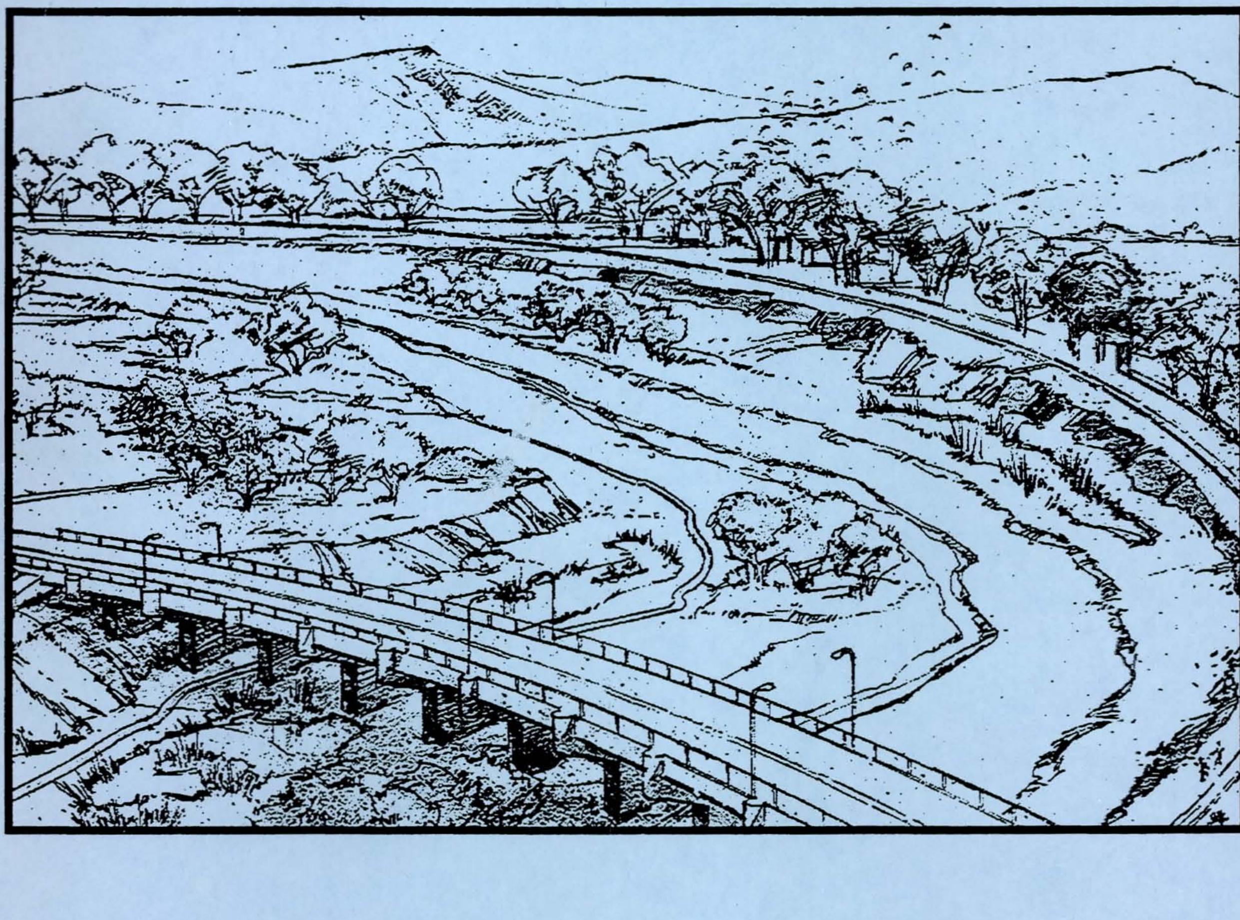
US ARMY CORPS
OF ENGINEERS
Los Angeles District
South Pacific Division

RIO SALADO
SALT RIVER, ARIZONA

FEASIBILITY REPORT
AND
ENVIRONMENTAL IMPACT STATEMENT



April 1998

CESPD-ET-P (April 1998) (1105) 1st End Sloan/tjm/415-977-8168
SUBJECT: Rio Salado, Salt River, Arizona, Feasibility Report and Environmental Impact Statement

DA, South Pacific Division, Corps of Engineers, 333 Market Street, Room 923
San Francisco, CA 94105-2195 April 10, 1998

FOR CDR USACE (CECW-AR), 7701 Telegraph Road, Alexandria, VA 22315-3861

I concur in the conclusions and recommendations of the District Commander.

J. Richard Capka

J. RICHARD CAPKA
Brigadier General, U.S. Army
Commanding

Executive Summary

This report presents the findings of a feasibility study of the Rio Salado, Salt River, Arizona. The study efforts were directed toward establishing the feasibility of environmental restoration with incidental recreation along the Salt River in Phoenix and Tempe, Arizona. Restoration efforts are required because upstream water projects have curtailed year-round water flows and converted the once perennial Salt River into a dry river bed devoid of habitat. This feasibility report is intended to: (1) provide a complete presentation of study results and findings, including those developed in the reconnaissance phase so that readers can reach independent conclusions regarding the reasonableness of recommendations; (2) indicate compliance with applicable statutes, executive orders and policies; and (3) provide a sound and documented basis for decisions makers at all levels to judge the recommended solution(s).

The two non-Federal sponsors identified were the Cities of Tempe and Phoenix, Arizona. A key initial activity of the feasibility effort was to work with the non-Federal sponsors to identify the study area and focus on the environmental restoration opportunities, with associated incidental recreation opportunities, within the defined study area. Upon initiation of the feasibility effort, the entire 33 mile reach studied under the reconnaissance phase was evaluated for potential environmental restoration. However, after discussion with the non-Federal sponsors, two specific sites were identified which would be of immediate interest in a cost-shared construction project.

The first site is located in Tempe, Arizona, on portions of the Indian Bend Wash and the Salt River and is hereinafter referred to as the "Tempe Reach." The second site studied in this feasibility report is located entirely in the Salt River within the City of Phoenix, Arizona and is referred to as the "Phoenix Reach." The total length of the Phoenix Reach is approximately 5 miles.

There is currently very little habitat found within either the Tempe or Phoenix Reaches. The desired habitat types for this area include mesquite habitat, cottonwood/willow habitat, wetland marsh, aquatic strand/scrub habitat, and open edges. Integral to the restoration of riparian habitat is providing sufficient water to irrigate the desired vegetation. After evaluation of several alternative water sources, groundwater was the selected source of water for restoration activities within both reaches.

A number of habitat restoration alternatives were developed in cooperation with the non-Federal sponsor and evaluated relative to their effectiveness, acceptability, and incremental economic efficiency. From the array of alternatives a plan was selected for each reach which was determined to be technically feasible, economically efficient, and environmentally sound according to the Federal water resources planning criteria. The selected plans would provide riparian habitat, marginal surface and groundwater quality improvement from well-head treatment and the natural filtering ability of wetland vegetation, and incidental aesthetic and recreational opportunities. Restoration within the Phoenix Reach would consist of 130 acres of mesquite, 99 acres of cottonwood/willow habitat, 58 acres of wetland marsh, 51 acres of aquatic strand/scrub habitat, and 187 acres of open edges. Restoration within the Tempe Reach would consist of 20 acres of mesquite, 50 acres of aquatic strand/scrub habitat, and 10 acres of open edges within Indian Bend Wash, as well as 10 acres of mesquite, 20 acres of cottonwood/willow habitat, 16 acres of wetland marsh and 24 acres of open edges within the Salt River.

The non-Federal sponsors have also expressed a desire to increase the passive recreation opportunities incidental to the restoration effort within the study area. The riparian habitat created by the selected restoration plans would be unlike any other resource in the metropolitan area. The selected recreation plans intend to create a wide variety of passive means to enjoy the resource, including viewing, picnicking, education, and exploring by foot, horseback or bicycle.

The total first cost of the project is currently estimated at $91,153,000 under October 1997 prices. The total first cost for construction of the selected restoration plans is $85,580,000, which includes $5,962,000 for the Tempe Reach and $79,618,000 for the Phoenix Reach. The total annual operations, maintenance, and associated non-Federal costs would be $2,021,000, which includes $230,000 for the Tempe Reach and $1,791,000 for the Phoenix Reach. The first cost for construction of the selected recreation plans is $5,573,000, which includes $686,000 for the Tempe Reach and $4,887,000 for the Phoenix Reach. The total annual operations and maintenance cost for the recreation areas would be $1,197,000, which includes $147,000 for the Tempe Reach and $1,050,000 for the Phoenix Reach. The period of analysis used to compute annual costs is 50 years with a discount rate of 7⅛ percent.

The analysis presented in this report shows that the selected plans are feasible and would provide environmental restoration benefits that serve the public interest. Therefore, it is recommended that the selected plans described herein for habitat restoration be authorized for implementation as a Federal project, with such modifications as in the discretion of the Chief of Engineers that may be advisable, and subject to cost sharing and financing arrangements satisfactory to the President and Congress.

Riparian habitat is especially significant in the arid southwest, and exhibits the majority of the functions and values typically present in a wetland system. The majority of riparian areas in Arizona exist as narrow, linear strips within the more arid habitats of chaparral and sage scrub. These riparian zones function as wildlife corridors and oases with respect to the surrounding arid regions. Overall, riparian habitats have declined by approximately 90% in the western United States, which further highlights the value of future restoration projects.

Table of Contents

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

Page

LIST OF FIGURES

LIST OF TABLES

PLATES

(Plates follow the main text)

APPENDICES AND TECHNICAL REPORTS

(under separate cover)

I. STUDY AUTHORITY

This report presents the findings of a feasibility study of the Rio Salado, Salt River, Arizona. The Salt River is a significant tributary to the Gila River in the state of Arizona. A location map is presented in **Figure 1.1.** This study has been conducted under the authority given in Public Law 761, Seventy-fifth Congress, known as Section 6 of the Flood Control Act of 1938. This authority, dated June 28, 1938, states "the Secretary of War (now Secretary of the Army) is hereby authorized and directed to cause preliminary examinations and surveys . . . at the following localities: . . . Gila River and tributaries, Arizona . . ."

Congress added renewed commitment to providing authority for the Corps to review prior reports in the State of Arizona by adopting House Resolution 2425 on May 17, 1994. HR2425 states that "the Secretary of the Army is requested to review reports of the Chief of Engineers . . . in the interest of environmental protection and restoration and related purposes." A copy of HR2425 is included as **Figure 1.2.**

Initial funding to begin a General Investigations, two-phase study was appropriated under the 1994 Senate Energy and Water Development Appropriations Bill. In this Bill, Congress directed the "Corps of Engineers to conduct a . . . study to investigate flooding and water quality problems in the Rio Salado area of the Salt River in Tempe and Phoenix. The study should consider water quality, recreation, and restoration of riparian habitat benefits as well as benefits traditionally displayed."

The Los Angeles District of the Corps of Engineers completed the first phase of the General Investigations study in March 1995. The results and conclusions of the first, reconnaissance, phase were presented in the Rio Salado, Salt River, AZ Reconnaissance Report, U.S. Army Corps of Engineers, Los Angeles District, South Pacific Division, March 1995. The recommendation of this report was that there was a Federal interest in proceeding to a second, feasibility phase of the General Investigation to explore "environmental restoration with incidental recreation . . . of the Salt River at Rio Salado, Tempe and Phoenix, Arizona." The Corps of Engineers' Headquarters certified the reconnaissance report on June 19, 1995 giving the Los Angeles District authority to move into the feasibility phase.

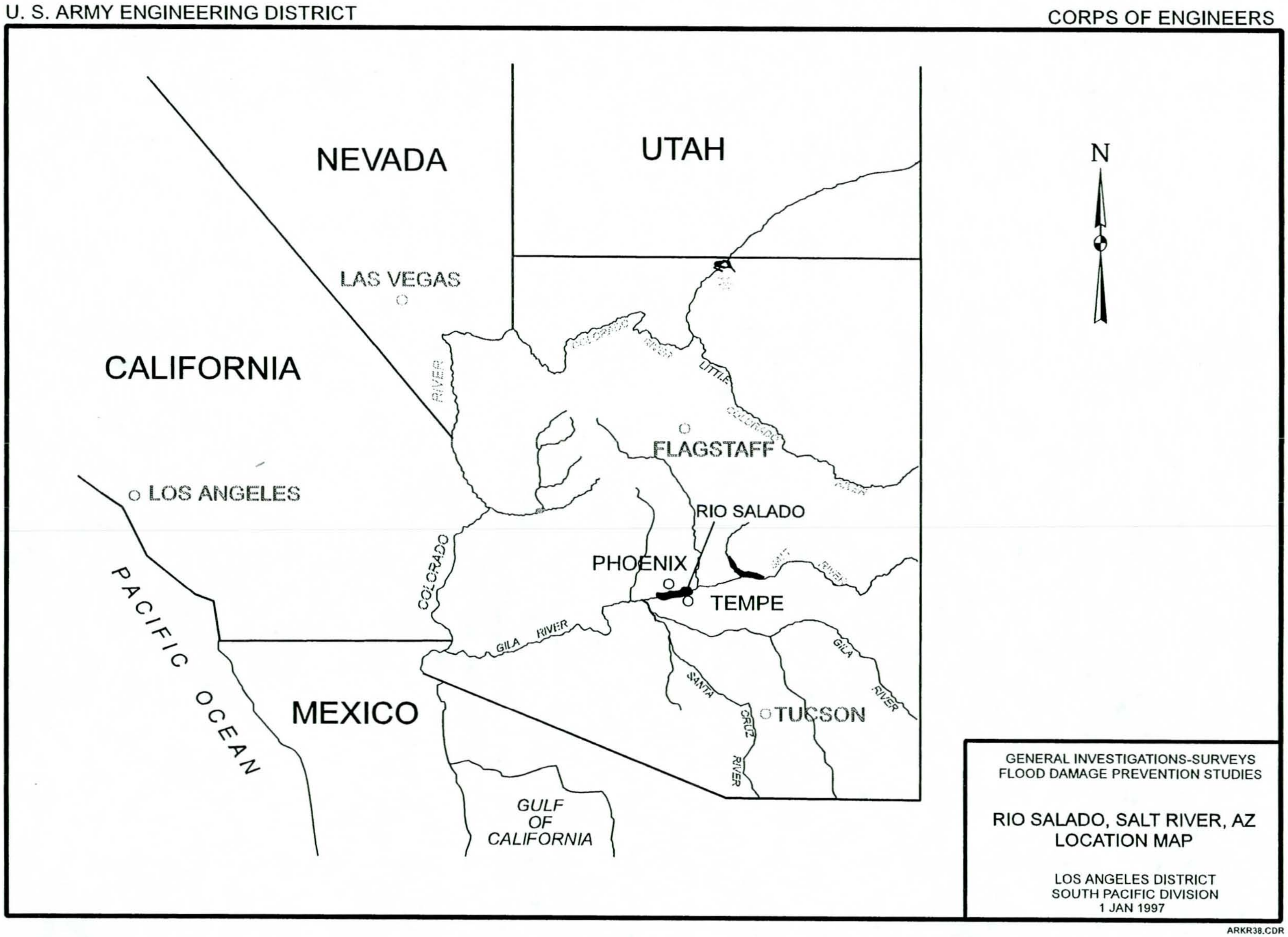


FIGURE 1.1
LOCATION MAP

FIGURE 1.2
HR2425

U.S. House of Representatives
COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION

SUITE 2165 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515
(202) 225-4472

COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION
U.S. HOUSE OF REPRESENTATIVES
WASHINGTON, D.C.

RESOLUTION

State of Arizona
Docket 2425

Resolved by the Committee on Public Works and Transportation of the United States House of Representatives, That, the Secretary of the Army is requested to review the reports of the Chief of Engineers on the State of Arizona, published as House Document 331, Eighty-first Congress, First Session; Senate Document 116, Eighty-seventh Congress, Second Session; Senate Document 127, Eighty-Seventh Congress, Second Session; House Document 625, Seventy-Eighth Congress, Second Session, House Document 648, Seventy-Eighth Congress, Second Session; Senate Document 63, Eighty-eighth Congress, Second Session; and other pertinent reports, to determine whether modifications of the recommendations contained therein are advisable at the present time, in the interest of flood damage reduction, environmental protection and restoration, and related purposes.

Adopted: May 17, 1994

ATTEST: [signature]
NORMAN Y. MINETA, Chair

II. STUDY PURPOSE AND SCOPE

A. Study Purpose

This feasibility study provides an interim response to the study authority cited in Chapter I. The study efforts were directed toward establishing the feasibility of environmental restoration with incidental recreation along the Salt River in Phoenix and Tempe, Arizona. The specific purpose of this feasibility study is to develop alternatives and recommend an implementable solution to the identified water resources problems to provide environmental restoration with incidental recreation. This report is intended to be a complete decision document that presents the results of both the reconnaissance and feasibility phases of the General Investigation effort. This feasibility report is intended to accomplish the following tasks:

(1) Provide a complete presentation of study results and findings, including those developed in the reconnaissance phase so that readers can reach independent conclusions regarding the reasonableness of recommendations;

(2) Indicate compliance with applicable statutes, executive orders and policies; and

(3) Provide a sound and documented basis for decisions makers at all levels to judge the recommended solution(s).

B. Study Scope

The reconnaissance phase of the General Investigation effort broadly covered water resource opportunities along the Salt River between Granite Reef and Gillespie Dams. The reconnaissance study area covered approximately 33 miles, including the metropolitan Phoenix area. The reconnaissance study area is presented in **Figure 2.1.** The opportunities explored during the reconnaissance phase included flood control, water quality, environmental restoration, and recreation. Upon conclusion of the reconnaissance phase of the study, a Federal interest was found in pursuing detailed feasibility studies of the environmental restoration with incidental recreation opportunities within the 33 mile reach of the Salt River.

The two non-Federal sponsors identified in the reconnaissance effort were the Cities of Tempe and Phoenix, Arizona. A key initial activity of the feasibility effort was to work with the non-Federal sponsors to identify the study area and focus on the environmental restoration opportunities, including incidental recreation, within the defined study area. Prior studies, reports, and existing information, as identified in Section III, was utilized to the maximum extent possible in identifying the study area.

Upon initiation of the feasibility effort, the entire 33 mile reach studied under the reconnaissance phase was evaluated for potential environmental restoration. As reported in the reconnaissance report, the entire 33 miles has experienced some degree of degradation. However, several areas are continuing to be impacted from sand and gravel mining, channelization, and other man made activities. Additionally, some areas within the 33 mile study area have limited non-Federal sponsor interest for participation in a cost-shared construction project. Therefore, after discussion with the non-Federal sponsors, two specific sites were identified which would be of immediate interest in a cost-shared construction project. **Figures 2.2 and 2.3** present the study areas to be included in this study.

To accommodate the Federal and non-Federal interest in the long term restoration of the entire 33 mile reach, this feasibility report provides an interim response, in that it focuses on the two immediate opportunity areas. Opportunities for other areas within the 33 mile study area would need to be addressed separately in the future.

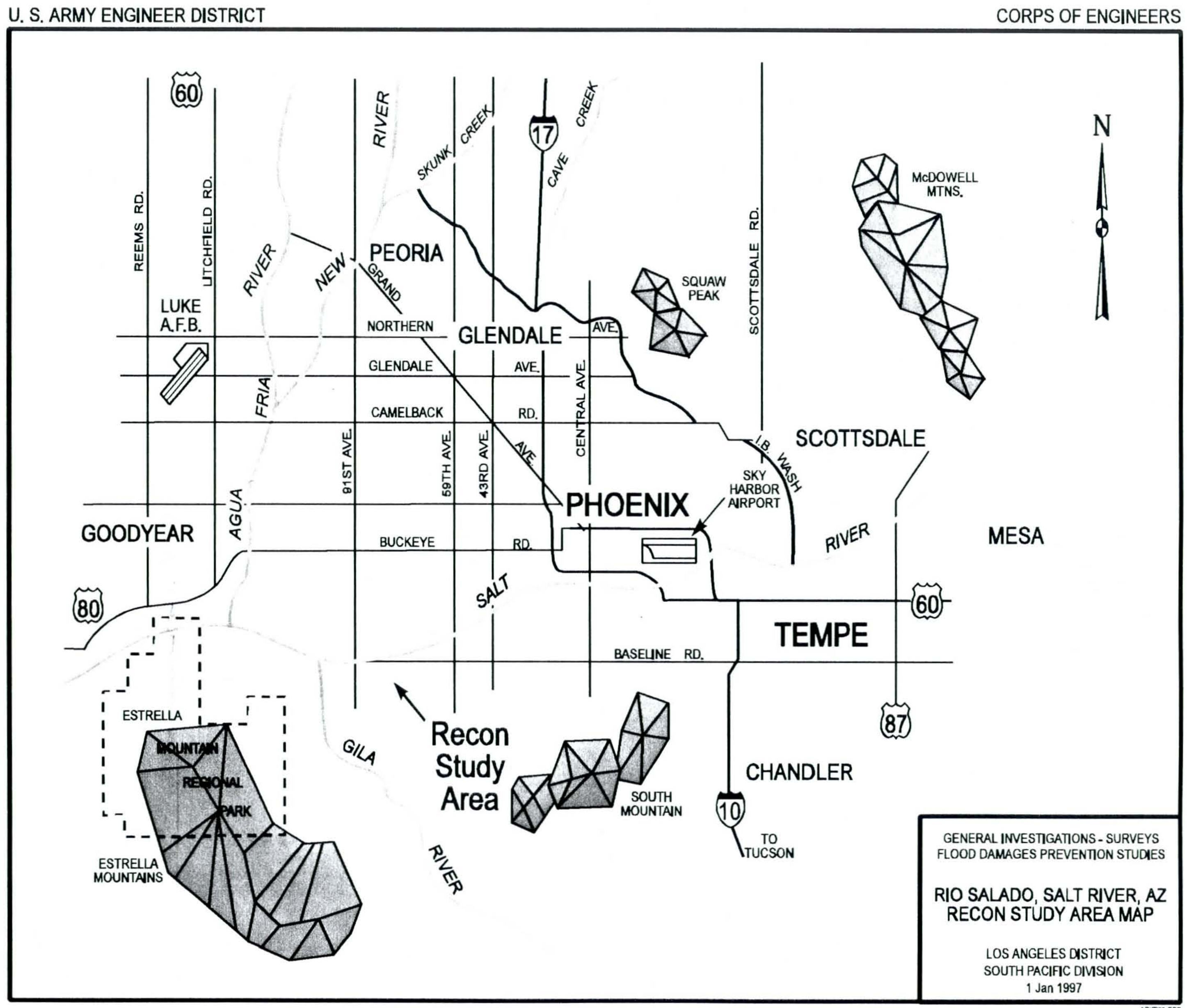
Tempe Reach

As stated above, the study area of this interim feasibility report was limited to two specific sites. The first site is located in Tempe, Arizona, on portions of the Indian Bend Wash and the Salt River. This area, hereinafter referred to as the "Tempe Reach" is shown in **Figure 2.2.** In the Tempe Reach, the Corps of Engineers constructed the outlet channel for Indian Bend Wash from McKellips Road south to the Salt River, a distance of 1.3 miles. The construction was completed in 1977. The completed project consisted of a low flow channel and a terraced bench between two levees.

