breakdown Structure described in chapter III. The cost for independent technical review is approximately \$135,000. The total estimated cost for Quality Management is \$20,000.

8. PMP QUALITY CERTIFICATION

The Chief, Planning Division has certified that 1) the independent technical review process for this PMP has been completed, 2) all issues have been addressed, 3) the streamlining initiatives proposed in this PMP will result in a technically adequate product, and 4) appropriate quality control plan requirements have been adequately incorporated into this PMP. The signed certification is included as Enclosure D.

9. FEASIBILITY PHASE CERTIFICATION

Independent technical review documentation shall be included with the submission of reports to CESPDP. Independent technical review documentation shall be accompanied by certification, indicating that the independent technical review process has been completed and that all technical issues have been resolved. The certification requirement applies to all documentation that will be forwarded to either CESPDP or HQUSACE for review or approval. The Chief, Planning Division will certify the pre-conference documentation for the HQUSACE issue resolution conferences and the draft feasibility report. The District Commander will certify the final feasibility report, which includes the signed recommendation of the District Commander. This certification will follow the example that is included as Appendix H of the CESPDP Quality Management Plan and will be signed by the Chief, Planning Division and the District Commander.

CHAPTER IX IDENTIFICATION OF PROCEDURES AND CRITERIA

1. EVOLUTION OF THE PMP

This PMP describes all activities from the initial tasks of the feasibility phase through the preparation of the final feasibility report, the project management plan for project implementation and design agreement, and concludes with the district's support during the Washington-Level Review. As this PMP is based primarily on existing information, it will be subject to scope changes as the technical picture unfolds. While this PMP includes tasks through the completion of the feasibility study, the level of detail in the scopes of work are greater for those tasks that occur prior to the first milestone conference. This plan will be reviewed at the first milestone conference and additional detail will be added to the scopes of work for the subsequent tasks. During the feasibility phase of the study, the current PMP, including the documentation of agreements on changes to the conduct of the study, will be addressed at each of the CESPDP milestone conferences and at the formal issue resolution conferences with HQUSACE, including the AFB and FRC.

2. THE PLANNING PROCESS

The Water Resource Council's Principles and Guidelines (P&G) is the basic planning guidance, which establishes a six-step planning process. This process is a conceptual planning sequence for developing solutions to water resource problems and opportunities. The Planning Manual and Planning Primer, both published by IWR provide excellent coverage of the planning process. The South Pacific Division also provides training in the six-step process. This six-step process will be followed during this study.

3. POLICY

The policies that govern the development of projects are contained in the DIGEST OF WATER RESOURCES POLICIES AND AUTHORITIES, EP 1165-2-1.

4. CORPS REGULATIONS

All of the Corps' current regulations are included on the HQUSACE homepage. The most important of these regulations is ER 1105-2-100, PLANNING GUIDANCE NOTEBOOK. Policy compliance review is addressed in EC 1165-2-203, TECHNICAL AND POLICY COMPLIANCE REVIEW. And, quality control is covered in the CESPDP Quality Management Plan, CESPDP R 1110-1-8. The review of the products will be accomplished with the review checklist that is provided in EC 1165-2-203 as Appendix B, POLICY COMPLIANCE REVIEW CONSIDERATIONS.

5. PROCESSING REQUIREMENTS

In addition to ER 1105-2-100, the South Pacific Division has provided additional guidance on the processing requirements for each of the milestone submittals. This guidance is contained in CESPDP-ET-P memorandum, dated 30 March 2000, subject: Processing of Planning Reports in the South Pacific Division.

CHAPTER X – COORDINATION MECHANISMS

1. CESPDP MILESTONES

Two of the milestones in the CESPDP milestone system have been established specifically for the purpose of providing a public forum to receive public input. The first of these is the initial public workshop. This workshop is an opportunity to present the study to the public, obtain input and public opinions, and fulfill the NEPA scoping meeting requirements. The second milestone in the system is the final public meeting. This meeting is after the release of the draft report for public review and is an opportunity to present the findings of the draft report to the public and receive public comment.

2. STUDY SPECIFIC PUBLIC INVOLVEMENT ACTIVITIES

In addition to the two public meetings mentioned above, this study includes one additional public outreach meeting in the two intervening years of the study. These meetings are designed to provide multiple opportunities for involvement of local and interested citizens and other interest groups and agencies. The Sponsor has primary responsibility for setting up and organizing these meetings. The Corps will participate in them. Although the specific dates of the meetings shall be determined by the Sponsor, it is anticipated that there would be one outreach meeting per year in calendar years 2006 and 2007.