The McKellips Road bridge crossing of the Indian Bend Wash is the upstream limit of the Tempe Reach. Existing dumped riprap in the low flow channel serves as the upstream limit. Between McKellips and Curry Roads, a municipal golf course now occupies the lands between the low flow channel and the outside levees. The golf course will remain in place. Restoration will be limited to the low flow channel in this section of Indian Bend Wash. Between Curry Road and the Salt River, the low flow channel and the bench between the outside levees remains bare dirt. In this section of Indian Bend Wash, restoration efforts will be examined both on the bench and in the low flow channel.

The Tempe Reach also includes an area within the Salt River. McClintock Road bridge is the upstream limit of the study area within the Salt River and Priest Drive is the downstream limit. Within the Salt River portion of the study area, construction of Tempe Town Lake is expected to be completed within two years. The construction of Tempe Town Lake began in August 1997.

FIGURE 2.1
RECONNAISSANCE STUDY AREA MAP



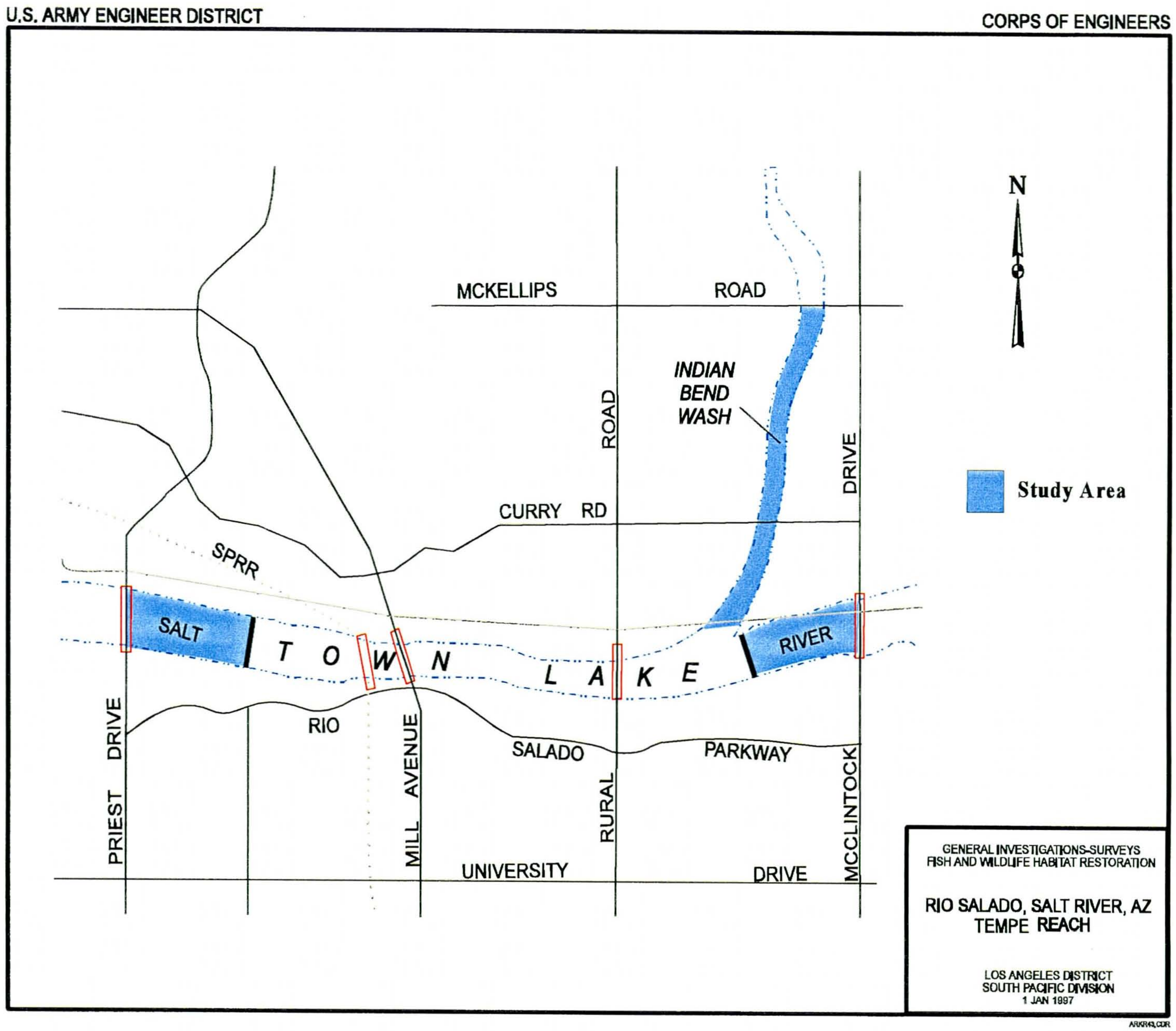


FIGURE 2.2
TEMPE REACH STUDY AREA MAP

Phoenix Reach

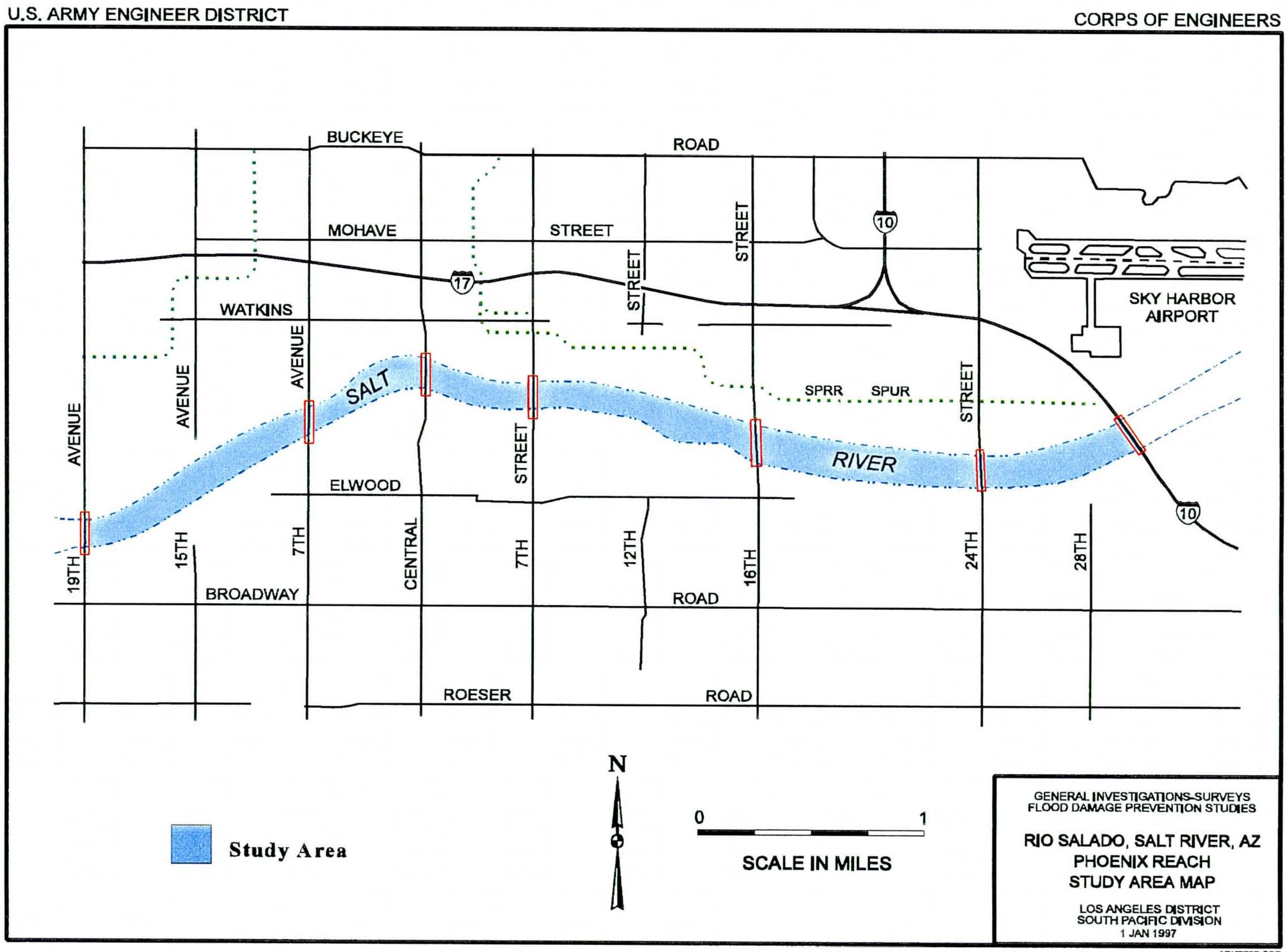
The second site studied in this interim feasibility report is located entirely in the Salt River within the City of Phoenix, Arizona. This is referred to as the "Phoenix Reach". The location of the Phoenix Reach is depicted in **Figure 2.3.** In pre-settlement times, the Salt River was one of the few perennially-watered riparian areas of the Sonoran desert with highly productive cottonwood, willow, and mesquite habitats. These areas were rich in habitat diversity, supporting a wide variety of wildlife species. As the lower Salt River Valley became developed, riparian habitat was degraded significantly. The upstream water projects curtailed year-round water flows and converted the once perennial Salt River into a dry river bed.

The Interstate 10 bridge is the upstream limit of the Phoenix Reach. A grade control structure on the downstream end of the bridge will serve as the starting point of the project. The 19th Avenue bridge was chosen as the downstream limit. At this location, a superfund remediation project is on-going for the 19th Avenue Landfill which is adjacent to the river. The total distance of the Phoenix Reach is approximately 5 miles. Old landfills and active gravel mining operations are present at many locations adjacent to the Phoenix Reach.

C. Scope Limitations

The results presented in this report are based on Corps criteria for determining Federal interest in developing and implementing solutions to water resource problems. The information presented in this report is to be used only to determine Federal interest and does not supersede or in any way affect the results of other studies conducted for other purposes.

FIGURE 2.3
PHOENIX REACH STUDY AREA MAP



III. PRIOR STUDIES, REPORTS AND EXISTING FLOOD CONTROL PROJECTS

Over 50 studies and reports have conducted or published on the Salt River since 1980 by various agencies and engineering firms. The topics of the reports or studies include water resources, flood control, recreation and urban development, and environmental assessment. Representative prior studies and reports are described by topic below.

A. Water Resources Type Studies or Reports

The Maricopa Association of Governments completed an overall conceptual plan for a Salt River redevelopment project in 1974 (Reference 2). The plan outlined water use and implementation recommendations and called for specific plans for two demonstration projects.

In 1978, the U.S. Army Corps of Engineers conducted a study which extended along the Salt River from the Gila River confluence to Granite Reef Dam (Reference 3). The study evaluated problems and alternative possibilities relating to flood control, waste water, flood water conservation, habitat restoration, and recreation. The study focused especially on the 16-mile reach between 27th Avenue in Phoenix and Country Club Drive in Mesa.

The U.S. Army Corps of Engineers investigated water and related land resources issues in the Phoenix Metropolitan area in 1981 (Reference 4). Issues discussed include water quality, flood-control, water conservation, and fish and wildlife enhancement. None of the projects proposed by local agencies, with the exception of flood-control along the Salt and Gila Rivers, were found to warrant Federal interest.

A Rio Salado Development District was created in the late 1970's and early 1980's. Their function was to investigate and implement a regional redevelopment of the Salt River. Maricopa County voters defeated the resolution to create a tax authority for the District. However, the District did conduct several studies. A published memorandum in 1982 provides a basis for the determination of a source of water for the redevelopment project (Reference 5). The memo identifies potential sources, gives general background on these sources, and provides a preliminary analysis of each.

Water Resources Associates, a private engineering consulting firm, conducted a study which evaluated the potential water sources and flood control options for a regional redevelopment of the Salt River in 1982 (Reference 6). Sources for domestic water include obtaining Central Arizona Project (CAP) allotment, obtaining water rights to surface runoff and groundwater, and from lands within the district. The source identified for aesthetic and recreational water was poor quality groundwater. Flood management plans were based on an existing condition scenario and also on an upstream flood control design condition.

Carr, Lynch Associates, a private engineering consulting firm, also conducted a study in 1982 which evaluated the potential water sources and flood control options for a regional project within the Salt River (Reference 7). This study included discussion of the physical structure of the project and its surroundings, the local social structure, the local economic situation, water supply, and flood-control.

In 1992, the U.S. Army Corps of Engineers completed the Central Maricopa County Reconnaissance Study (Reference 8). This study analyzes and describes flooding problems and water resource opportunities within the Phoenix metropolitan area to develop a wide range of alternatives that would reduce or eliminate these problems. Twenty three flood related problems were identified within Central Maricopa County. Two areas determined to have Federal interest were a flood control project on the Dysart Drain near Luke Air Force Base, and a water quality and environmental restoration project on the Salt River near 91st Avenue.

The Bureau of Reclamation completed the Conceptual Design for the Tres Rios Demonstration Wetlands in 1993 (Reference 9). The design was completed in cooperation with the City of Phoenix, Arizona Game and Fish, Arizona Department of Environmental Quality (ADEQ), Maricopa County Parks and Recreation, Maricopa County Flood Control District, and the EPA. The study evaluates methods for reclaiming water from sewage effluent from the 91st Avenue Regional Wastewater Treatment Plant and develops plans for using the reclaimed water. This report presents a conceptual design for a constructed wetland demonstration project designed to improve the quality of treated effluent currently being discharged to the Salt River.

Arizona State University completed a geomorphic assessment of the Salt River for the U.S. Army Corps of Engineers in 1994 (Reference 10). The assessment supports a reconnaissance-level geomorphologic evaluation of the Lower Salt River and a portion of the Gila River. The study discusses environmental history, the hydrologic system, the geomorphic system, and engineering features of the Salt River.

The City of Phoenix completed a report in 1994 which summarizes problems and issues that are part of the setting of the Salt River as it passes through the City (Reference 11). The report includes discussion of resources and activities that will be the basis of the area's restoration.

The U.S. Army Corps of Engineers completed the reconnaissance phase of the Rio Salado, Salt River, Arizona in 1995 (Reference 1). The report included an assessment of the problems and opportunities and an evaluation of alternatives for a 33 mile reach of the Salt River. A preliminary environmental assessment and a detailed habitat evaluation of the study area was included.

B. Flood Control Type Studies or Reports

The U.S. Army Corps of Engineers prepared a document in 1981 as a result of severe flooding along the Salt and Gila River (Reference 12). The flood damage reduction measures presented include discussion on flood proofing, relocation, floodplain regulations, preparedness planning, channel excavation, and evaluation of hydraulic structures.

Simons, Li & Associates, Inc, a private engineering consulting firm, prepared a report on the channelization of the Salt River through Tempe, Arizona in 1989 (Reference 13). The study addresses issues related to channel design, determines appropriate hydraulic design criteria, and presents several alternative design concepts. The engineering analysis includes the evaluation of alternative river sections, alignments and profiles. In addition, the study identifies potential impacts of the proposed changes.

The U.S. Army Corps of Engineers completed the Salt-Gila Reconnaissance Report in 1989 (Reference 14). This study focuses on the flooding problems and associated solutions downstream from the confluence of the Verde and Salt River to Gillespie Dam. It was determined that none of the alternatives presented were economically justified; therefore, the study did not proceed to the feasibility phase.

In 1994, the U.S. Army Corps of Engineers completed a bank stabilization study on the Salt River (Reference 15). The study focused on the portion of the Salt River within the Salt River Pima-Maricopa Indian reservation, east of Scottsdale, and within Maricopa County. Flood events in 1992 and 1993 caused erosion of landfill material into the Salt River. Several flood protection measures and alternatives were considered. The study concluded there was no Federal interest in participating in installation of bank stabilization at this location. Since that time, the Salt River Pima-Maricopa Indian Community initiated construction of bank stabilization for two of the landfill sites studied with Federal Emergency Management Agency (FEMA) funding.

The Flood Control District of Maricopa County completed a land use and structures inventory in 1994 (Reference 16). The inventory was published in a report which listed the various structures, utilities, and land use conditions along the Salt and Gila Rivers from Granite Reef Dam to Gillespie Dam.

In 1996, the U.S. Army Corps of Engineers, in cooperation with the U.S. Bureau of Reclamation, completed an analysis of various release plans for the modified Roosevelt Dam (Reference 17). As a result of this effort, a new release plan was developed for the Roosevelt Dam which showed significant reductions in discharges downstream. In addition, the hydrology for the lower Salt and Gila Rivers was updated to reflect the new operation schedule of the dam.

C. Recreation and Urban Development Type Studies or Reports

In 1978, the City of Tempe completed a preliminary design study which examined redevelopment alternatives of the Salt River through Tempe, Arizona (Reference 18). The alternatives presented were:(1) limited water facilities with a semi-desert environment, (2) maximum water facilities with a water-oriented environment, and (3) a quasi water oriented environment that represents a compromise of water use.

The City of Tempe completed the Rio Salado Plan in 1982 (Reference 19). This document serves as a guide for the Tempe City Council and its Boards and Commissions in making decisions concerning development and use for all lands within and bordering the Salt River through Tempe. The plan includes a statement of goals and policies for the improvement, development and use of lands, relationships of various land uses, and description of methods and programs.

In 1983, the Rio Salado Development District completed an economic analysis of the impacts that a redeveloped Salt River would have on the economy of metropolitan Phoenix (Reference 20). The study quantifies, on an annual basis, new public dollar revenues derived from increased property and sales tax revenues and income generated by a redevelopment project from the sale and/or lease of publicly-owned land in the project area. Conclusions from this study indicated that over a fifty year period, redevelopment of the Salt River corridor would provide $7.6 billion in public revenues and $2.4 billion in private benefits to the metropolitan region and the State of Arizona.

Carr, Lynch Associates, a private engineering consulting firm, completed a master plan for a regional redevelopment of the Salt River corridor in 1985 (Reference 21). The Master Plan involved the reclamation of nearly 10,000 acres of land which included the transformation of the present riverbed into a regional park and development of its banks for cultural, business, recreational, and educational uses. This master plan was never implemented.

Arizona State University College of Architecture & Environmental Design prepared a companion document to the City of Tempe Rio Salado Master Plan in 1988 (Reference 22). The ASU document combined development, organized sporting events, environmental concerns, economic interests and others to help guide future redevelopment initiatives.

In 1989, the City of Phoenix completed a South Village Redevelopment Plan (Reference 23). The plan established that redevelopment activities in this area of Phoenix must begin with rehabilitation and redevelopment of the Salt River as it passes through Phoenix.

In 1991, the City of Phoenix Planning Department completed a compilation of development goals for the City by the year 2015 (Reference 24). The report included discussion of the future role of the Salt River.

In 1992, CH_2MHill, a private engineering consulting firm, completed an engineering analysis for the City of Tempe (Reference 25). The analysis examines the engineering feasibility of creating a recreation lake as part of the redevelopment of the Salt River corridor through Tempe. Alternative methods of lake construction, alternative methods of protecting the lake from runoff, and alternative potential water supplies were presented in the report.

CH_2MHill completed a second document on a recreation lake for the City of Tempe in 1992, (Reference 26). This document continues the examination of the feasibility of a recreation lake within the Salt River in Tempe. The study includes information regarding the hydrogeology near the lake site and project feasibility. The study discusses how much water is required to create and sustain a lake in the Salt River channel. The preferred lake alternative has a water surface of approximately 165 acres. The construction cost ranges from $18,600,000 to $23,600,000.

The City of Tempe completed a draft master plan of the public art and events to be displayed or held within the area redeveloped along the Salt River (Reference 27). This document includes an assessment analysis and recommendations regarding three primary areas of interest: public art, cultural facility development, and cultural animation including festivals, exhibitions, and special events.

In 1994, the City of Tempe completed an economic impact analysis of a redevelopment project centering around a recreation lake and commercial developments within Tempe (Reference 28). This economic analysis updated information previously presented in the analysis of the regional redevelopment created by the Rio Salado Development District in 1983. The updated Tempe report analyzed the one-time economic impact of constructing all redevelopment features including the recreation lake, and the effect of the redevelopment on the existing businesses in Tempe. If the entire redevelopment master plan is constructed, total construction costs including commercial buildings was estimated to be $952,800,000.

The City of Phoenix conducted an economic analysis in 1994 (Reference 29). The analysis included a listing of development activities necessary to initiate and sustain economic development within the Salt River area of Phoenix. The key to redevelopment outside of the river corridor was redevelopment of the river itself.

D. Environmental Assessment Type Studies or Reports

In 1987, Dames & Moore, a private engineering consulting firm, completed an investigation of the waste sites within the Salt River bed (Reference 30). The study was performed for the Rio Salado Development District. The study area extended completely through the Phoenix metropolitan area. The study recommends a plan for the complete investigation and remediation of waste sites and provides an order-of-magnitude cost estimate for the implementation of the plan. Sixty-three landfills or dump sites were identified. The projected cost for investigation and remediation of waste sites range from $49,500,000 to $90,800,000.

The Arizona Department of Transportation completed an environmental assessment of the impacts due to the construction of the Red Mountain Freeway in 1987 (Reference 31). The freeway, which has since been constructed, passes alongside the Salt River from 52nd Street to past McClintock Drive in Tempe. The assessment considers the likely impacts and effects of the alterative selected for design, right-of-way acquisition, and construction.

In 1990, Howard Needles Tammen and Bergendoff conducted a mitigation study (Reference 32). This document presents mitigation measures intended to replace habitat lost due to construction of the Red Mountain Freeway. The mitigation measures proposed in this document have since been constructed.

In 1990, the City of Tempe completed an environmental assessment of the installation of soil cement levees on the Salt River through Tempe (Reference 33). This environmental assessment is a follow-up to flood protection required by the location of the Red Mountain Freeway. The study area represents the second half of a channelization program that encompasses the Salt River floodplain from the Southern Pacific Railroad Bridge east to McClintock Drive.

SCS Engineers, a private engineering consulting firm, prepared an environmental assessment of three sites along the Salt River for the City of Phoenix in 1993 (References 34, 35, and 36). The sites included an area on the north bank of the river between 10th and 16th Streets and two areas on the south bank of the river between Central Street and 16th Street. These site screening studies were performed to obtain information regarding environmental concerns that may impact redevelopment of the sites. The assessments concluded that the areas contained evidence of old landfill areas and it was recommended that further field investigation be performed to evaluate the potential presence of contaminants.

As a part of the Rio Salado Reconnaissance Study, the U.S. Army Corps of Engineers completed an environmental evaluation in 1994 (Reference 1). The evaluation presents a brief synthesis of present conditions, active and inactive locations of landfill sites, potential mitigation of upper aquifer contamination, preservation and/or reconstruction of habitat, and potential opportunities for recreation based on demand and economic feasibility. The study area covered 33 miles of the Salt River through the metropolitan Phoenix area. Included in the evaluation was a field reconnaissance conducted to determine the present habitat value of the vegetation within the Salt River. A total of 29 sites were assessed during the field study.

In 1997, Dames & Moore, a private engineering consulting firm, completed a groundwater quality survey in the vicinity of the proposed Rio Salado Habitat Restoration Project (Reference 50). The study was performed for the City of Phoenix Office of Environmental Programs. The objective of the report was to support project planning and design criteria associated with the groundwater supply wells, wellhead treatment, and water distribution system, and to evaluate potential impacts of the project's well field on existing groundwater contamination and remedial actions in the vicinity of the project.

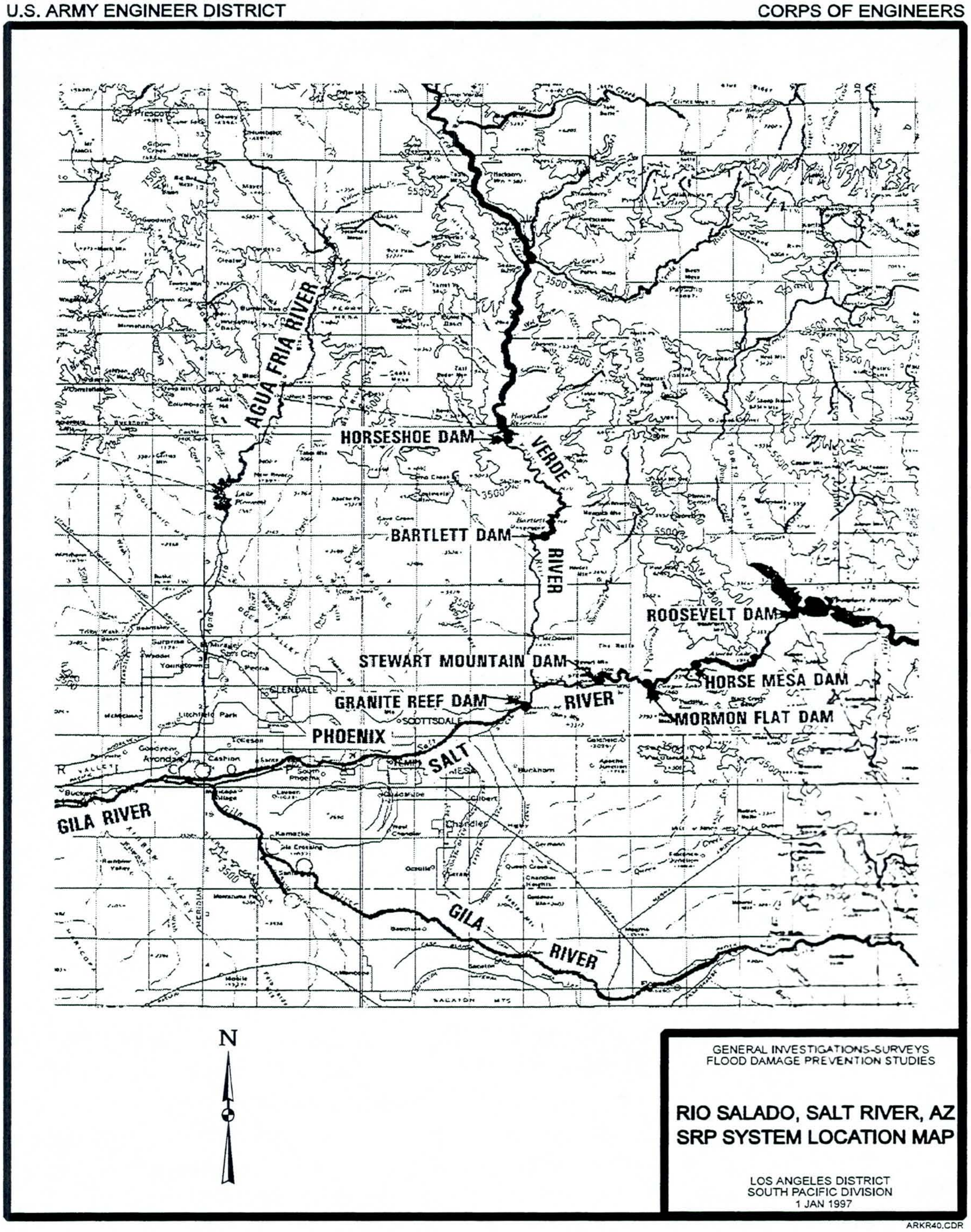
E. Existing Water Projects

<u>Salt River Project System</u>

Flows in the Salt River are controlled by a series of upstream dams built by the Bureau of Reclamation (BOR) and operated by the Salt River Project (SRP). The SRP system is comprised of six reservoirs and seven dams on the Salt and Verde Rivers as shown on **Figure 3.1.** The dams on the Salt River include Roosevelt Dam, Horse Mesa Dam, Mormon Flat Dam, Stewart Mountain Dam, and Granite Reef Dam. Horseshoe Dam and Bartlett Dam are found on the Verde River. The reservoirs receive runoff from a combined watershed of more than 12,600 square miles.

Roosevelt Dam is the oldest and largest in the SRP system. It was originally authorized by Congress in 1903 for water supply and power generation. The construction of the dam was completed in 1911. In 1978, Congress authorized the modification of Roosevelt Dam. The modifications were to include a new storage allocation for flood control. The modifications to the Dam began in 1989 and were completed in 1996. The Dam is expected to be operated under a new Water Control Manual (Reference 17) beginning in 1997.

FIGURE 3.1
SRP SYSTEM MAP



Indian Bend Wash

In the Flood Control Act of 1965, the Corps of Engineers was authorized to construct the Indian Bend Wash Flood Control Project in Scottsdale and Tempe, Arizona. The construction of the project began in 1973 and was completed in 1982. The project included an inlet, collector and side channels, a siphon, a greenbelt floodway, and an outlet channel. The location of the project features are depicted on **Figure 3.2.**

The inlet is an earthen channel from Indian Bend Road south to McDonald Drive. The inlet collects flood flows and conveys them into the greenbelt floodway. A series of collectors and side channels collect flood waters that once were impounded behind the north bank of the Arizona Canal and conveys them into the earthen inlet. The greenbelt floodway is 7 miles long and varies from 480 to 1,100 feet wide. It extends from McDonald Drive south to McKellips Road. The greenbelt includes parks, golf courses, fishing lakes, trails and other recreational features. The outlet channel extends 1.3 miles from McKellips Road south to the Salt River.

Tres Rios Demonstration Project

The Phoenix Metropolitan area is serviced by a regional wastewater treatment plant located at 91st Avenue and the Salt River. The plant discharges approximately 154 million gallons per day (mgd) of effluent to the Salt River. The treatment plant is operated by the City of Phoenix on behalf of the Multi-City Subregional Operating Group (SROG). SROG represents a consortium of cities including Phoenix, Mesa, Glendale, Tempe, Scottsdale, and Youngtown.

In 1992, the BOR was authorized by Sections 1605 and 1608 of Public Law 102-575 to participate in the development of a demonstrations wetlands project at the 91st Avenue plant. In 1995, the SROG and the BOR built the Tres Rios Demonstration Project within the floodway of the Salt River below the 91st Avenue plant. The location of this project is shown in **Figure 3.3.** The Tres Rios project provides final treatment of approximately 2 mgd of effluent. The project consists of 10 acres of constructed wetlands and research facilities. The City of Phoenix and the BOR operated and monitor the wetlands, collecting water quality readings, water use readings, and plant and animal counts.

Salt River Channelization

In 1996, the Arizona Department of Transportation (ADOT) and the Maricopa County Flood Control District (MCFCD) completed channelization of the Salt River from 48th Street to Price Road, a distance of approximately 7.5 miles. The channelization included soil cement and gabion bank protection with grade control and drop structures. The channelization is designed to convey flood waters and eliminate erosion and channel migration. The design capacity is just over 250,000 cfs at Rural (Scottsdale) Road bridge. The construction also included a construction of a defined confluence with Indian Bend Wash.

FIGURE 3.2
INDIAN BEND WASH FEATURE MAP

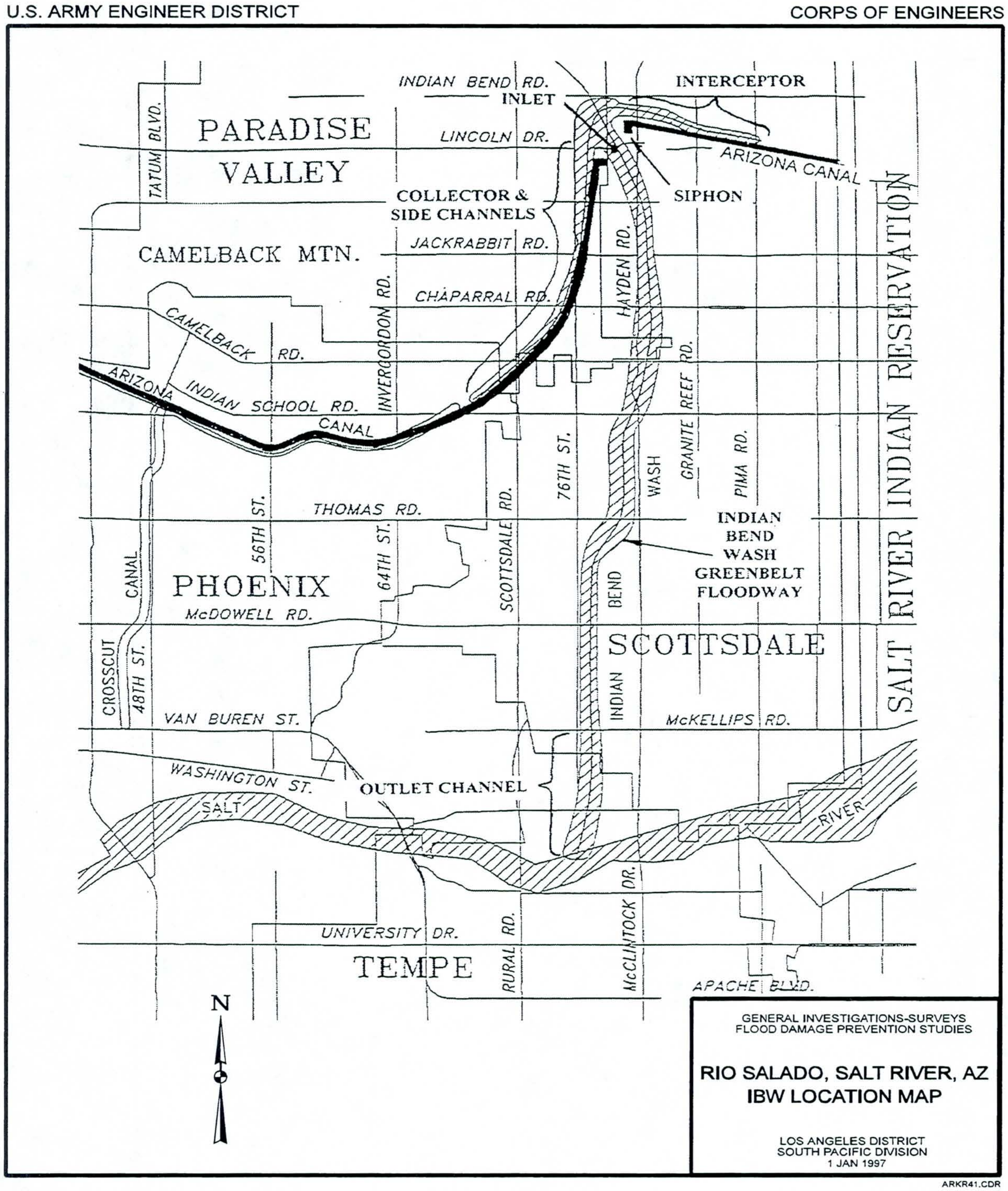
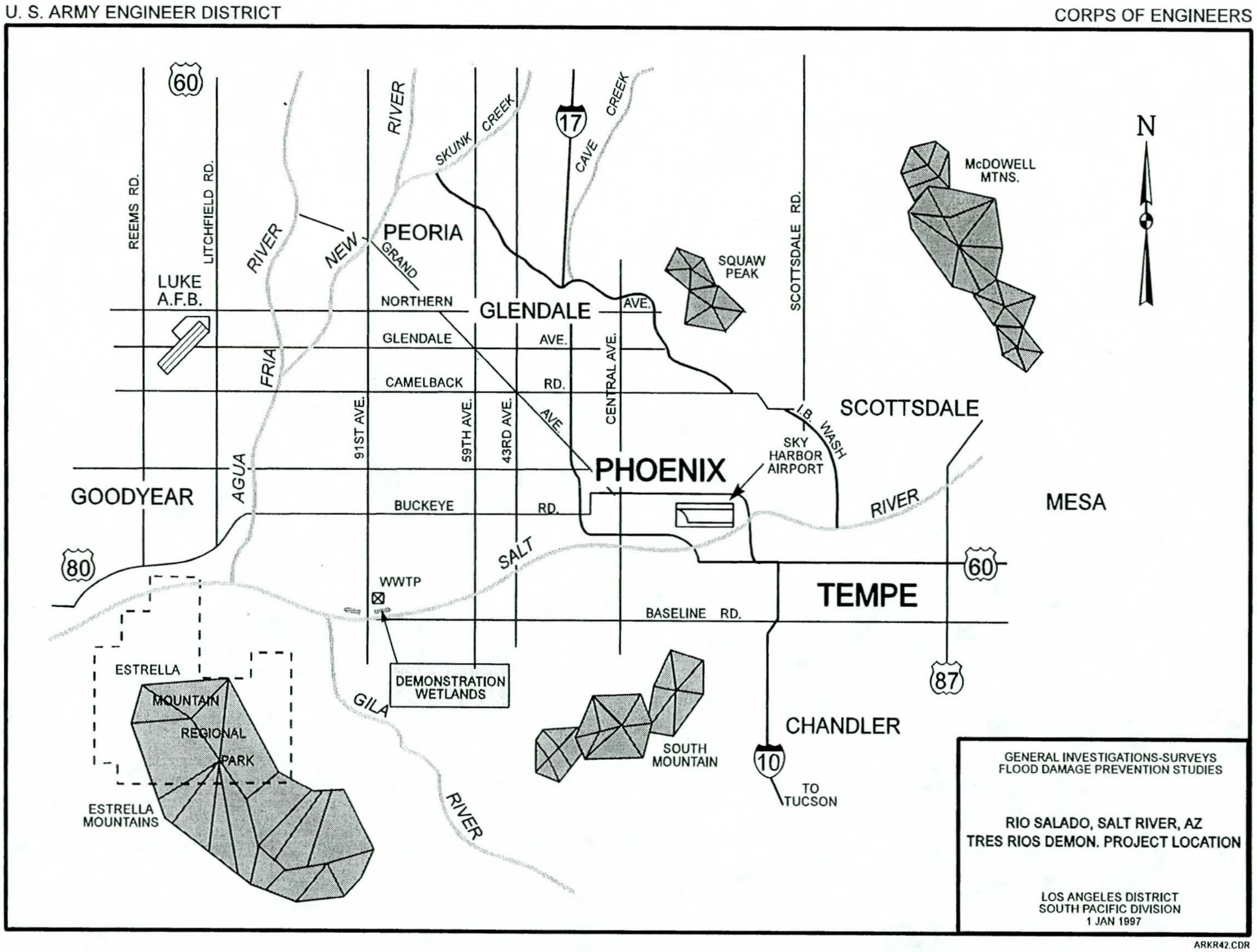


FIGURE 3.3
TRES RIOS DEMONSTRATION PROJECT LOCATION MAP



Tempe Town Lake

The City of Tempe, together with private developers, are proceeding with construction of Tempe Town Lake. The location of Town Lake is presented in **Figure 3.4.** The project will include installation of two inflatable dams within the Salt River bed. The dams are located approximately two miles apart at the Center Parkway alignment and just upstream of the confluence with Indian Bend Wash. The dams will contain a 200 acre lake that is approximately 600 feet wide with an average depth of 12 feet. The lake will contain approximately 3,500 acre-feet of water. The City of Tempe is currently reviewing potential water sources for the Tempe Town Lake. The most likely source of water is from the Central Arizona Project (CAP). This water could be transported to the site using the Salt River Project's (SRP) delivery system. The project features also include an extensive seepage control system which consists of multiple groundwater pumps. As the water infiltrates into the river bed, the pumps will recover the water and place it back into the lake. Together with a small amount of make-up water, the recovery system will keep the lake water surface at a constant elevation.

Tempe Town Lake has not been constructed as of the writing of this report. However, the City of Tempe began the construction of the lake in August 1997. Therefore, for the purposes of this Interim Feasibility Report, Tempe Town Lake is assumed to be in place for the without-project condition.

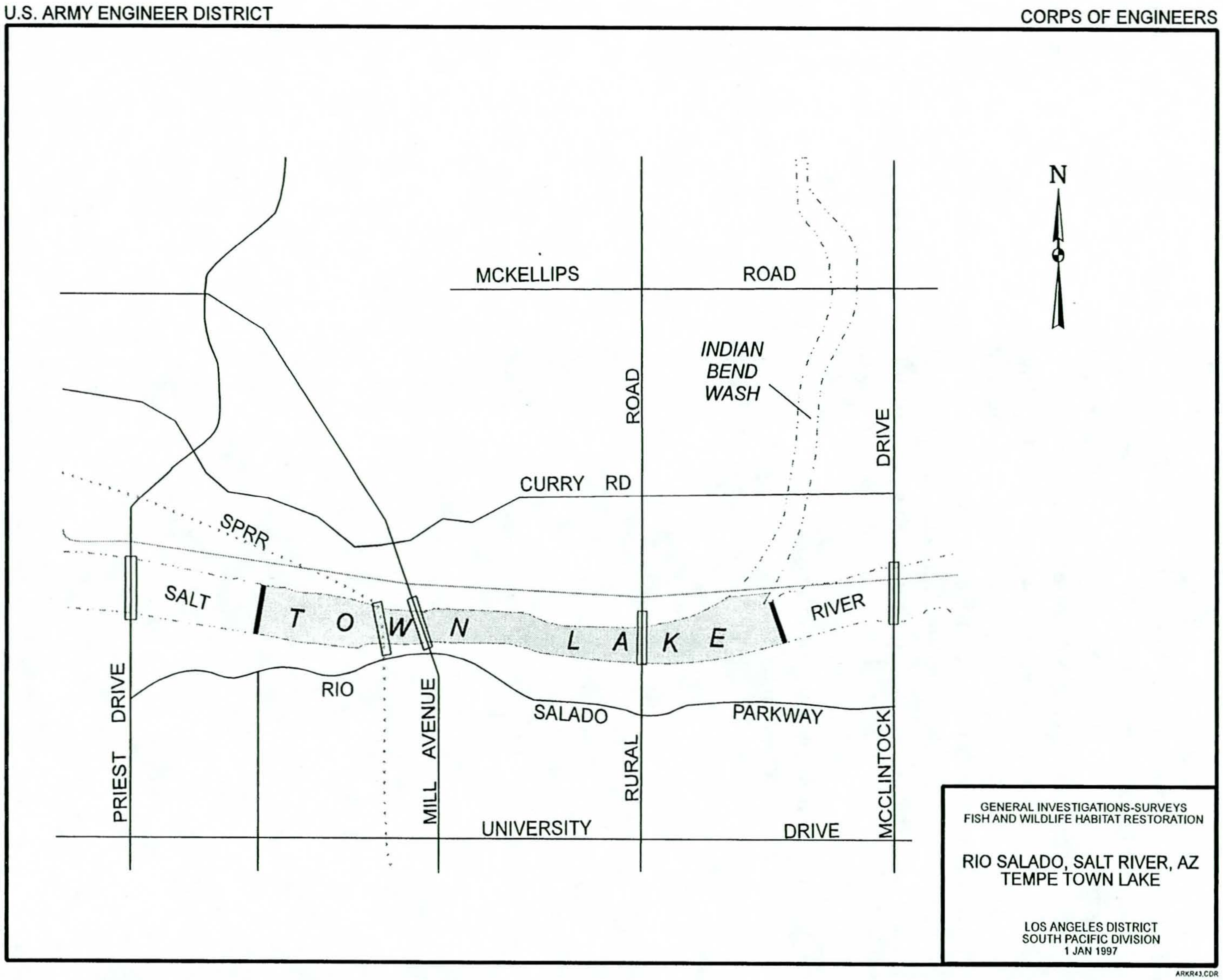


FIGURE 3.4
TEMPE TOWN LAKE

IV. PROBLEMS AND OPPORTUNITIES

The Salt River has been extensively utilized for irrigation since prehistoric times. In the 1800's, settlers reestablished many historic irrigation canals that were constructed by the Hohokam Indians. Since then, the Phoenix metropolitan area has established itself around the river. With a population of nearly 2.6 million people, the river has presented many challenges. Because of this, the problems and opportunities of the Salt River have been studied extensively. The opportunity now exists to restore riparian habitat along certain reaches of the Salt River within the metropolitan Phoenix area.