ENCLOSURE A
STUDY AREA MAPS

ENCLOSURE B

**CESPD MILESTONE SYSTEM
FEASIBILITY PHASE**

MIL¹	MILESTONE NAME	DESCRIPTION
100	Initiate Feasibility Phase	SPD Milestone F1 ² – This is the date the district receives Federal feasibility phase study funds.
101	Feasibility Study Public Workshop	SPD Milestone F2 – This is a Public Meeting/Workshop to inform the public and obtain input, public opinions and fulfill scoping requirements for NEPA purposes.
102	Feasibility Study Conference, #1	SPD Milestone F3 – The Feasibility Scoping Meeting is with HQUSACE to address potential changes in the PMP. It will establish without project conditions and screen preliminary plans.
103	Feasibility Study Conference, #2	SPD Milestone F4 – The Alternative Review Conference will evaluate the final plans, reach a consensus that the evaluations are adequate to select a plan and prepare AFB issues.
124	Alternative Formulation Briefing (AFB)	SPD Milestone F4A – Alternative Formulation Briefing (AFB) is for policy compliance review of the proposed plan with HQUSACE to identify actions required to prepare and release the draft report.
145	Public Review of Draft Report	SPD Milestone F5 – Initiation of field level coordination of the draft report with concurrent submittal to HQUSACE through SPD for policy compliance review.
162	Final Public Meeting	SPD Milestone F6 – Date of the final public meeting.
130	Feasibility Review Conference	SPD Milestone F7 – Policy compliance review of the draft report with HQUSACE to identify actions that are required to complete the final report.
165	Feasibility Report w\NEPA	SPD Milestone F8 – Date of submittal of final report package to CESPD-ET-P, including technical and legal certifications, compliance memorandum and other required documentation.
170	MSC Commander’s Public Notice	SPD Milestone F9 – Date of issue of the Division Commander’s Public Notice. Congressional notification would occur two days prior. The report and supporting documentation would be forwarded to HQUSACE. This milestone is used as the completion of the feasibility report in the CMR.

¹ MIL – Milestone number used in the PROMIS database.

² F1 through F9 are the typical labels for the respective milestones and will be use by the Los Angeles District as well as SPD as reference to the Milestone.

MIL¹	MILESTONE NAME	DESCRIPTION
310	Filing of Final EIS/EA	Date that the notice appears in the Federal Register. Letters for filing would be furnished by HQUSACE.
330	Chief's Report to ASA (CW)	Date of the signed report of the Chief of Engineers.
320	ROD Signed or FONSI Signed	Date that the ROD is signed by the ASA(CW) when forwarded for authorization.
350	President Signs Authorization	Date President signs authorizing legislation.

¹ MIL – Milestone number used in the PROMIS database.

ENCLOSURE C
COST ESTIMATE

ENCLOSURE D

QUALITY CONTROL CERTIFICATION

COMPLETION OF QUALITY CONTROL ACTIVITIES

The District has completed the Project Management Plan for the Arroyo Seco Watershed, Los Angeles County, CA Feasibility Study. All quality control activities defined in the generic quality control plan for reconnaissance phase products have been completed. Compliance with clearly established policy principles and procedures, utilizing justified and valid assumptions, has been verified, including whether the PMP meets the non-Federal Sponsors needs and is consistent with law and existing Corps policy. All issues and concerns resulting from the independent technical review of the PMP have been resolved.

CERTIFICATION

Certification is hereby given that 1) the independent technical review process for this PMP has been completed, 2) all issues have been addressed, 3) the streamlining initiatives proposed in this PMP will result in a technically adequate product, and 4) appropriate quality control plan requirements have been adequately incorporated into this PMP. In summary, the study may proceed into the feasibility phase in accordance with this PMP.

Date

RUTH B. VILLALBOBOS
Chief, Planning Division

ENCLOSURE E

LIST OF ACRONYMS

AFB	Alternative Formulation Briefing
APE	Area of Potential Effect
ASA (CW)	Assistant Secretary of the Army for Civil Works
BA	Biological Assessment
BO	Biological Opinion
CAFG	California Department of Fish & Game
CEQA	California Environmental Quality Act
CESPD	Corps of Engineers South Pacific Division (also SPD)
CESPL	Corps of Engineers South Pacific Division, Los Angeles District
CMR	Command Management Review
CNDDB	California Natural Diversity Database
DE	Division Engineer (Division Commander)
DTM	Digital Terrain Model
EA	Environmental Assessment
EC	Engineering Circular
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EIR	Environmental Impact Report
EM	Engineering Manual (U. S. Army Corps)
EP	Engineering Pamphlet
EPA	Environmental Protection Agency
ER	Engineering Regulation
FCSA	Feasibility Cost Sharing Agreement
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
FRC	Feasibility Review Conference
FWS	Fish & Wildlife Service
GIS	Geographical Information System
GPS	Global Positioning System
H&H	Hydrology and Hydraulics
HEC-1	Hydrologic Engineering Center - Hydrology
HEC-2	Hydrologic Engineering Center - Hydraulics
HEC-FDA	Hydrologic Engineering Center - Flood Damage Analysis
HEC-HMS	Hydrologic Engineering Center –Hydrologic Modeling System

HEC-RAS	Hydrologic Engineering Center –River Analysis System
HEP	Habitat Evaluation Procedure
HU	Habitat Units
HQUSACE	Headquarters, U.S. Army Corps of Engineers
HTRW	Hazardous, Toxic and Radioactive Waste
LERRD	Lands, Easements, Right-of - Ways, Relocations, Disposal Areas
LIS	Land Information System
MCACES	Micro Computer Aided Cost Engineering System
MOA	Memorandum of Agreement
MSC	Major Subordinate Command
MUSLE	Modified Universal Soil Loss Equation
NAD	North American Datum
NAS	Network Analysis System
NAVD	North American Vertical Datum
NED	National Economic Development
NEPA	National Environmental Policy Act
NER	National Ecosystem Restoration
OBS	Organizational Breakdown Structure
OM	Operations Manual
P&G	Water Resources Council’s Principles and Guidelines
PCA	Project Cooperation Agreement
PED	Pre-construction Engineering and Design
PM	Project Manager
PMP	Project Management Plan
PPMD	Programs and Project Management Division
PROMIS	Project Management Information System
RAM	Responsibility Assignment Matrix
ROD	Record of Decision
S&A	Supervision and Administration
SAM	Sediment Analysis Model
SHPO	State Historic Preservation Officer
SMT	Study Management Team
SPD	South Pacific Division (CESPD)
TMDL	Total Maximum Daily Load
USFS	USDA Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geologic Survey

WBS Work Breakdown Structure
WRDA Water Resources Development Act