In general, riparian areas occur along stream banks where soils are fertile and water is abundant for at least some portion of the year (Faber et al., 1989). The term "riparian" has been defined as:

> *"Pertaining to the banks and other adjacent terrestrial (as opposed to aquatic) environs of freshwater bodies, water courses, and surface-emergent aquifers (springs, seeps, oases) whose transported waters provide soil moisture significantly in excess of that otherwise available through local precipitation"* (Warner, 1983).

The single factor that defines riparian habitat is the presence of a stream or river. Riparian habitats are especially significant in the arid southwest, and exhibit the majority of the functions and values typically present in a wetland system (Brinson et al., 1981). The majority of riparian areas in Arizona exist as narrow, linear strips within the more arid habitats of chaparral and sage scrub. These riparian zones function as wildlife corridors and oases with respect to the surrounding arid regions (Warner and Hendrix, 1985). The resulting microclimate within these areas provides habitat for species which would not otherwise survive the summer (Brode and Bury, 1984). In general, species diversity is higher in riparian areas than in the neighboring upland areas (Warner and Hendrix, 1985). Overall, riparian habitats have declined by approximately 90% in the western United States (US Department of the Interior, 1994), which further highlights the value of future restoration projects.

A. Historical Conditions

The Salt River

Historically, gallery forests of cottonwoods and willows covered hundreds of miles along the lower reaches of rivers like the Salt in the desert southwest. Optimal conditions for these forests were found along the Lower Salt River prior to 1900. Cottonwood and willow forests are typically found in depositional environments where fine grained alluvial soils are located on flood plains. These forests commonly occur with other riparian areas because fluvial processes such as floodplain aggradation and channel meandering create environmental gradients and mosaics, in for example water table depth and inundation frequency, which favor diverse riparian species assemblages. The Lower Salt River was historically a perennial stream fed by snowmelt from the mountains to the east and the highlands to the northeast. Its clear, streaming waters contrasted with the muddy, sluggish Gila River to the south and west. Flows within the Salt

River had a distinct seasonal pattern, with highest flows occurring in December and January and lowest flows in October. The river had many channel meanders, sand bars and backwater areas that were conducive to riparian growth.

Prior to dam construction in the early 1900's, the Salt River riparian vegetation was dominated by cottonwood, willow and the various species of mesquite. This suite of vegetation is considered to be representative of the natural species that would be found in an undisturbed riparian corridor along the Salt River. Mesquite is typically found along the outer bank of the river, at the outer edge of the natural riparian vegetation. The willow and cottonwoods were located inward of the mesquites, adjacent to the low flow channel and closer to a more continuous flow of water. Some channel areas were barren, while others had vegetation in strips along the low flow channels and abandoned high flow channels.

The bottom lands of the Salt River supported a variety of vegetation, including trees, shrubs, marsh plants, and some grasses. Large cottonwood, willow, and alder trees grew along the margins of the river, and mesquite, greasewood, palo verde, and sagebrush covered the low terraces. Dense mesquite and other shrubs made crossing the bottom land impossible in places, while in other locations the vegetation was more scattered. There Salt River was also once home to several species of fish, similar to those currently found in the Gila River.

Large, dense mesquite forests or bosques are found along lake shores and river floodplains in southern Arizona. Mesquite bosques were once the most abundant riparian type in the Southwest. Most modern mesquite bosques are large (typically one mile long and 600 feet wide), but these are small compared to pre-development bosques which extended for miles. Mesquite bosques are usually found in the drier areas within the riparian continuum. Mesquite can be found in floodplains or low terraces several yards above the stream bed, and up to 45 feet above the water table.

Indian Bend Wash

Historically, Indian Bend Wash contained abundant mesquite trees. Several areas included high quality, undisturbed, mesquite bosque communities that provided excellent riparian habitat. Since the flow in the wash was associated with rainfall events, cottonwoods and willows were not found along its length. The infrequent flows in the wash were a result of storm water runoff that traveled off the alluvial plains to the wash by sheet flow. Soils in this area are extremely fine grained and little stream meander or backwater areas existed.

At the confluence with the Salt River, the wash entered the river in an upper terrace of the river. Today, the bed of the wash is nearly 30 feet higher in elevation than the Salt River at the confluence. This area was particularly abundant in mesquite trees and served as an important habitat site. From this location, wildlife could take advantage of both the Salt River and the Indian Bend Wash riparian corridors for food and water.

B. Existing (Without-Project) Conditions

In the early 1900's the conditions of the Salt River and Indian Bend Wash (IBW) began to change. These areas have been radically altered from their historic condition, largely due to area water projects. The U.S. Bureau of Reclamation began construction of the Salt River Project (SRP) system in 1903. The SRP now consists of a series of seven dams and six reservoirs in the Salt and Verde River watersheds. The water supply and hydropower benefits that the dams provided led to the economic development of the Phoenix metropolitan area. Phoenix has grown from a small settlement that supplied food and animal feed to the regional Army outposts and mines to its current population of 2.6 million people. Despite the economic success of the SRP project, the resulting environmental impacts have devastated the Salt River downstream of the Granite Reef Dam.

Due to damming and diversions, perennial flows on the Salt River have ceased. This has resulted in serious environmental impacts to natural wildlife habitat and riparian communities along the Salt River. The elimination of the historic base flow has limited Salt River flows to infrequent regional flood events. The groundwater table beneath the river began to decline. The soil moisture in the river bed has been virtually eliminated, and the native cottonwoods, willows and riparian ecosystem rapidly died out. Most areas of the Salt River are barren today. The little vegetation that does exist is mostly limited to salt cedar (Tamarisk), a non-native species with little habitat value.

The environmental impacts of the SRP system and other area flood control projects on the environmental conditions of the Salt River and Indian Bend Wash were quite significant. Additional alterations to the natural system have led to a multitude of environmental problems within the two study reaches. The existing conditions in the Salt River and Indian Bend Wash are summarized in the following sections. Additional information on the various topics can be found in the Appendices to this Feasibility Report.

Riparian Habitat

The Salt River below Granite Reef Diversion Dam is essentially devoid of vegetation since the river is dry for most of the year. Only disturbed vegetation occurs on sand bars and terraces. The vegetation is primarily of low quality salt cedar (tamarisk) and desert broom with scattered cottonwood, seep willow, and rabbit bush. There are 880 acres in the Phoenix Reach and 140 acres in the Tempe Reach that are being considered for restoration. Out of the entire 1020 acres under consideration, only 4.6 acres contain what could be classified as riparian habitat.

The habitat values of various sites along the Salt River were determined through the use of a Habitat Evaluation Procedure (HEP) during the completion of reconnaissance efforts. The HEP analysis evaluated two riparian sites that lie in the Phoenix Reach. One site is located at the mouth of Tempe Drain, just west of I-10 bridge. This 4.6 acre site is intact and continuing to provide habitat for a number of birds despite its location near the interstate and airport. It contains willows, cottonwoods, and other riparian species. The effluent from the Tempe Drain provides the water source to support this habitat area. The second site was located in the Salt

River on the east side of 19th Avenue. This site was impacted during the construction of the 19th Avenue Landfill remedial action. Although this site provided only limited habitat value, the impacts were mitigated with a landscaping plan.

Indian Bend Wash contains a golf course on the bench upstream of Curry Road which is planted with bermuda grass, eucalyptus and other non-native trees. The bermuda grasses have invaded the low flow area and are now a maintenance problem for the golf course. Downstream of Curry Road, a few mesquite trees remain as visible reminders of the bosque that once occupied the area. Otherwise, the land is barren and is composed of mostly river run stone.

As wildlife depends on the vegetation for food and cover, the lack of vegetation in the two study reaches makes the area, in its present condition, unsuitable as wildlife habitat. Only small birds, small mammals, and reptiles tolerant of very disturbed conditions in a dry arid environment can inhabit the area. Some birds and mammals that may inhabit the area are the black-tailed jackrabbit, Merriams kangaroo rat, mourning dove, longnose leopard lizard, and the short-horned lizard. There are no fish species living in either of the two study reaches. Additionally, no Threatened or Endangered Species are known to inhabit the two study reaches.

Several areas of existing habitat are shown on **Plates 4-1 through 4-5.** With the exception of the site at the mouth of Tempe Drain, the existing habitat is of extremely low quality, consisting of open water or scattered bushes. For additional information concerning the riparian habitat of the two study reaches, please refer to **Appendix C, Economics** or the Environmental Impact Statement of this report.

Geology and Geomorphology

Within the study area, the Salt River flows through a major valley with a relatively flat floor of deep alluvium. Soils in the vicinity of the channel are of the hyperthermic torrifluvents association, a group of soils that are well-drained to excessively well-drained on nearly level or gently sloping surfaces. They are often sandy to gravelly, but may include lenses of finer particles. These soils are often redistributed by water flows associated with nearby active channels.

The Lower Salt River is associated with three pediment-inselberg complexes in the surrounding terrain: Spook, Papago and Bush Pediments. A pediment is usually an erosional ramp-like feature. It is a common feature found in most of the semiarid regions of the world. Pediments form at the base of mountains or extend outward from the base of an inselberg. The term inselberg refers to an isolated hill of solid rock.

Pediments can be characterized by two relatively easily identifiable qualities: (1) well-defined "break in slope" (a severe gradient change) between the pediment surface and the inselberg hill slope of the same rock type and (2) a bedrock surface, in some cases covered with a layer alluvium not more in thickness than $^{1}/_{100}$ of the width of the pediment. Geomorphologists are still uncertain as to how pediments form. One theory suggests that pediments are relic features formed when the climate was different and have not been altered since then. Another theory suggests that pediments are caused by deep weathering of rock during moist periods followed by striping of the weathered material by erosion. Regardless of their formation processes, the slopes along the Lower Salt River appear to supply the river with small amounts of sediment compared to the direct fluvial inputs.

From Granite Reef Dam to the City of Tempe, the surrounding geology north and south of the river changes from bedrock outcroppings to valley fill and alluvium. Valley fill has been accumulating since the onset of the basin and range formation, so that in many portion of this reach of the river the fill is greater than 1000 feet deep. The underlying bedrock surface is below sea level in many areas. The valley fills tend to be more coarse near the mountain fronts, and more fine in the interior of the valley. Near the Salt River, the valley fills have been eroded as the river formed terraces during its evolution.

Most of the interior valley floor is covered by coarse to fine grained alluvium. This material has been continuously deposited by the shifting channels of streams draining the mountains. Sand and gravel that is moderately well sorted and stratified compose the bulk of the Salt River deposits. These deposits are composed of well-rounded clasts and are locally interbedded with silts and clays. The fine sediments are derived from over bank flows.

From Tempe to the Agua Fria confluence with the Gila River, the channel is dominated by valley fills and alluvium. The water table is closer to the surface in the western portion of the study area because of shallow depths to bedrock and because of numerous relatively impermeable clay layers within the alluvium.

The geomorphologic history of the river is characterized by natural scour and fill events, floods, and channel shifts. The channel has shifted within the floodplain several times from the 1880's to present, meandering on the north side of the floodplain during some periods and on the south side during others. Channel shifts have distributed alluvial material across the entire width of the floodplain. The alluvium deposited by the river consists of cobbles, sands, silts and clays from numerous tributary streams within the watershed. Urban development within the study reach has altered the stream course from that of a naturally meandering channel to a relatively straight channel with high banks in several reaches.

The river is dominated by scour and fill events which degrade the river in some areas and aggrade it in others. The process of sediment aggradation has produced numerous thick deposits within the fluvial system: cobble lag surfaces, sand sheets (macro-forms), channel side bars, mid-channel bars, point bars and over bank deposits. Many of these deposits have recently been disturbed by intensive mining for sand and gravel. Mining affects natural scour and fill events by reducing the amount of material that can be transported and loosening other sediments, also sand pits serve as depositional traps for fine sediments.

Within the study area, there are three hydrogeologic units: the lower alluvial unit (LAU), the Middle Alluvial Unit (MAU), and the Upper Alluvial Unit (UAU). There is also the Red Unit which forms the base of the aquifer beneath part of the area north of the Salt River. Additional information pertaining to subsurface geologic and hydrogeologic units can be found in the section entitled "Groundwater Hydrology."

For additional information concerning geology and geomorphology of the two study reaches, please refer to **Appendix F, Geotechnical**.

Surface Water Hydrology

The Salt River is the largest tributary of the Gila River and drains a total area of approximately 13,200 square miles within the northern and eastern portions of the State of Arizona. The Salt River originates on the Eastern portion of the Mogollon Plateau, in the White Mountains. Formed by the confluence of two westward flowing streams, the White and Black Rivers, the Salt drains directly into the lake formed by the Modified Roosevelt. Tonto Creek also flows into this lake. The drainage area controlled by Modified Roosevelt Dam is approximately 5,800 square miles. The Salt River Project (SRP) operates four dams on the Salt River upstream of the Verde River confluence, including modified Roosevelt Dam as shown on **Figure 3.1.** Total water supply space behind these dams is 1.9 million ac-ft, with an additional 0.56 million ac-ft for flood control.

The Verde River is the principal tributary of the Salt River. The Verde River flows south from the Chino Valley and joins the Salt River upstream of the cities of Mesa, Tempe, and Phoenix. The Verde drains approximately 6700 square miles and is partially controlled by two water supply dams operated by SRP. The two dams provide a water supply space of 310,000 ac-ft.

Approximately 3 miles below the Verde and Salt River confluence, SRP operates the Granite Reef Diversion Dam. The purpose of this facility is to divert upstream reservoir releases into water supply canals. The canals crisscross the Phoenix metropolitan area furnishing water for agricultural and municipal uses. The total water supply space of the SRP system is 2.8 million ac-ft, not including the amount of water that is stored within the canal system.

Due to the large water supply space behind the SRP dams, the Salt River rarely flows through metropolitan Phoenix. The relative frequency of flow downstream of Granite Reef Dam is about once every three years. **Table 4.1** gives an estimated discharge-frequency values of the Salt River in the two study reaches.

TABLE 4.1
Salt River Discharge-Frequency Values

Return Period	Tempe Reach Peak Discharge (cfs)	Phoenix Reach Peak Discharge (cfs)
500-year	243,000	240,000
200-year	204,000	202,000
100-year	169,000	166,000
50-year	140,000	135,000
20-year	90,000	87,000
10-year	55,000	53,000
5-year	20,500	20,200

Because of the SRP system, flows in the Salt River do not follow the typical bell-shaped hydrograph. Flows do not rise to their peak and then fall to normal levels as the flood wave passes. Rather, when a release is made, the flow in the river is sustained at a constant level for many days. Only after the desired storage level in the SRP system is reached do the releases stop and flow in the Salt River ceases. As such, inundation duration in the Salt River is of prime concern to maintaining habitat within the river. **Table 4.2** depicts an expected inundation duration for various discharge frequencies.

TABLE 4.2
Salt River Duration-Frequency Values (cfs)

Freq.	Peak	1-day	3-day	5-day	10-day	30-day	60-day
500-yr	240,000	190,000	100,000	70,000	46,000	25,000	14,000
200-yr	202,000	145,000	75,000	55,000	33,000	19,000	9,000
100-yr	166,000	100,000	60,000	40,000	25,000	15,000	7,000
50-yr	135,000	70,000	40,000	29,000	18,000	10,000	5,000
20-yr	87,000	40,000	22,000	15,000	10,000	5,300	2,800
10-yr	53,000	21,000	11,000	7,000	5,200	2,700	1,400
5-yr	20,200	8,000	3,500	2,100	1,500	800	0

Note: The above values display the discharge equaled or exceeded for the specified duration shown. For the 5-year frequency, a flow rate of 200 cfs is exceeded for 53 days.

Indian Bend Wash (IBW) drains approximately 90 square miles. The watershed is mostly urbanized and includes portions of Scottsdale, Phoenix, and Tempe. The outlet of IBW is the Salt River about midway between McClintock Road and Rural Road (**Figure 3.2**). The improved channel was designed to convey a 100-year discharge of 30,000 cfs. The improved channel also includes a low flow channel which was designed to convey a 5-year discharge of 4,000 cfs.

Although there is sparse record available, there are no documented instances during which runoff from IBW did much more than wet the Salt River bed. Under most circumstances, water from IBW does not contain sufficient volume nor flow for long enough duration to fill the Salt River channel and flow downstream. However, estimates have been made to describe how the runoff from the 10-year and 5-year flood events from IBW affect the Salt River. The results are displayed in **Table 4.3** below. As shown, the impacts are minimal.

TABLE 4.3
Impact from IBW runoff to the Salt River

Location	Approx 5-yr Peak Discharge	Approx 10-yr Peak Discharge
IBW-Salt River Confluence	4,800 cfs	9,000 cfs
Salt River at Mill Avenue	370 cfs	1,500 cfs
Salt River at Central Avenue	0	140 cfs

Two significant side drains to the Salt River mainstem are the Old Cross Cut Canal and the Tempe Drain. The Old Cross Cut Canal was originally a part of the SRP canal system. Today it serves to drain flood waters to the Salt River just upstream of the Phoenix Reach. The confluence is approximately one-quarter mile west of 48th Street on the north side of the Salt River. The drainage area is approximately 17 square miles. The discharge capacity of this side drain is approximately 5000 cfs. The Tempe Drain serves to drain storm water from within the urbanized portion of Tempe. It enters the Salt River from the south, along the west bound lanes of the Interstate 10 bridge. The drainage area of the Tempe Drain is approximately 14 square miles. The capacity of the drain is 1100 cfs at 48th Street.

Similar to those of Indian Bend Wash, the impacts from runoff from the Old Cross Cut Canal and Tempe Drain to the Salt River are minimal. The disparity in size (IBW drains about 5 times as much area) as well as the larger Salt River cross section eliminates anticipated problems from drainage in these two side drains.

There are numerous local side/storm drains which discharge into the Salt River and IBW. In the Tempe Reach, there are 17 side drains varying in size from 36 inches to 18 feet in diameter. The contributing drainage areas range in size from 0.03 to 2.87 square miles. The peak 100-year discharge from any drain in the Tempe Reach ranges from 25 to 3200 cfs, and the average annual volume is expected to range from 1.7 to 210 ac-ft. None of drains discharging into IBW appear to produce significant flows. The side drain data in the Tempe Reach is listed in Tables 3-5A and 3-7A of **Appendix A, Hydrology**, of this report. The location of the outfalls and the specific sizes of all side drains in the Tempe Reach can be found on **Plate 4-5.**

In the Phoenix Reach, there are 34 storm drains varying in size from 15 inches to 21 feet in diameter. The contributing drainage areas range in size from 0.05 to 13.87 square miles. The peak 100-year discharge from any side drain in the Phoenix Reach is anticipated to range from 37 to 3,730 cfs. The anticipated average annual volume ranges from 2.5 to 900 ac-ft. Additional information on the side drains in the Phoenix Reach can be found in Tables 3-5B and 3-7B of **Appendix A, Hydrology**. The location of the outfall and specific sizes of all side drains can be found on **Plates 4-1 through 4-4.**

For additional information concerning surface water hydrology of the two study reaches, please refer to **Appendix A, Hydrology**, of this report.

Surface Water Quality

The Environmental Protection Agency and the Arizona Department of Environmental Quality have set quality standards for surface waters in the Tempe and Phoenix Reaches. These standards vary depending on the designated use of the waterway. The current designated uses for the Indian Bend Wash portion of the Tempe Reach are "Aquatic and Wildlife (warm water fishery)," "Partial Body Contact" referring to aquatic recreation, and "Fish Consumption." For the Salt River portion of the Tempe Reach, the designated uses are "Aquatic and Wildlife (ephemeral)," and "Partial Body Contact." The current designated uses in the Salt River in the Phoenix Reach are "Aquatic and Wildlife (warm water fishery)" and "Partial Body Contact." The various water quality standards for the study reaches are given below in **Tables 4.4, 4.5, and 4.6.**

TABLE 4.4
Surface Water Quality Standards for the IBW Portion of Tempe Reach

	Fish Consumption	Partial Body Contact	Aquatic and Wildlife (warm water fishery) Acute/Chronic
Fecal Coliform (cfu/100ml)		4,000/1,000	4,000/1,000
Arsenic (ppb)	3.1 T	2,800 T	360 D/190 D
Mercury (ppb)	0.6 T	42 T	2.4 d/0.01 D
TCE (ppb)	78		20,000/1,300
PCE (ppb)	11	4,000	6,500/680
TCA (ppb)	160,000	13,000	2,600/1,600
Benzene (ppb)	120	470	2,700/180
Chloroform (ppb)	590	1,400	14,000/900

Note: Standards for Cadmium, Copper, Lead, Silver, and Zinc not shown. No standards for TSS, TDS, Chloride, Fluoride, Nitrate, or DBCP.

TABLE 4.5
Surface Water Quality Standards for the Salt River Portion of Tempe Reach

	Partial Body Contact	Aquatic and Wildlife (ephem.) Acute/Chronic
Fecal Coliform (cfu/100ml)	4,000/1,000	
Arsenic (ppb)	2,800 T	440 D/230 D
Mercury (ppb)	42 T	5 D/2.7 D
TCE (ppb)		20,000/1,300
PCE (ppb)	4,000	15,000/1,600
TCA (ppb)	13,000	2,600/1,600
Benzene (ppb)	470	
Chloroform (ppb)	1,400	

Note: Standards for Cadmium, Copper, Lead, Silver, and Zinc not shown. No standards for TSS, TDS, Chloride, Fluoride, Nitrate, or DBCP.

TABLE 4.6
Surface Water Quality Standards for the Salt River in the Phoenix Reach

	Partial Body Contact	Aquatic and Wildlife (warm water fishery) Acute/Chronic
Fecal Coliform (cfu/100ml)	4,000/1,000	4,000/1,000
Arsenic (ppb)	2,800 T	360 D/190 D
Mercury (ppb)	42 T	2.4 d/0.01 D
TCE (ppb)		20,000/1,300
PCE (ppb)	4,000	6,500/680
TCA (ppb)	13,000	2,600/1,600
Benzene (ppb)	470	2,700/180
Chloroform (ppb)	1,400	14,000/900

Note: Standards for Cadmium, Copper, Lead, Silver, and Zinc not shown. No standards for TSS, TDS, Chloride, Fluoride, Nitrate, or DBCP.

Flows in the Salt River originating upstream of the Phoenix metropolitan area are generally of good quality. Salt River flows maintain high amounts of mineral content and total dissolved solids (TDS). The Salt River water contains sodium chloride both above and below the SRP system dams due to natural salt springs upstream of the SRP lakes. Verde River water has a lower amount of total dissolved solids (TDS) than found in the Salt River water. The Verde water tends to lower the overall TDS content in flows downstream of their confluence. The water quality would support native fish species if there were sufficient base flows within the river.

Storm runoff in the two study reaches is intermittent and highly variable. Concentrations of bacteria, metals, petroleum products, and pesticides have been observed. Fecal coliform commonly exceeds water quality standards.

For additional information concerning surface water quality of the two study reaches, please refer to **Appendix A, Hydrology**, of this report.

<u>Groundwater Hydrology</u>

Salt River was a perennial stream prior to development of the Phoenix metropolitan area and construction of upstream reservoirs. The river was a significant source of groundwater recharge in some areas and a recipient of groundwater discharge in other areas. As the area was settled, water to irrigate crops was obtained by diverting the stream flow into canals. By the 1900's, much of the Salt River Valley was waterlogged due to excess groundwater recharge from canal seepage and deep percolation. In the 1920's substantial groundwater pumping began for irrigation and to control shallow groundwater levels. Following World War II, advances in drilling and pump technology enabled extensive pumping from deep aquifers. The result of the groundwater pumping practices was extensive overdraft.

The groundwater supply beneath the study reaches is regulated by the Arizona Department of Water Resources (ADWR). To aid in monitoring, ADWR differentiates between groundwater basins. The subsurface geologic conditions in the two study reaches are within the Phoenix Active Management Area (AMA) of ADWR.

The Phoenix AMA is comprised of portions of two distinct but interconnected alluvial groundwater basins, the West Salt River Valley (WSRV) and the East Salt River Valley (ESRV). These two basins are divided by subsurface geologic outcroppings located near Priest Road in Tempe. The Tempe Reach lies in the ESRV basin while the Phoenix Reach lies in the WSRV basin. In general, the groundwater in these two basins is moving laterally toward extensive and deep depressions in some of the main aquifer systems. In the ESRV, major groundwater depressions are centered in the Scottsdale-Paradise Valley area, in east Mesa, and north of the Santan Mountains. In the WSRV, a major depression is centered near Luke Air Force Base.

Within the two groundwater basins, there are three hydrogeologic units: the lower alluvial unit (LAU), the Middle Alluvial Unit (MAU), and the Upper Alluvial Unit (UAU). There is also the Red Unit which forms the base of the aquifer beneath part of the area north of the Salt River. The LAU overlies the Red Unit and consists mainly of conglomerate and gravel. The LAU is tapped by many city wells, and it is estimated that approximately 25 percent of the pumping originates from this unit. The MAU overlies the LAU and consists mainly of clay, silt, mudstone and some sand and gravel. The unit ranges in thickness from 100 feet to over 1600 feet in the deeper parts of the basin. The MAU is now the primary source of groundwater in the Phoenix metropolitan area. ADWR estimates that 50 percent of the total pumpage in the valley is from the MAU.

The UAU overlies the MAU and consists primarily of gravel, sand and silt. The amount of coarse-grained deposits is highest near the Salt and Gila Rivers. The thickness of the UAU is relatively uniform and ranges from 200 to 300 feet thick in ESRV and between 300 and 400 feet thick in the WSRV. In the past, the UAU was the primary source of groundwater in the valley, but because of dewatering and large areas of poor quality water, only about 25 percent of groundwater pumped in the valley is from the UAU.

The current groundwater level is estimated to be approximately 23 to 43 feet below the ground surface near the Phoenix Reach, and approximately 56 to 130 feet below the ground surface near the Tempe Reach. Fluctuations in groundwater levels occur in response to flood events. The current groundwater levels shown on **Plates 4-1 through 4-5.** For additional information concerning the groundwater hydrology of the two study reaches, please refer to **Appendix A, Hydrology**, of this report.

Groundwater Quality

When groundwater pumping began in the Phoenix metropolitan area in the 1920's, the groundwater quality, although high in minerals, was considered to be very good quality. Today, there are a number of groundwater quality problems in the Salt River Valley. The problems associated with inorganic chemical constituents include high levels of chloride, TDS, nitrates, and salinity. The problems associated with trace organic constituents include the pesticide DBCP and volatile organic chemicals. Most of the regional problems are currently limited to groundwater in the UAU. One notable exception in that in the vicinity of Indian Bend Wash the MAU is impacted by volatile organic chemicals. At this time little data exists with respect to the salinity levels of the water in the near surface aquifers.

Hundreds of incidents of volatile organic chemicals contamination have been detected in the Phoenix metropolitan area. Volatile organic chemicals are located in shallow groundwater beneath several landfills along the Salt River, near industrial facilities, and beneath large sections of land formerly used for agricultural purposes. In some cases, the contamination is limited to plumes and can be associated with waste disposal practices or industrial activities at specific sites. The extent of groundwater contamination is not well defined. Approximately 1 to 1.5 miles to the north of the site, parallel to the Salt River is a large area of low level volatile organic chemical contamination stretching from the Motorola/52nd Street Superfund Site, west through downtown Phoenix, and through the West Van Buren area. Multiple sources of contamination exist throughout this area and various plumes have comingled.

Because of high organic and volatile organic chemical concentrations and decreases in the use of land for agriculture, use of the groundwater in the UAU for public consumption has dropped significantly. New water supply wells that tap the higher quality groundwater stored in the MAU or LAU have been replacing the shallow wells for several decades. In addition, increased use of surface water has replaced groundwater sources. Much of the shallow groundwater is now only suitable for industrial or agricultural purposes. The deeper water is generally unaffected by agricultural and industrial contamination and has lower salinity and nitrate concentrations.

For additional information concerning the groundwater quality of the two study reaches, please refer to **Appendix A, Hydrology**.

Hydraulic Conditions

Without-project overflow information for both the Indian Bend Wash (IBW) and Salt River were developed for multiple discharge using HEC-2 models. The respective models were originally developed by the Michael Baker Jr., Inc. In 1996 the consulting firms of Simons, Li and Associates, and Michael Baker Jr., Inc. were engaged by the Corps of Engineers to update both of the HEC-2 models specifically for use in this Feasibility effort.

The original Salt River HEC-2 model was formulated using aerial topography that was developed by the Michael Baker company in 1991 and 1993 in support of a 78-mile floodplain delineation study of the Salt and Gila Rivers. The study was generated for the Flood Control District of Maricopa County (District). In order to reassess the study reach for current conditions, it was necessary to update the reaches for both the City of Phoenix and City of Tempe (19th Avenue to the I-10 Freeway and Rural Road Bridge to McClintock bridge respectively). The Michael Baker company, as stated above, was contracted to update the model. Major revisions to the model included: (1) Salt River channelization consisting of soil cement bank construction completed in 1996 in the vicinity of the 19th Avenue Landfill approximately between River Mile Station (relative to the confluence of the Gila and Colorado Rivers) 211+52 to Sta. 212+27 including a grade control structure immediately downstream of 19th Avenue; (2) March 1996 bank stabilization improvements along the north bank and adjacent to the Sky Harbor Airport between Sta. 216+62 and Sta. 218+24; (3) new SR 153 Bridge in the vicinity of Sta. 218+98; and (4) new grade control structure just downstream of McClintock drive near Sta. 223+02.

Using the updated model for the Salt River, without-project flood overflow information was developed for the Phoenix Reach between Sta. 211+50 to Sta.216+50. Water surface profiles were determined using the peak discharges of the 5-, 10-, 20-, 50-, and 100-year flood events, as listed in **Table 4.1.** Also, the inundation limits of the 100-year peak discharge were determined. The 100-year flood inundation limits are illustrated on **Plates 4-1 through 4-4.**

In general, the without-project flood overflow analyses for the Phoenix Reach of the Salt River indicated that, apart from in-stream mining operations and a few localized areas of low channel banks, there were minimal impacts to any significant structures, since the 100-year peak flood discharge was mostly well-contained within the incised channel system.

There are seven transportation bridges that cross the Salt River in the Phoenix Reach: I-10, 24th Street, 16th Street, 7th Street, Central Avenue, 7th Avenue, and 19th Avenue. Additionally, there are two mining conveyor belts that are suspended above the river on piers near 12th Avenue and 18th Street. Two grade control structures are located in the Phoenix Reach. One is located just downstream of I-10 and a second grade control structure was installed immediately downstream of 19th Avenue.

In certain areas, the banks of the Salt River in the Phoenix Reach are lined. Gabion lining is found on the north bank from 3rd Avenue to Central Avenue, 7th Street to 16th Street, and 24th Street to I-10. Gabions are also in place on the south bank between 14th Avenue and 10th Avenue. Soil cement lines both the south and north banks from 19th Avenue to 15th Avenue. Rock rip-rap has been placed on the south bank from 7th Street to 24th Street. The remaining areas of the Salt River are unlined.

Using the updated hydraulic model for the Salt River, the without-project flood overflow information was also developed for the Tempe Reach between Sta. 222+50 to Sta. 223+10. The model assumed the rubber dams containing Tempe Town Lake to be deflated so as not to impede flood waters. Water surface profiles were determined using the peak discharges of the 5-, 10-, 20-, 50-, and 100-year flood events, as listed in **Table 4.1.** Also, the inundation limits of the 100-year peak discharge were determined. The 100-year flood inundation limits are illustrated on **Plate 4-5**.

While the deflation of the rubber dams containing Tempe Town Lake will allow flood waters to pass, a hydraulic analysis of the effect of the release of the water within Tempe Town Lake was required as well. In 1997 a report titled "Revised Sudden Gate Opening Analysis for Rio Salado Town Lake" was prepared by CH2MHill (Reference 41) to address this issue. Analysis of the findings in this report shows that a sudden release will produce flows equivalent to a flood of less than 10-year frequency. Scour as a result of a sudden release of water is estimated as less than one foot. More information on the hydraulic analysis can be found in **Appendix B, Hydraulics**.

As with the Phoenix Reach, the without-project flood overflow analyses for the Tempe Reach of the Salt River indicated that the 100-year peak flood discharge was well contained within the incised channel system. The banks of the Salt River through this reach are lined with soil cement. In addition, a drop structure exists immediately downstream of McClintock Road Bridge.

Using the updated hydraulic model for the Indian Bend Wash, without-project flood overflow information was developed for the IBW between IBW Sta. 0+50 to Sta. 1+60. Water surface profiles were determined using the peak discharges of the 5- and 100-year flood events, that is, 4,000 cfs and 30,000 cfs, respectively. Additionally, the inundation limits of the 5- and 100-year peak discharge were determined. The 5- and 100-year flood inundation limits are illustrated on **Plate 4-5.** The analysis shows that the 100-year flood event is fully contained within the IBW channel banks.

There are three transportation bridges that cross IBW within the Tempe Reach. These are the Red Mountain Freeway, Curry Road, and McKellips Road. The freeway is supported upon multiple piers. The Curry and McKellips Road crossings are culverts designed to pass the 5-year event. If flood levels in IBW exceed the 5-year event, flows overtop the culverts and sheet across dip sections in the roadway. IBW contains a low flow channel within well-defined banks. A triple drop structure is located at the confluence with the Salt River.

For additional information concerning the hydraulic conditions of the two study reaches, please refer to **Appendix B, Hydraulics** of this report.

Landfills

Within the Phoenix Reach, there are 11 inactive landfills that once operated within the study area. In general, these operations filled areas of the river that had either naturally eroded or areas created by gravel mining. There are two active landfill operations within the Phoenix Reach operated by CalMat Properties, Inc. and United Metro Materials. Both parties are accepting inert construction debris and other inert materials to fill in areas excavated by their sand and gravel extractions. It is not believed that these operations increase the potential to leach CERCLA hazardous substances into the underlying soils and groundwater. There is no active municipal waste landfilling in the Phoenix Reach.

The inactive 19th Avenue municipal landfill, within the Phoenix Reach, is listed by EPA as a superfund site. The construction portion of the remedial action for this site was recently completed. The construction included soil cement bank stabilization of the Salt River to remove the landfill from the 100-year floodplain, installation of a grade control structure to minimize erosion of the channel into the landfill, a landfill cap, a landfill gas extraction system, two flare stations to incinerate the captured landfill gas, a perimeter drainage system, and landscaping for mitigation of future impacts to the Salt River. Approximately $22.5 million was spent on remedial action construction with an additional $2 million spent on construction oversight for the City of Phoenix. Quarterly groundwater monitoring continues for this site, and there is a groundwater contingency plan in place should concentrations of certain constituents exceed threshold levels. As part of the monitoring program, there are currently eight landfill gas (methane) monitoring probes located within the Salt River channel.

The Del Rio Landfill is regulated under the State of Arizona's Water Quality Assurance Revolving Fund (WQARF) authority. It is not listed under either the WQARF Priority List or EPA's National Priority List (NPL). Several phases of groundwater studies have been completed at the Del Rio landfill and groundwater monitoring is ongoing.

Within the Tempe Reach there are no inactive or active landfills immediately in or adjacent to the study reach. There are inactive landfills adjacent to the Salt River upstream of McClintock Road. Two landfills referred to as SRP75 and SRP 78 once operated in the confluence area of IBW and the Salt River. These two landfills were found to contain inert construction debris. They were removed in their entirety during construction of the Red Mountain Freeway.

Of the 11 inactive and 2 active landfills within the Phoenix Reach, 6 inactive and 2 active landfills have been delineated on **Plates 4-1 through 4-4**. The remaining 5 inactive landfills are not depicted on the Plates because there is active gravel mining operations underway on the site. All thirteen landfills are summarized in **Table 4.7** below. For additional information concerning landfills within the study reaches, please refer to the following areas within this report: **Appendix A, Hydrology**; **Appendix F, Geotechnical**, and the Environmental Impact Statement.

TABLE 4.7
Phoenix Reach Landfill Information

ID	Name	ADEQ ID#	Owner	Location	Status
A/A1	19th Avenue	C11508 (49000000*)	City of Phoenix	N. and S. bank of SR, east side of 19th Ave.	Inactive, superfund clean up resulted in capping materials with soil cement and fill
B	7th Avenue	C11511	James McDonald	N. bank of SR, west side of 7th Ave.	Inactive, capped with fill, vacant land on top
C	Rio Salado #8	C11561	United Metro	S. bank of SR, west side of 7th Ave.	Active, United Metro accepting inert construction debris
	Rio Salado #32	C11542	United Metro	S. bank of SR, east side of 7th Ave.	Inactive, gravel operations in progress on site
D	Central Avenue	C11505	United Metro	N. bank of SR, west side of Central Ave.	Inactive, vacant land on top of fill, permitted under GQPP G-007007
E	Rio Salado #6	C11560	CalMat Properties	S. bank of SR, east side of Central Ave.	Inactive, vacant land on top of fill
	Rio Salado #3	C11539	(multiple owners)	N. bank of SR, 0.5 miles W. of 16th St.	Inactive, capped with gabion lining and fill, buildings situated on top
F	Del Rio	C11507	City of Phoenix	S. bank of SR, 0.25 miles W. of 16th St.	Inactive, capped with fill, City park and vacant land on top, under WQARF authority
	Rio Salado #27	C11538	CalMat Properties	0.25 miles W. of 24th St. on Raymond St.	Inactive, gravel operations in progress on site
	Rio Salado #28	C11536	CalMat Properties	0.5 miles W. of 24th St. on Raymond St.	Inactive, gravel operations in progress on site
	Rio Salado #29	C11537	CalMat Properties	NE corner of 16th St. and Elwood St.	Inactive, gravel operations in progress on site
G	CalMat Landfill	07034300*	CalMat Properties	N. bank of SR, west side of 24th St.	Active, accepting inert construction debris
H	Rio Salado #26	C11535	Robert McIntyre	S. bank of SR, E. side of 24th St.	Inactive, auto wrecking yard situated on top of fill

* ADEQ USAS Number. The other numbers listed represent ID numbers in a format no longer used by ADEQ; as most of these landfills are inactive, the ID number was never updated to the new format. The ADEQ ID Number listed is therefore still current.

Sand and Gravel Mining

Extensive sand and gravel mining operations moved into the river bed and surrounding floodplain once upstream dams began controlling the flows in the Salt River. The materials extracted from the river have been used extensively in the development of the Phoenix Metropolitan area. Currently, there are no active mining operations within the Tempe Reach. Within the Phoenix Reach, however, mining activities are on-going at several locations within the 5 mile study area.

Within the Phoenix Reach, the mining within the Salt River bed itself is limited. A grandfathered Section 404 Permit of the Clean Water Act to allow mining activity in the river channel expired in August, 1996. However, the river bed is still used for some mining haul roads. The material extraction within the Phoenix Reach is currently taking place outside of the channel on the adjacent overbanks.

The current mining activities are mainly controlled by CalMat Properties and United Metro Materials. CalMat operates two gravel pits located east of 16th Street. Their batching and sorting plants to make concrete and asphalt materials are located on the north bank of the river, east of 16th Street. CalMat intends to operate the plants and mine the pits for 10 to 15 more years. United Metro owns mineral rights and property west of Central Avenue and east of 24th Street. A portion of United Metro's haul road is on land owned by the City of Phoenix. A gravel pit belonging to a third party was used most recently to provide materials for the construction of the 19th Avenue Landfill superfund cleanup operation.

A summary of the mining activity in the Phoenix Reach is given in **Table 4.8** below. The existing sand and gravel pits are depicted in **Plates 4-1 through 4-4.** For additional information concerning the sand and gravel mining in the study area, please refer to **Appendix F, Geotechnical**, of this report.

TABLE 4.8
Phoenix Reach Sand and Gravel Mining

ID	Owner	Location	Status
A	James McDonald/Robert Linsenmeyer	N. bank of SR, E. side of 15th Ave.	Inactive. Most recently used in 1996.
B	United Metro	S. bank of SR, E. side of 15th Ave.	Inactive.
C	James McDonald	2000 ft. N. of SR, W. of 7th Ave.	Inactive.
D	United Metro	S. bank of SR, E. side of 7th Ave.	Inactive.
E	CalMat Properties	S. bank of SR, E. side of 16th St.	Active mining operations in progress.
F	CalMat Properties	N. bank of SR, E. side of 24th St.	Active mining operations in progress.
G	United Metro	1000 ft S. of SR, E. side of 24th St.	Active mining operations in progress.

Cultural Resources

The Salt River Valley has been witness to human activity for several thousand years, most notably in the Phoenix/Tempe metropolitan area. The Hohokam populated the Salt River Valley in prehistoric times. The Hohokam were an agricultural people, and cotton and corn became important crops circa 500 A.D. The Hohokam culture was at its height circa 1200 A.D. and during this time platform mounds and village compounds were numerous and widespread. The Hohokam people constructed over 500 miles of prehistoric canals in the Salt River Valley. Due to changes in rainfall patterns and other factors, the Hohokam culture collapsed around 1450 A.D. Soon thereafter, the Salt River Valley was visited by several Spanish expeditions. Catholic missionaries such as Father Eusebio Kino and Father Jacobo Sedelmayr wrote early passages about the area in the 1700's. The City of Phoenix was not established until 1870.

A records and literature search at the regional archaeological clearing house (State Historic Preservation Office, Phoenix),the Office of Cultural Resource Management at Arizona State University, and the Archaeologist for the City of Phoenix, indicated that no resources listed in, or eligible for, the National Register of Historic Places are recorded within the area of potential effects (APE) for the project.

The records search also indicated that the Tempe Reach area was studied as part of the Indian Bend Wash project in the 1970s. Archeological surveys identified only one archeological site, AZ U:9:45, near the southern end of Indian Bend Wash. The site was tested by Arizona State Museum in 1974, and does not qualify for the National Register of Historic Places. Therefore, the Tempe portion of the project does not contain resources eligible for, or listed in the National Register of Historic Places.

The Phoenix portion of the APE has not been formally surveyed by qualified archeologists. However, the potential for intact cultural resources is very low due to the highly disturbed nature of the area. Gravel mining has destroyed much of the surrounding river bank areas. Nevertheless, the APE needs to be professionally surveyed. In addition to identifying any unrecorded resources, the extent of disturbance in the APE needs to be formally documented. Undeveloped areas along the Salt River contain numerous archeological sites, and in many cases have been ranked as high sensitivity districts. There are several developed areas along the Salt River which have been ranked moderately sensitive, since they contain extensive evidence of past Hohokam habitation sites and irrigation systems. Although in many cases no surface evidence remains, sub-surface materials could exist in undisturbed portions of the APE.

For additional information concerning the cultural resources of the two study reaches, please refer to the **Environmental Impact Statement** accompanying this report.

Recreation

In the Phoenix Reach, the Salt River consists primarily of dry river bottom and virtually no recreation activity takes place in this area. The only improved recreation area adjacent to the Salt River is Rio Salado Park, which is located at 12th Street and Elwood in Phoenix. The park encompasses about 14 acres and contains picnic facilities, and racquetball and basketball courts. Most of the park users are employees of industrial businesses located in the area. According to the City of Phoenix Parks Department, fewer than 200 people visit the park on a weekly basis (or less than 10,400 annually). There are currently no plans for expansion of the park, and visitation is not expected to increase in the absence of improvements to the Salt River.

In the Tempe Reach, there are several recreation facilities in the study area or in the near vicinity. A bike/walking path lies on the west bank of Indian Bend Wash. This path links the recreation features of the Scottsdale IBW greenbelt floodway to the City of Tempe. Additionally, the Rio Salado golf course lies on the bench within IBW from Curry to McKellips Road. Existing recreation facilities in the nearby vicinity include Indian Bend Park, Tempe Beach Park, B.B. Moeur Park, the North and South Bank (Salt River) Linear Parks and a wetlands wildlife habitat area.

The City of Tempe has begun construction of its Tempe Rio Salado Project, which will restore a five and one-half mile stretch of the Salt River from an unsightly utility corridor into a linear green belt. Central to this project will be Tempe Town Lake (see **Figure 3.4**). The lake will contain about 200 surface acres and 20,000 feet of shoreline and will support paddle-boating, canoeing, sailing and fishing. Tempe is hoping to establish the state's largest urban fishing program within the Town Lake. Such a program would be dependent upon the water quality within the lake. Over 1,000 acres of adjacent land has been dedicated for recreational development and open space. Activities will include picnicking, hiking, bicycling, horseback riding, softball/baseball, volleyball, golfing, water slides and play areas. An 80,000 square foot ice skating rink is also planned. Other possible recreational uses include soccer and major sports events, such as marathons.

Significant commercial development, including hotels and resorts, is also expected in the area. The City projects that roughly 7 million square feet of mixed use development will take place over the next 25 to 30 years, representing about $1.2 billion in expenditures. This development will be supported substantially by the tourism generated by the project.

Recent estimates of recreation demand for the proposed activities surrounding Town Lake is shown to greatly exceed the available supply in the market area (Ref 42). Therefore, in order to determine the financial impact of the project, the focus of the study was to determine the capacity of the proposed facilities rather than to project use based upon demand. Based upon the size and configuration of the lake, the report recommended the following facilities: 208 slips for the rental of sail and power boats, 24 slips for water taxis, tour boats and gondolas, two boat ramps which could launch 150 boats per day, and facilities for 52 paddle boats. In all, the lake capacity would be approximately 505 watercraft, or about 2.5 boats per surface acre of lake. Although projected visitation for the lake and surrounding recreation facilities was not included in the report, it is obvious that it would be substantial.

For additional information concerning existing recreation within the two study reaches, please refer to **Appendix C, Economics**, of this report.

Land Use/Real Estate

In the Phoenix Reach, there are 880 acres under consideration for improvement. There are eight different land owners that are potentially affected. The primary landowners include two sand and gravel mining operators (CalMat and United Metro), the City of Phoenix, and the Arizona Department of Transportation. Four private parties own a total of 141.5 acres. The current land uses of the various parcels affected in the Phoenix Reach include a superfund site, river channel, vacant land, manufacturing areas, gravel pits, landfills, quarry facilities, an old landfill with a park, and a salvage yard. Adjacent to the project boundary, north of the Salt River and to the east of 7th Avenue, there is a large plot of land owned by the city of Phoenix. This area will not be restored as part of the proposed project.

In the Tempe Reach, there are 140 acres under consideration for improvement. There are five different land owners that are potentially affected. The primary landowners include the Maricopa County Flood Control District, the City of Tempe, the Arizona State Board of Regents (ASU), and the U.S. Bureau of Land Management. The current land uses of the various parcels affected in the Tempe Reach include the Indian Bend Wash channel, a Golf Course, vacant land, and the Salt River channel. The Tempe Reach is located within the South Indian Bend Wash Superfund and NPL Site.

For additional information concerning land use and real estate ownerships within the two study reaches, please refer to **Appendix E, Real Estate**.

C. Summary of Problems and Opportunities

As shown in the discussion of the existing conditions, the problems associated with the two study reaches are significant. Federal dams constructed in the early 1900's in the upper Salt and Verde Rivers have limited flows in the lower Salt River through the Phoenix Metropolitan area. As a result, all historical riparian habitat has been severely impacted. Only sporadic vegetation exists in the Salt River today. Open bodies of water that once supported waterfowl and migratory species have disappeared. Urbanization and construction of the Indian Bend Wash flood control project have eliminated high value riparian mesquite bosque communities. However, the opportunities to address these problems through environmental restoration do exist.

Riparian habitat is important for several reasons: as a source of food and cover for wildlife, as a shade source for smaller order streams to help keep water temperatures low, as a natural bank stabilizer by preventing excessive erosion, and as a natural filtering system to improve water quality. Riparian habitat is rapidly disappearing throughout the desert regions of the American Southwest. This type of habitat is geographically specific, and rare. Roughly 90% of all wildlife species in Arizona depend on riparian habitat for their survival. The rapid disappearance of riparian habitat helps explain the large number of species in Arizona that are on the brink of extinction. A large restoration effort along a linear feature such as the Salt River or IBW would provide the opportunity to establish cover, open space, and the ability for wildlife to migrate utilizing a linear habitat corridor.

The primary problem associated with riparian habitat restoration is that it often difficult to acquire the water required to support the desired vegetation. Cottonwood/willow, mesquite, and wetland marsh habitats all require a constant supply of water to survive. Once a water source has been identified, restoration of native riparian habitat in the Salt River of up to 140 acres in the Tempe Reach and up to 880 acres in the Phoenix Reach could be possible.

The opportunity exists to restore portions of the Indian Bend Wash by reestablishing riparian habitat. Wetland marsh habitat could be established in the low flow channel, leaving the existing golf course in place. Between Curry Road and the Salt River, the opportunity exists to establish a mesquite bosque on the bench and wetlands in the low flow channel. This is the location of the historic mesquite bosque that was lost during the Indian Bend Wash channel flood control improvements. The opportunity exists to restore 60 acres of riparian habitat within the Salt River as well.

In the Phoenix Reach, the opportunity exists for riparian habitat restoration efforts to replace valuable habitat lost as a result of construction of upstream Federal water projects. In pre-settlement times, the Salt River was one of the few perennially-watered riparian areas of the Sonoran desert with highly productive cottonwood, willow, and mesquite habitats. The total distance of the study reach within Phoenix is approximately 5 miles. Old landfills and active mining operations occupy much of the study reach today. Abandoned gravel pits can be incorporated as water features into a restoration plan. Incidental water quality improvement can be obtained through incorporation of wetlands into the restoration plan.

The opportunities for riparian habitat restoration within the Salt River will be further examined in the following sections.

V. PLAN FORMULATION

A. Planning Objectives

Federal Planning Objectives

The Corps of Engineers' ecosystem restoration philosophy and guidance gives a priority to projects for restoration of degraded ecosystems to a less degraded ecological condition. This includes the restoration of ecosystem's hydrology, and its plant and animal communities. Ecosystem restoration projects must examine the condition of the existing ecosystems, or portions thereof, and determine the feasibility of restoring degraded ecosystem structure, function, and dynamic processes to a less degraded, more natural condition. Such activities are most likely to address ecosystems associated with wetlands, riparian and aquatic systems. Generally, it is not appropriate for the Corps to conduct ecosystem restoration activities on upland, terrestrial sites that are not closely linked to water and related land resources. Ecosystem restoration planning considers the roles of plant and animal species populations and their habitats in the larger context of community and ecosystem framework. Plans to address ecosystem restoration should be formulated, and measures for restoring ecological resources may be recommended, based on their monetary and non-monetary benefits. These measures do not need to exhibit net National Economic Development (NED) benefits associated with traditional flood control economic analysis. Rather, they should be viewed on the basis of non-monetary outputs compatible with the Planning and Guidance selection criteria, and be offered for consideration and budgetary support. However, planning studies must also look for opportunities to contribute to NED when formulating plans for ecosystem restoration. Quantifiable economic benefits of restoration projects stem from changes in economic values associated with ecosystem improvement. Restoration projects which provide benefits such as water quality improvement, habitat restoration, recreation, and flood damage reduction, for example, are likely to include both NED and environmental quality (EQ) benefits.

The Federal objective in water and related land resources project planning is to contribute to national economic development (NED) consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders and other Federal planning requirements. Water and related land resources project plans shall be formulated to alleviate problems and take advantage of opportunities to contribute to this objective. Contributions to NED are increases in the net value of the national output of goods and services, expressed in monetary units.

Limited funding, planning resources, and study time necessitate giving priority to those alternatives which produce the greatest environmental output when compared to the cost of the project. The anticipated value of the outputs of an ecosystem restoration alternative is the principal measure of the proposal's worth. An ecosystem restoration proposal must be justified on the basis of its contribution to restoring the structure and/or function of a degraded ecosystem, or parts thereof, when considering the cost of the proposal. The willingness of a non-Federal sponsor to share study and project costs and the general concurrence of the State and Federal resource agencies and environmental community are strong indicators of the reasonableness and worthiness of the recommended action.

Specific Planning Objectives

Specific planning objectives were identified for this feasibility effort through coordination with local and regional agencies, the public involvement process, site assessments, review of prior studies and reports (including the Rio Salado Reconnaissance Study), and review of existing water projects. The specific objectives for environmental restoration within the study area have been identified as follows:

(1) Restore riparian habitat in and around the Salt River within the Cities of Phoenix and Tempe.

(2) Create a complete and diverse riparian system similar to the natural riparian habitat model shown in **Figure 5.1**. The restored habitat areas should incorporate a diverse mix of riparian habitat types including mesquite, cottonwood/willow, wetland marsh, aquatic strand/scrub, open water, and open edges.

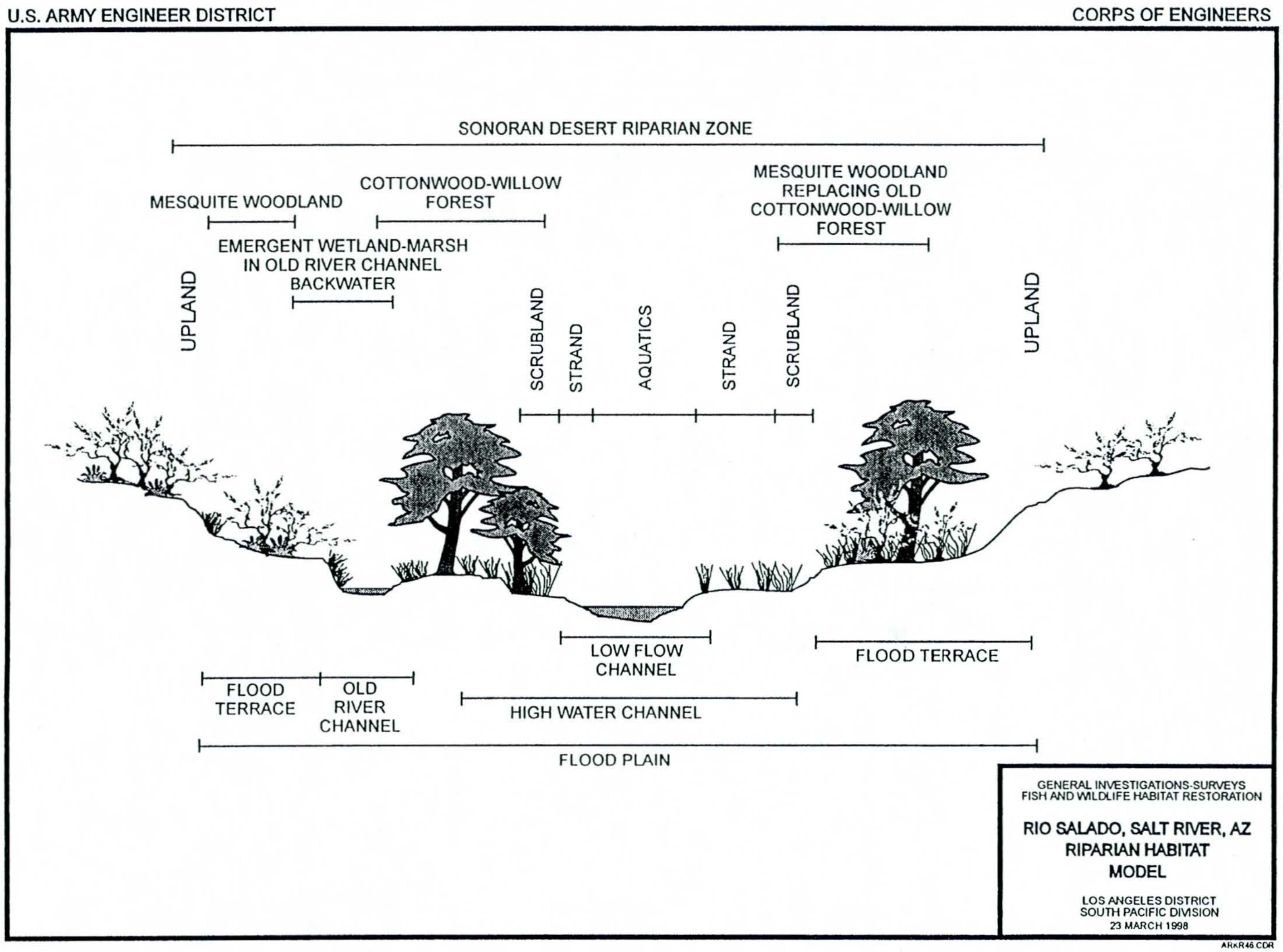
(3) Increase environmental education and passive recreation opportunities incidental to the restoration effort.

Upon initiation of the feasibility effort, the entire 33 mile reach studied under the reconnaissance phase was evaluated for potential environmental restoration. As reported in the reconnaissance report, the entire 33 miles has experienced some degree of degradation. However, several areas are continuing to be impacted from sand and gravel mining, channelization, and other man made activities. Additionally, some areas within the 33 mile study area have limited non-Federal sponsor interest for participation in a cost-shared construction project. Therefore, after discussion with the non-Federal sponsors, two specific sites were identified which would be of immediate interest in a cost-shared construction project. To accommodate the Federal and non-Federal interest in the long term restoration of the entire 33 mile reach, this feasibility report provides an interim response, in that it focuses on the two immediate opportunity areas. Opportunities for other areas within the 33 mile study area would need to be addressed separately in the future.

B. Planning Constraints

In order to develop environmental restoration alternatives that will best meet the established objectives, consideration of the existing constraints must be made. For the Tempe and Phoenix Reaches considered in this Interim Feasibility Study, the following planning constraints have been identified for consideration in developing alternatives.

FIGURE 5.1
RIPARIAN HABITAT MODEL



FAA 10,000 Foot Open Water Constraint

The Federal Aviation Administration (FAA) has regulations that oppose open water within 10,000 feet of the end of the runway. This is to help prevent attracting waterfowl or larger birds. Airport operators have a responsibility to provide for safe operating areas for all aircraft using their airport as well as an obligation to prevent unnecessary harm to wildlife. Any improvements planned within 10,000 feet of the airport runway must not create additional bird strike hazards (Refs 38, 39). Site specific layout of improvements and careful plant selection must be made. This 10,000 foot constraint impacts the Phoenix reach between I-10 and 24th Street, and the Tempe reach from Priest Drive to approximately one-quarter mile upstream of Priest Drive.

Constructed Wetland Water Quality

Water to irrigate and sustain riparian habitat is used to support plant growth and as a source of drinking water for wildlife. In addition, it is anticipated that the recreation features associated with this project would allow some limited human interaction with the restoration features. For these reasons the water used for restoration must not be hazardous to humans or to animals. The water source would require a National Pollutant Discharge Elimination System (NPDES) permit, in accordance with the Clean Water Act. The most likely source of water for this project is groundwater. As much of the available groundwater contains measured amounts of regulated contaminants, well-head treatment may be required to meet the NPDES requirements. In addition, there are several other potential water quality constraints related to the habitat restoration, including salinity and temperature limitations. Native trees, such as cottonwood trees, cannot tolerate high levels of salinity or total dissolved solids (TDS) in their water source. This is especially important during their establishment period. In general, water with an electroconductivity (EC) value greater than four (4) may present problems to the health of the desired plant species. As cottonwood trees mature, they can withstand higher salinity levels. While local groundwater and other potential local sources of water are somewhat saline in nature, accumulation of salinity in the constructed wetlands is not expected to be a problem. The constructed wetlands have been designed as flow-through systems, with constant inflow and outflow of fresh water. Salinity in the water will not accumulate within the system, in fact, salinity present in the soils will be leached out by the constant flow of water.

Extensive literature searches have been conducted by the Cities of Phoenix and Tempe to insure that water quality within the constructed wetlands can be maintained.

Impact on Plants from Peak Discharges and Long-Term Discharges

Most plant species found in riparian ecosystems can tolerate periodic flooding without damage because of special metabolic and physical features such as adventitious roots, porous cell structure, and specific metabolic pathways. Despite these adaptations, these plants will be damaged if inundated for an extended period of time. Areas that are characterized by fine-textured soils and high water availability may create an anaerobic environment that surrounds the root systems of planted vegetation. In the absence of oxygen, several plant processes are stressed, including water and nutrient uptake, photosynthesis, and transpiration. Newly planted vegetation is more susceptible to damage from inundation than are mature plants (Briggs, 1996). In addition to the potential problems associated with long term inundation, peak flows may have associated currents that could erode and damage vegetated areas. The study areas in both the Tempe and Phoenix Reaches are within the flood channels of the Salt River and IBW. Although flows in these channels are infrequent, the length of time that flows would inundate the restoration areas may be detrimental to sustained plant life. Additionally, the upstream dam of Tempe Town Lake could impound nuisance flows on its upstream side. Alternative plans must consider the inundation duration constraints for the types of plants considered in the restoration alternatives.

Converse to the long term inundation problem is the need for riparian habitat to be occasionally inundated. This is a natural process for a riparian ecosystem. The occasional flooding provides opportunity for germination of seeds and provides flushing and cleansing benefits. With an artificial water supply, such as well water, this flushing becomes very important in substances in the water source that might accumulate in the soil matrix over time. Resource agencies have suggested an ideal flooding return interval of seven years for riparian habitat.

Avoidance of Project Induced Bank Erosion

It will be necessary to ensure that the Salt River banks remain stable. This is especially important in the vicinity of the existing 13 landfills that are adjacent to the river in the study area. Any increase in vegetation in the channel must not increase scour or erosion of the bank. For the most part, these local landfill operations filled areas of the river that had either naturally eroded or depressions created by gravel mining. Filling resulted in narrowing the Salt River channel, causing elevated flood stages and increasing erosion potential. The inactive landfills accepted both municipal and construction type wastes. The 19th Avenue accepted some solid and liquid wastes with hazardous characteristics and possibly materials with low levels of radioactivity. Additionally, there are two active landfills within the Phoenix Reach that are accepting inert construction debris.

Avoidance of Additional Groundwater Contamination

Alternatives considered for the Phoenix Reach must not recharge the aquifer so as to facilitate the migration of contaminants or to generate leachate from the existing landfills or cause degradation of the aquifer. This is due to the potential for groundwater to rise into the landfill materials causing leaching of contaminants to the groundwater table.

Prevention of Migration of Existing Groundwater Contamination

Certain areas in the Tempe and Phoenix Reaches, associated with industrial uses and landfills, are underlain with contaminated groundwater. The Tempe Reach is part of a larger Federal Superfund Site. The southern boundaries of two State Superfund (WQARF) project areas, East Washington and West Van Buren, overlap Phoenix Reach. By increasing the amount of water in the Salt River and IBW, there is a potential for adverse impacts to the existing contamination plumes. Alternatives being considered must assure that infiltration of water will not cause contamination plumes to migrate. Additionally, if the alternatives utilize groundwater as a source to sustain vegetation, then pumping must not cause contamination plumes to migrate toward the project unless treatment of contamination is included as a project feature. Prior to construction it is anticipated that a well permit would be required. Appropriate analysis would be required prior to obtaining these permits in order to address the impacts to the aquifer and existing contamination plumes. Groundwater flow modeling is currently underway. Results of the comprehensive flow modeling using Modflow are detailed in the **Appendix A, Hydrology**. Guidance is currently being sought from ADEQ and ADWR as to whether or not a contaminant transport model and an aquifer protection permit would be required before the final approval of this project.

Maintenance of Existing Flood Conveyance Capacity

The Salt River and IBW serve to convey flood waters through the Phoenix metropolitan area. They are currently relatively barren, free of vegetation and restoration features. Any alternatives considered must not compromise the level flood protection currently provided by reduction of channel capacity or other adverse impacts to conveyance.

Prevention of Restoration Waters from Creating Nuisances

Tempe Town Lake, considered to be part of the without-project condition, is being constructed by the City of Tempe for recreation and aesthetic purposes. In order to allow water based recreation, the EPA and the ADEQ require that the water quality be safe for partial body contact recreation. This requirement is not one that is measured upon initial filling of the lake; rather, it is a requirement that must be maintained throughout the life of the project. The water flow system required to support the environmental restoration must not jeopardize the water quality in the lake. Alternative plans for the Tempe Reach must prevent water required for the restoration in the Salt River or Indian Bend Wash from entering and mixing with the water in the lake. In addition, restoration waters must be prevented from ponding on the upstream side of Tempe Town Lake to avoid prolonged inundation of potential habitat.

In the Phoenix Reach, flows traveling past 19th Avenue may adversely impact activities within the river bed such as gravel mining. To alleviate these problems, alternatives in the Phoenix Reach may need to ensure that flows do not travel past 19th Avenue.

Real Estate Ownership of Sand and Gravel Mining Operations

There are two active sand and gravel mining operations within the Phoenix Reach study area. These two companies own real estate including vested mineral rights to operate within the City of Phoenix. These operations provide a needed product to the growing community, as well as employment opportunities to the area. As of August, 1996, mining within the ordinary high water mark of the Salt River must be permitted by Corps 404 Permit. Both mining companies have indicated that they will not continue mining within the river bed itself, but may continue operating their processing plants and gravel pits outside of the river channel for many years to come. Both operators maintain haul roads on their properties in the river bed. Any alternatives considered for the Phoenix Reach must be sensitive to the needs of the existing operations.

Permitting Requirements

Alternative plans for within the Salt River and IBW must comply with Federal, State and local guidelines and regulations. Any structural improvements within the floodway must comply with Federal Clean Water Act guidelines. Any water that is discharged to the watercourses must meet National Pollutant Discharge Elimination System (NPDES) standards. If use of groundwater as a source is intended, well permits would be required. An aquifer protection permit may be required to ensure the water required to support the habitat does not have an adverse impact on the aquifer.

Water Supply Acquisition and Cost

Selection of the source of water that is required for the project involves numerous important decisions by the Cities of Phoenix and Tempe. These decisions include securing the water rights for the project and the associated cost of the water supply. The water rights within both reaches of the study area are currently under a variety of public and private ownerships. Alternatives considered must address the quantities of water required to sustain project features so that the non-Federal sponsors can obtain proper water rights, if necessary. Utilization of main stem Salt River or CAP flows may require obtaining surface water rights. Although both the City of Tempe and the City of Phoenix currently have groundwater rights, utilization of groundwater as a source to supply water to the restoration areas may require changes to the existing water rights. An expanded discussion and analysis of water supply alternatives, considerations, and costs is presented in **Appendix H, Water Supply Analysis and Cost**.

C. General Management Measures

As described above, there are many constraints associated with development of environmental restoration alternatives. However, through extensive coordination with local and regional agencies and numerous site assessments, the following general management measures have been identified for the two specific sites addressed in this study. These general measures, alone or in combination, have been selected because they would accomplish the specific restoration objectives that have been established for this study and address the identified planning constraints.

Vary the Mix of Plant and Habitat Types

By utilizing the plant species that are native to riparian streams and washes of Arizona, environmental outputs would be maximized for the study area. Arizona Game and Fish Department and the local office of the U.S. Fish and Wildlife Service were consulted to determine what plant species were native to Arizona riparian areas. The specific habitat types to be considered for use to create an optimal habitat community have been identified as follows:

A. Mesquite Habitat

This habitat is dominated primarily by honey, velvet, or screw bean mesquite trees. They are normally found on the upper terraces of the floodplain, above the active flood channel. Although mesquite can be found outside of the river channel, it is still closely linked to the floodplain geomorphology, and this habitat type is an integral part of a complete riparian ecosystem. Mesquite habitat provides a buffer between the surrounding urban area and the more sensitive habitat features within the lower terrace. The plants, along with the terrace, will provide an important vertical structure component for the habitat. This is very important for many neotropical migratory bird species that require canopy and cover. This area would also provide an area for the wildlife that inhabits the lower areas to temporarily utilize in times of flooding.

B. Cottonwood and Willow Dominant Habitat

This habitat is dominated by a combination of cottonwood and willow trees. This plant community is found below the upper terrace of the floodplain. In active streams, this habitat is found along the bank of the active stream bed. In ephemeral streams, this habitat is found along the boundary of where the two-year flood level would extend out from the middle of the channel.

C. Wetland-Marsh Habitat

This habitat consists primarily of cattails, bulrushes, and water cress. This community is located at the lowest elevations of the stream bed. In active streams, this habitat is found along the slowest moving portions of the water course or in backwater areas. In ephemeral streams, this habitat is found in shallow ponds or heavily saturated soils.

D. Aquatic Strand/Scrub Habitat

This habitat is associated with the low flow channel portion of the riparian habitat where the most frequent flows occur. It is below the flood terrace and contains aquatic vegetation if there is a perennial flowing portion of the channel. Adjacent to the aquatic vegetation within the low flow channel, a strand of native grasses and scrubs are typically found. Larger trees and upland species are typically not found in this habitat due to the more frequent flows and longer root saturation periods.

E. Open Edges

Typically edge habitat is described as the interface between two different habitat types. Open edges are integral to the defined restoration project. These areas do not contain specific plant species and they are most valuable to wildlife when they are interspersed with habitat types providing cover. Predator species and raptors use open edges for hunting. This habitat can also serve as a buffer between other habitats and non-habitat areas. All areas of open edges referred to in this report will be entirely within the defined project boundaries.

F. Other Land Uses

This habitat type has little or no habitat value. It includes those areas needed for canals, recreation trails, service roads, parking areas, general landscaping, soil cement embankments, gravel pit bottoms, and other constructed features.

Vary Water Use

Environmental restoration within the Tempe and Phoenix Reaches would be accomplished by planting and establishing different combinations of habitat types. By varying the amount of different habitats, a range of water supply requirements needed to support the various alternatives can be established. Studying a range of water demands would allow for consideration of a full range of alternative water sources and the associated costs for the water supply. The cost of the water supply requirements can then be included in the incremental cost analysis. The general water demands for use with different habitat restoration alternatives in this Feasibility Study have been identified as follows:

A. Low Water Demand Habitat

This type of habitat would have more mesquite habitat and less water consumptive habitat such as wetland marsh and aquatic strand. Water deliveries through unlined canals would be minimized. The wetlands that are incorporated into the plan would have an earth lining or synthetic liner installed to minimize infiltration losses.

B. High Water Demand Habitat

This type of habitat would be able to support more water consumptive wetland habitat plus the additional amount of water necessary to support a small flowing stream in the bottom of the low flow channel. The flowing stream would allow for aquatic strand/scrub type of habitat and more open water areas. Additionally, there is more potential for vegetation to become established on its own because of the increase in saturated soils. This would help take advantage of the land required for the low flow channel and use it to provide valuable aquatic strand/scrub type habitat component. Infiltration from the wetlands would be encouraged so that additional cottonwood and willow habitat can be supported around each wetland area. The use of mesquite habitat would be emphasized in areas with limited access to water.

Vary Areas to be Restored

For the Tempe Reach, there are approximately 140 acres available to be restored. This is divided between 50 acres in the low flow channel of IBW, 30 acres in the bench area of IBW, and 60 acres in the Salt River bottom. By varying the amount of areas to be restored, the amount of water needed to support the associated vegetation would vary. A full range of installation costs and operation and maintenance costs can be considered.

For the Phoenix Reach, the total acreage available for restoration is 880 acres. This total is divided between 550 acres in the Salt River bed and 330 acres in six different gravel pits. Alternative plans will be developed with and with-out the gravel pits, as their availability for inclusion in the project is still in question. Similar to the Tempe Reach, by varying the amount of areas to be restored, a full range of water demand, installation costs, and O&M costs can be considered.

Installation of a Low Flow Channel

Restoration features within the river channel will be periodically subjected to flows from the Salt and Verde River system. In order to alleviate problems associated with long term inundation, the alternatives have been evaluated with and without the construction of a low flow channel. If a low flow channel is not constructed, inundation will be more frequent, and therefore plants would be more frequently impacted than if a low flow channel is constructed. Installation of a low flow channel would increase the likelihood of plant survival and reduce the replacement costs after major flood events over the life of the project.

Alternatives that include a low flow channel would have all wetland-marsh, cottonwood-willow, and mesquite habitat types outside of the low flow channel, between the low flow channel and the main bank. The low flow channel would simulate the natural low flow channel that would be found in a natural riverine riparian area. The low flow channel provides opportunity for aquatic strand/shrub habitat type. It is anticipated that the banks associated with the low flow channel would require stabilizing to ensure the low flow channel is capable of functioning over the life of the project. The low-flow channel and main bank channel system would maintain design conveyance capacity including allowance for vegetative growth within the low-flow channel and on the bench area. The low-flow channel and main bank channel system would also limit scour and erosion of the channel banks to reduce damage to vegetation and the potential for disturbing landfill material that may be present along the channel. There is no indication that the proposed restoration project would have any adverse impact to the bank erosion potential when compared to the without project condition.

Continual Flow Measures for Wetlands

Continuous flow is required for proper wetland functioning. This helps to keep water temperatures lower, aerates the water to maintain dissolved oxygen, and helps minimize the build-up of organics in the bottom of the wetlands. The following measures could be implemented in order to satisfy this requirement:

A. Incorporate Wetlands in Water Distribution System
The wetlands could be incorporated as part of the overall water supply distribution system for the entire restoration alternative. Other habitat types could be supported by the water source supplying the wetlands and by the water outfall from the wetlands.

B. Provide By-Pass Pump Upstream of Tempe Town Lake

A pump at the upstream dam for Town Lake would eliminate several problems and constraints. The pump would prevent water required for habitat restoration upstream of the lake from accumulating upstream of the lake and entering the lake or inundating/drowning the habitat. Nuisance flows generated from upstream of the lake could be prevented from inundating the restored habitat. The pump would allow for continual, aerating water flow for the wetlands habitat, and prevent the accumulation of standing or stagnant water. The water level upstream of the lake could be maintained at an optimal elevation for the wetland habitat. The downstream disposal location for the pumped water could be utilized as a water source for habitat restoration downstream of the lake.

Site Location of Habitat Areas

Site specific locations for habitat areas must be included in the development of the alternative plans. Improvements must consider providing nesting areas that are isolated from public access and away from road crossings or recreation trails so that noise impacts are minimized as much as possible. Other restoration features must be located to maximize the unique recreation opportunities provided by the alternatives.

In order to comply with the FAA runway constraint it would be necessary to avoid habitat types that might attract waterfowl or other larger birds within 10,000 feet of any airport runway. For the Phoenix reach, this would involve the area between I-10 and 24th Street. For the Tempe reach, this would include an area from Priest Drive to approximately one-quarter mile upstream of Priest Drive. The proposed method of compliance is to avoid restoration with any open water habitat in these areas. Therefore, these restoration areas would not include wetland-marsh habitat. Habitat that does not require open water, such as mesquite bosques, would be considered acceptable.

In order to avoid adversely impacting local groundwater flow patterns, open water habitat features will be sited so that infiltration will not cause the migration of contaminants. If groundwater is the selected water source, no leachate problems are anticipated, as the infiltration would represent a net reduction into the aquifer (infiltration would be approximately 61% of the removed volume.) A detailed groundwater quality and flow analysis will be carried out and presented in Chapter VI.

Post Formulation Measures

Certain engineering features to address many of the identified constraints cannot be fully developed until after a specific plan has been identified. This is because of analysis that cannot be cost effectively performed until the plan is formulated. These measures, if required, would include those formulated to address potential impacts to existing landfills, impacts to existing groundwater contamination, and permitting requirements.

D. Alternative Plans

Tempe Reach

As a result of the constraints and management measures discussed above, six alternatives were formulated for restoration of the Tempe Reach. The alternatives are described below including a summary of the measures that have been included in order to address the restoration opportunities and constraints. The following abbreviations are used to describe the alternatives:

1) LW- low water use,
2) HW- high water use,
3) IBW- Indian Bend Wash,
4) SR- Salt River,
5) SR(US)- Salt River upstream of Tempe Town Lake, and
6) SR(DS)- Salt River downstream of Tempe Town Lake.

Table 5.1 presents a general summary of the locations, habitat types, and areas that would be included in each of the alternatives. Additionally, **Figures 5.2 through 5.6** are provided to visually show Alternative IBW+SR(US + DS)/HW. This alternative contains all of the features that are included in the other alternatives. Figures for the other alternatives have not been presented as all of their components may be found within **Figures 5.2 through 5.6**.

The alternatives for the Tempe reach do not include a low flow channel for the Salt River areas. Existing conditions or those included in the without-project condition make a low flow channel impractical. Upstream of Town Lake, there is an existing grade control structure in the Salt River, immediately downstream of McClintock Drive, which maintains channel stability. In addition the upstream dam of Town Lake acts as another grade control structure. When the dam is deflated to allow the passage of flood discharges the structure will only be approximately one-inch above the existing channel invert. These two structures are within less than one-half mile of each other and constrain design and construction of an entrenched low flow channel. Downstream of Town Lake, bedrock is shallow for the entire length of the Salt River between Town Lake and Priest Drive. Immediately downstream of Priest Drive bedrock exists at the invert elevation of the river acting as a natural grade control structure.

Alternative T1. (No Action)

Alternative T1 is the No Action Alternative. The No Action Alternative would maintain the current and future without-project conditions in the Tempe Reach. The low flow channel of IBW between McKellips Road and Curry Road would continue to have very little habitat value. The IBW bench, between the low flow channel and the main bank, from Curry Road to the Salt River, would remain barren. The Salt River bed upstream of Town Lake would remain barren cobbles. The habitat value of the entire 140 acres under consideration within the study area would continue to be negligible.

Alternative T2. IBW/LW

Alternative T2 has been formulated to restore only areas within the IBW with low water use vegetation. This alternative would consist of restoration of the 30 acres on the bench of IBW between Curry Road and the confluence with the Salt River. The improvements would consist of 20 acres of mesquite habitat and 10 acres of open edge habitat. The existing sprinkler irrigation system in place on the bench would be modified to support irrigation of the additional mesquite trees. The 50 acres of low flow channel in IBW, would continue to be of negligible habitat value. The alternative would not produce any excess water or outfall required to be diverted from Town Lake.

Alternative T3. IBW+SR(US+DS)/LW

Alternative T3 would restore areas in both Indian Bend Wash and the Salt River with low water use vegetation. In addition to the 30 acres of restoration in IBW proposed by Alternative T2, this alternative would also provide for restoration of the 60 acres in the Salt River upstream and downstream of Tempe Town Lake (30 acres each). The Salt River improvements would consist of 5 acres of mesquite habitat and 25 acres of open edge habitat in each of the upstream and downstream areas. There would not be permanent irrigation to support the plants in the Salt River. A long establishment period would be utilized to allow the root structure of the trees to become established to the point where the plant could survive without permanent watering.

Alternative T4. IBW+SR(DS)/HW

Alternative T4 would restore IBW areas and the Salt River area downstream of Town Lake with high water use vegetation. This alternative would consist of installation of improvements to the entire 80 acres in the IBW portion of the Tempe Reach and the 30 acres downstream of town Lake. On the bench of IBW, between Curry Road and the confluence with the Salt River, the improvements would consist of 20 acres of mesquite habitat and 10 acres of open edge habitat. The existing sprinkler irrigation system in place on the bench would be modified to support irrigation of the additional mesquite. In the low flow channel of IBW, the improvements would consist of 50 acres of aquatic strand habitat that would extend 1.3 miles from McKellips Road to the confluence with the Salt River. Overflow/outfall from the IBW low flow channel would be diverted through a pipe by gravity flow, along the north side of Town Lake, and discharged into the Salt river immediately downstream of Town Lake. The excess water from the IBW restoration would partially satisfy the water requirements for the restoration of the Salt River area downstream of Town Lake. The restoration in the Salt River would consist of 10 acres of cottonwood/willow, 8 acres of wetland marsh, and 12 acres of open edges. Since this alternative emphasizes riparian habitat, it is considered a high water use alternative. The area within the Salt River upstream of Town Lake would remain in its present condition.

Alternative T5. IBW+SR(US+DS)/HW

Alternative T5 would maximize restoration opportunities in both IBW and the Salt River with high water use vegetation, as shown in **Figures 5.2 through 5.6** In addition to the 80 total acres of restoration areas available in IBW, this alternative would also provide for restoration of the 60 total acres of the Salt River available for restoration upstream and downstream of Town Lake. The IBW restoration would include 50 acres of aquatic strand in the low flow channel, 20 acres of mesquite habitat on the bench, and 10 acres of open edges. The alternative includes a gravity pipe to drain excess restoration waters from IBW to the upstream side of Town Lake. The Salt River restoration would provide for installation of 16 acres of wetland marsh habitat, 20 acres of cottonwood/willow dominant habitat, and 24 acres of open edge habitat. The soils surrounding the wetlands would be allowed to saturate to support the cottonwood and willow trees without installation of permanent irrigation facilities. The alternative includes a pump and pipeline to remove excess water from upstream of Town Lake to the downstream side. A long establishment period would be utilized to allow the root structure of the trees to become established to the point where the plants could survive without permanent watering.

Alternative T6. SR DS/HW

This alternative would restore only the area of the Salt River downstream of Town Lake with high water use, riparian dominant habitat. The water supply could be provided, in part, by water from Tempe Town Lake. The alternative would consist of 10 acres of cottonwood willow habitat and 8 acres of wetland marsh, and 12 acres of open edges.

Table 5.1 Tempe Reach Alternative Matrix

Area	Acreage						Total Acres
	Mesquite	Cottonwood Willow	Wetland Marsh*	Aquatic Strand	Open Edges	Other	
Alternative T1 No Action							
IBW Low Flow	-	-	-	-	-	50	**50**
IBW Bench	-	-	-	-	-	30	**30**
Upstream Salt River	-	-	-	-	-	30	**30**
Downstream Salt River	-	-	-	-	-	30	**30**
Totals	**0**	**0**	**0**	**0**	**0**	**140**	**140**
Alternative T2 IBW/LW							
IBW Low Flow	-	-	-	-	-	50	**50**
IBW Bench	20	-	-	-	10	-	**30**
Upstream Salt River	-	-	-	-	-	30	**30**
Downstream Salt River	-	-	-	-	-	30	**30**
Totals	**20**	**0**	**0**	**0**	**10**	**110**	**140**

Table 5.1 Tempe Reach Alternative Matrix
(continued)

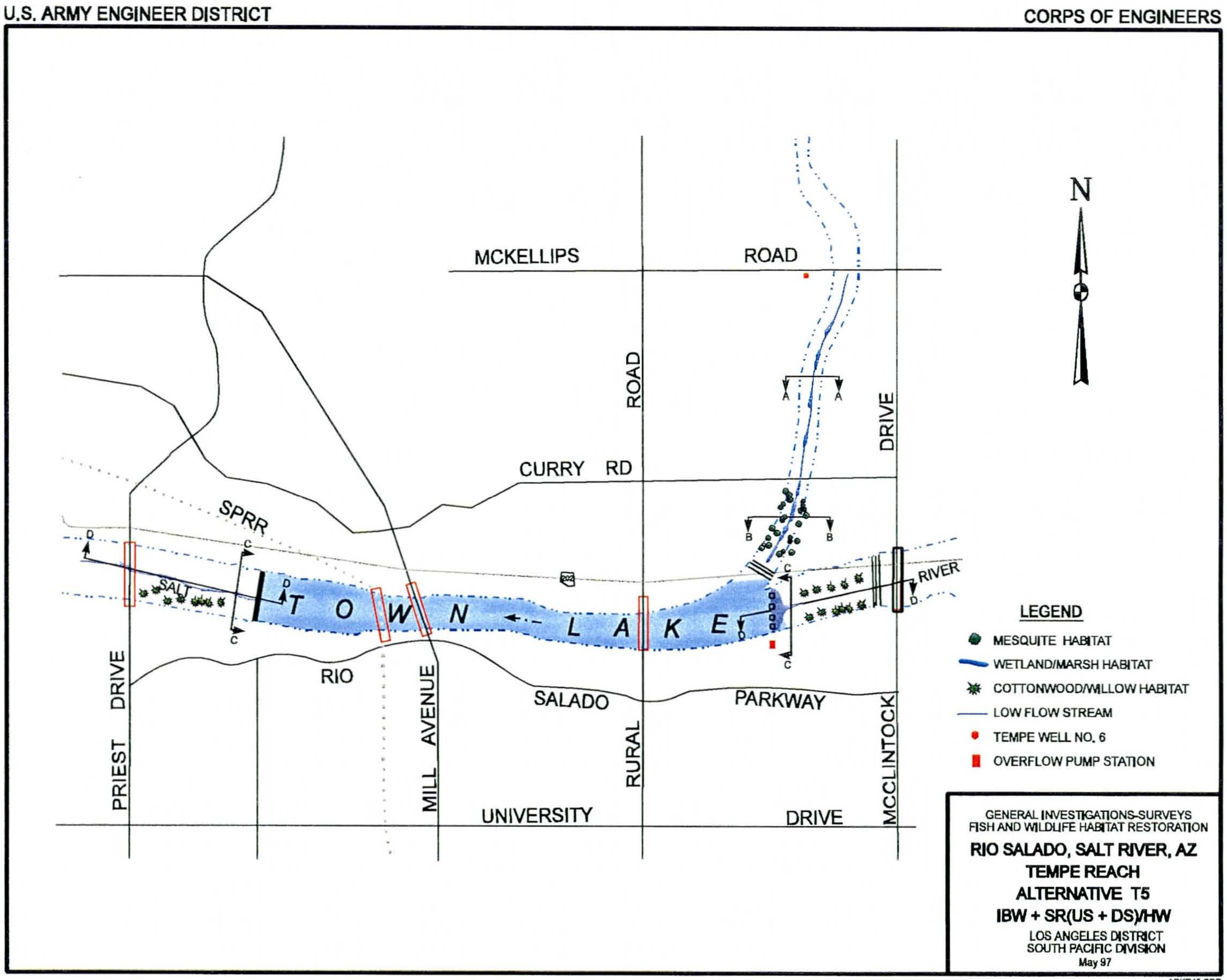
Area	Acreage						Total Acres
	Mesquite	Cottonwood Willow	Wetland Marsh*	Aquatic Strand	Open Edges	Other	
Alternative T3 IBW+SR(US+DS)/LW							
IBW Low Flow	-	-	-	-	-	50	**50**
IBW Bench	20	-	-	-	10	-	**30**
Upstream Salt River	5	-	-	-	25	-	**30**
Downstream Salt River	5	-	-	-	25	-	**30**
Totals	**30**	**0**	**0**	**0**	**60**	**50**	**140**
Alternative T4 IBW+SR(DS)/HW							
IBW Low Flow	-	-	-	50	-	-	**50**
IBW Bench	20	-	-	-	10	-	**30**
Upstream Salt River	-	-	-	-	-	30	**30**
Downstream Salt River	-	10	8	-	12	-	**30**
Totals	**20**	**10**	**8**	**50**	**22**	**30**	**140**
Alternative T5 IBW+SR(US+DS)/HW							
IBW Low Flow	-	-	-	50	-	-	**50**
IBW Bench	20	-	-	-	10	-	**30**
Upstream Salt River	-	10	8	-	12	-	**30**
Downstream Salt River	-	10	8	-	12	-	**30**
Totals	**20**	**20**	**16**	**50**	**34**	**0**	**140**

Table 5.1 Tempe Reach Alternative Matrix
(continued)

Area	Acreage						Total Acres
	Mesquite	Cottonwood Willow	Wetland Marsh*	Aquatic Strand	Open Edges	Other	
Alternative T6 SR(DS)/HW							
IBW Low Flow	-	-	-	-	-	50	**50**
IBW Bench	-	-	-	-	-	30	**30**
Upstream Salt River	-	-	-	-	-	30	**30**
Downstream Salt River	-	10	8	-	12	-	**30**
Totals	**0**	**10**	**8**	**0**	**12**	**110**	**140**

* Includes areas of open water.

FIGURE 5.2
ALTERNATIVE T5
IBW + SR(US+DS)/HW



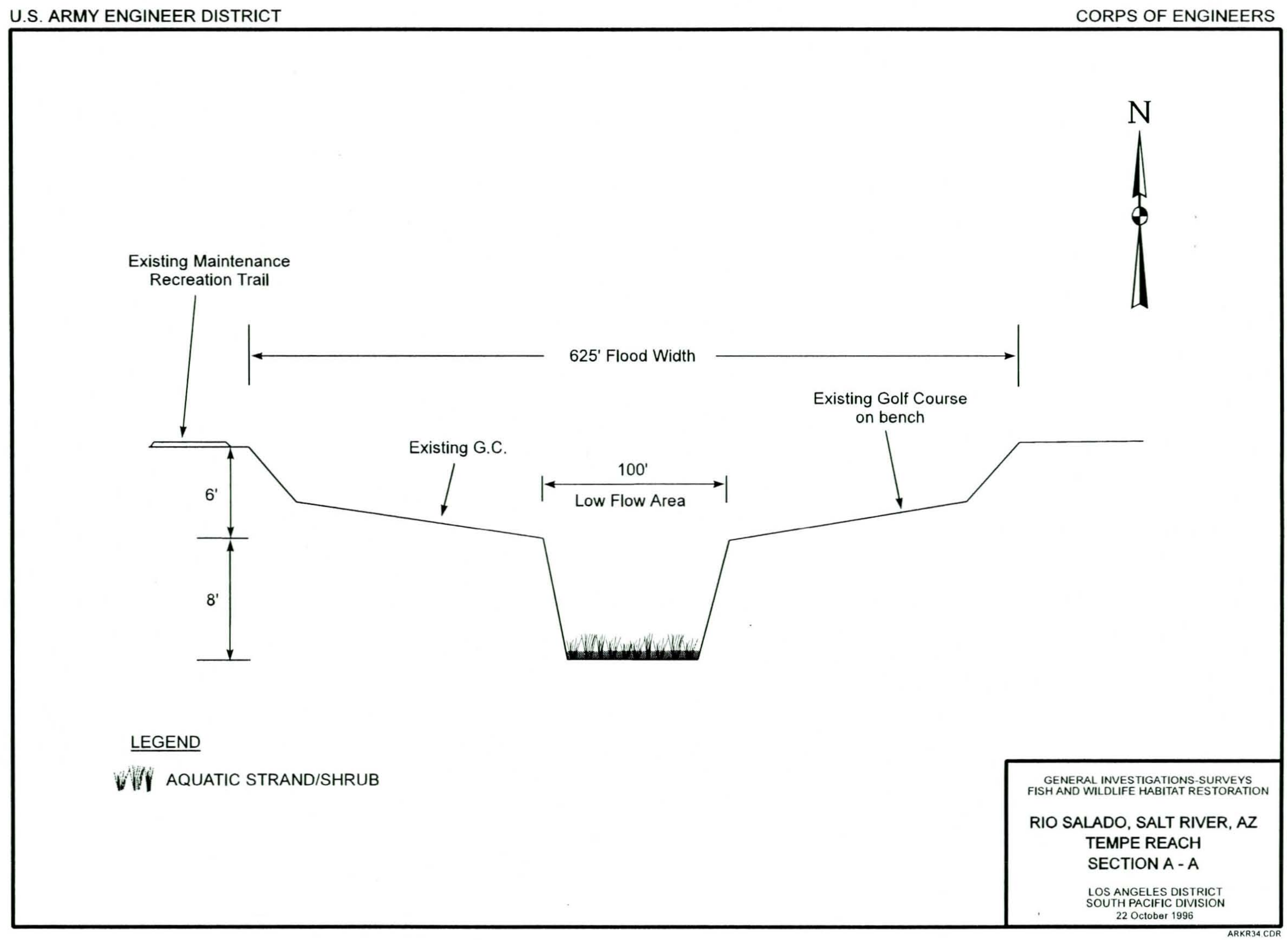
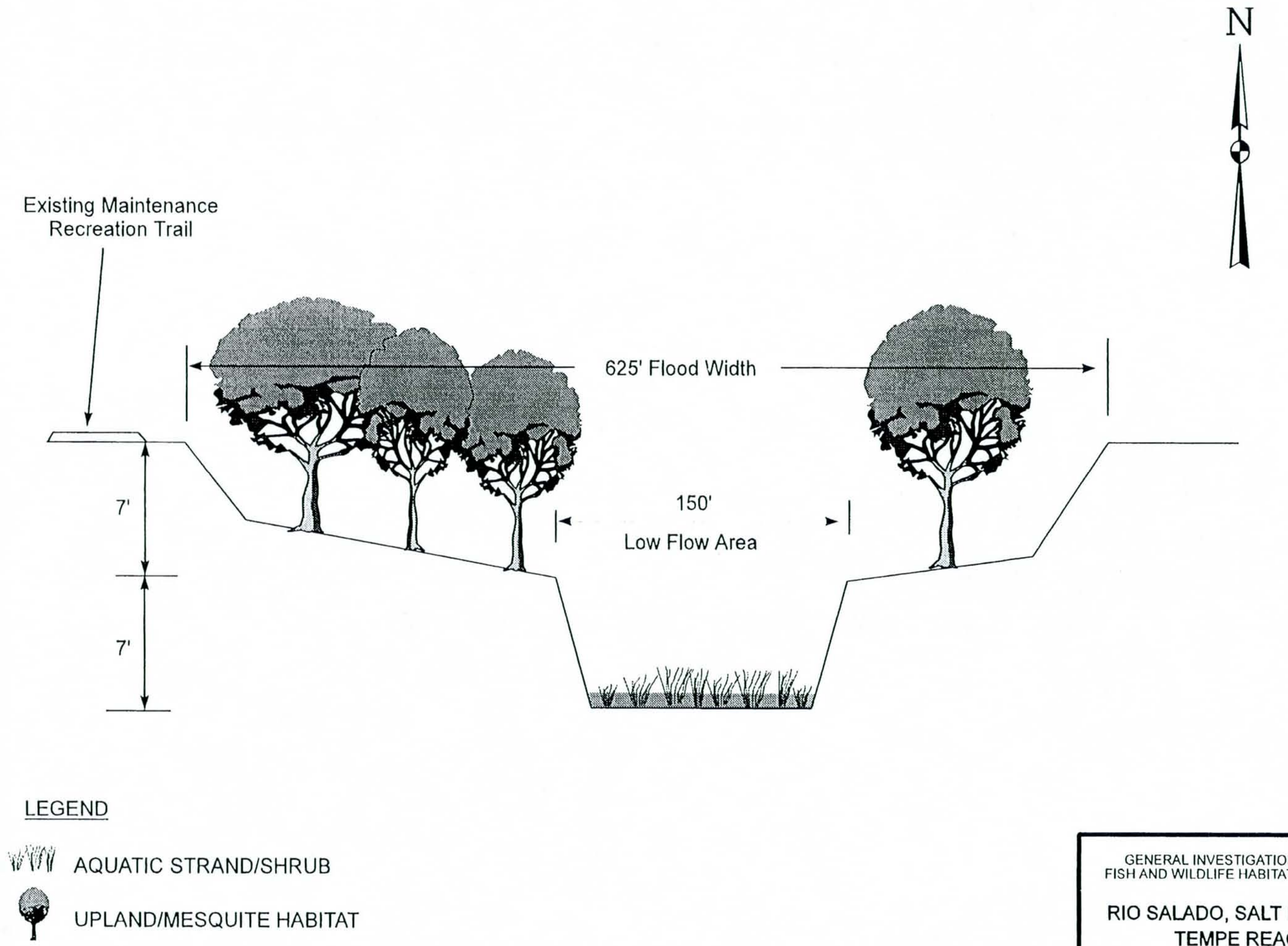


FIGURE 5.3
TEMPE REACH
SECTION A-A

U.S. ARMY ENGINEER DISTRICT

CORPS OF ENGINEERS



GENERAL INVESTIGATIONS-SURVEYS
FISH AND WILDLIFE HABITAT RESTORATION

RIO SALADO, SALT RIVER, AZ
TEMPE REACH
SECTION B - B

LOS ANGELES DISTRICT
SOUTH PACIFIC DIVISION
Jan 97

ARKR35.CDR

FIGURE 5.4
TEMPE REACH
SECTION B-B

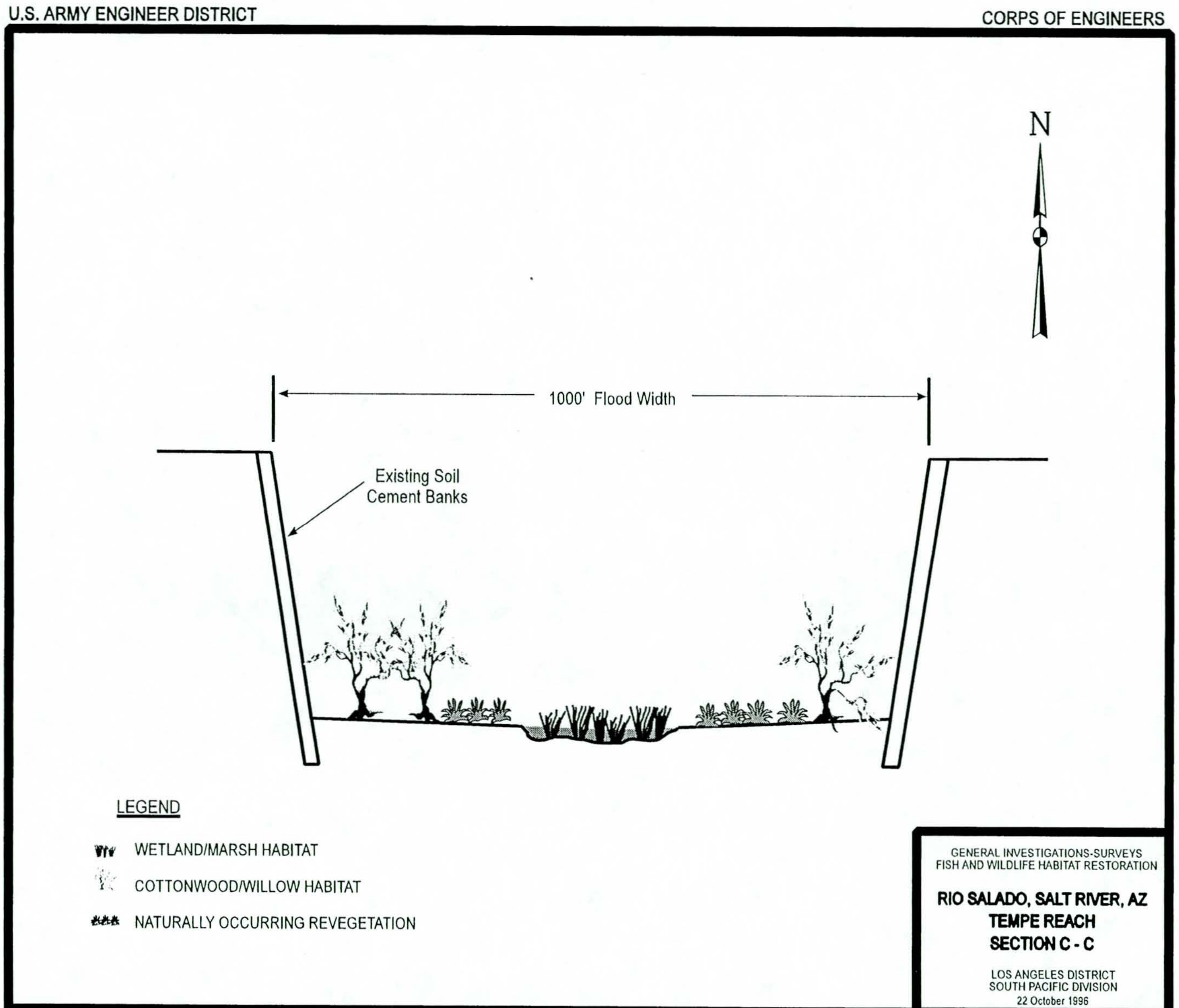
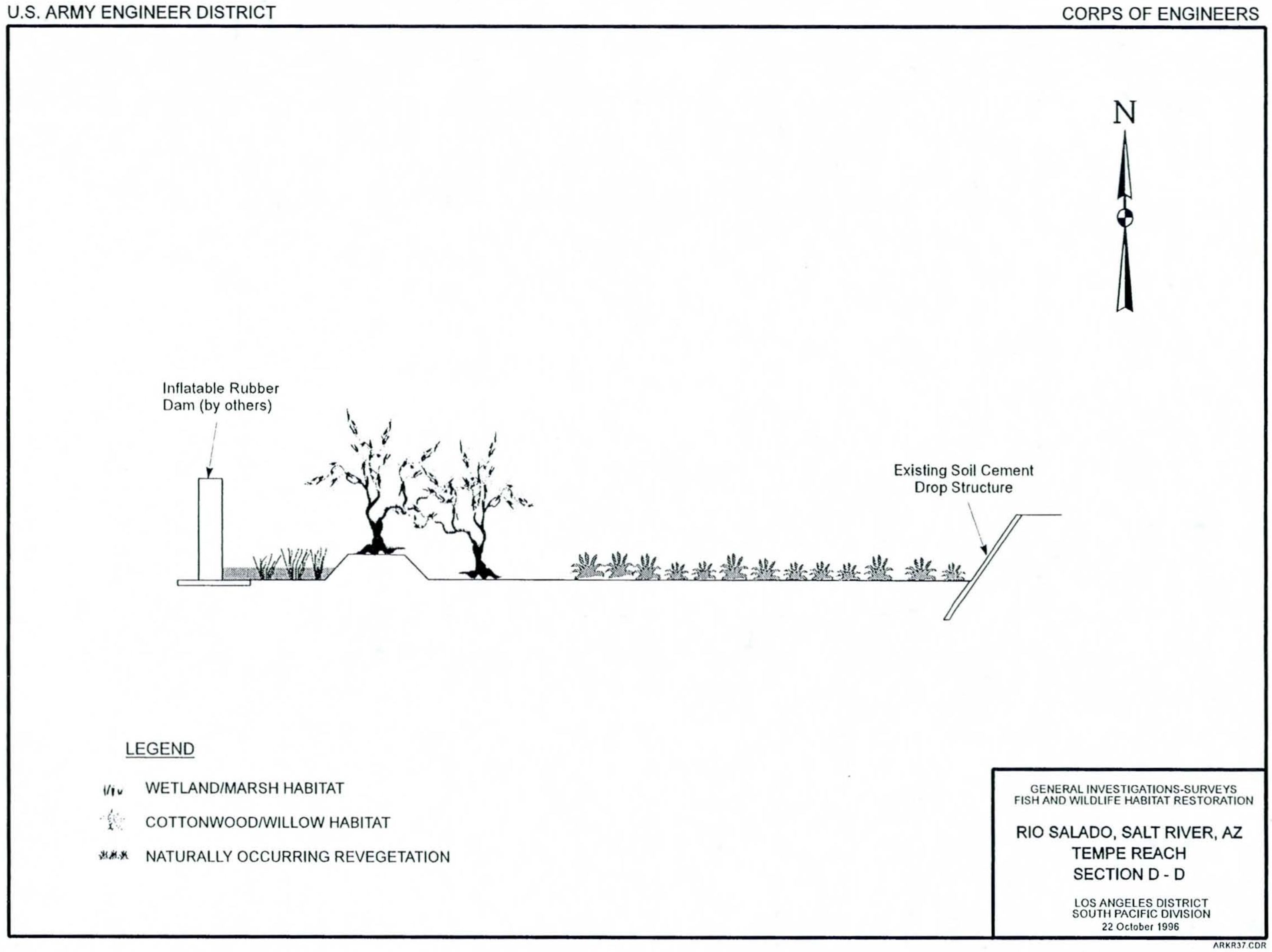


FIGURE 5.5
TEMPE REACH
SECTION C-C

FIGURE 5.6
TEMPE REACH
SECTION D-D



Phoenix Reach

Initial Alternatives Considered

Including the no action alternative, there were twenty-one (21) different initial alternatives developed for environmental restoration of the Phoenix Reach. This initial array of alternatives included differing sizes of low flow channels. The alternatives considered differing low flow channel widths including a 500 foot, 350 foot, 200 foot widths and no low flow channel alternatives.

The alternatives which were eliminated from further consideration were those alternatives that did not include a low flow channel or those that included a low flow channel greater than a 12,200 cfs capacity. A maximum low flow discharge of 12,200 cubic feet per second (cfs) was agreed upon by the study team as being the design target discharge based on a step 4 release schedule found in the Modified Roosevelt Dam Water Control Diagram (Plate 11 in the **Appendix A, Hydrology**). This particular discharge corresponds to between a 50- and 100-year flood for flow duration times of 30 days. However, in terms of peak flows, a discharge of 12,200 cfs corresponds to less than a 5-year flood. The low flow channel was designed to limit the velocity associated with 12,200 cfs to 6 feet per second (ft/s) to avoid the potential for scouring of the bed. In addition potential damage due to high flow velocities, the inundation time to which the restored habitats would be subjected was an identified constraint that could be better controlled with inclusion of a low flow channel. The alternatives with low flow channels wider than 200 feet (>12,200 cfs) were eliminated because (1) they would require additional river bottom land that could otherwise be used for restoration areas, (2) they cost more, and (3) they did not appear to meet the identified planning constraints, including the need for periodic but limited inundation of restored habitat areas.

The selection of the low flow channel capacity was primarily based on minimizing the frequency of 30-day or longer flow durations exceeding the capacity of the low flow channel. This 30-day duration constraint was intended to prevent the root structure of the cottonwood trees from being inundated for a length of time that might be fatal. The 12,200 cfs low flow channel would have flood discharges exceeding this 30 day constraint on a return interval of 83 years. Peak flows exceeding the 12,200 cfs capacity of the low flow channel would have an estimated return interval of 3.85 years for a 6-hour average maximum discharge and a return period of 6.67 years for a 1-day average maximum discharge. This matched well with the recommended seven year flood return interval of the riparian habitat for flushing and duplication of natural conditions. Based on these technical criteria, the 12,200 cfs low flow channel capacity is recommended.

The following abbreviations are used to describe the alternatives:

1) LW- low water use,
2) HW- high water use,
3) SR- Salt River,
4) G- includes gravel pits, and
5) S - includes a perennial stream.

Based on this screening of the initial array of alternatives, a total of nine alternatives, including a no action alternative, were forwarded for further consideration and incremental analysis evaluation. These alternatives all included a 12,200 cfs low flow channel. A description of each alternative is presented below. **Table 5.2** presents a general summary of the locations, habitat types, and areas that would be included in each of the alternatives. **Figures 5.7 through 5.13** are provided to conceptually depict Alternative P9 (SR+G/HW+S). Figures for the other alternatives were not created as all of their conceptual components may be found on the figures provided for Alternative P9.

Alternative P1.(No Action)

Alternative P1 is the No Action Alternative. This alternative would maintain the future without-project conditions in the Phoenix Reach. The 550 acres of the Salt River bed from I-10 bridge to 19th Avenue would remain almost entirely barren cobbles. The 330 acres of gravels pits (G) would remain as unsightly, unused hazard areas. The habitat value of the entire 880 acres under consideration would be continue to be negligible.

Alternative P2. SR/LW

Alternative P2 would restore the Salt River portion of the Phoenix Reach with low water use vegetation. This alternative would include the construction of a 200 foot wide low flow channel but would not incorporate the gravel pits. The restoration would consist of 20 acres of mesquite habitat, 80 acres of cottonwood and willow habitat, 40 acres of wetland marsh, and 120 acres of open edges on the constructed bench in the Salt River bottom. No improvements would be placed in the low flow channel itself; rather, this area would remain as 130 acres of open edges. Restoration on the banks of the river would consist of 35 acres of open edges. Fifty feet of overbank on each side of the river would be incorporated into the restoration, consisting of 30 acres of mesquite habitat and 20 acres of open edges. Also included in the restoration would be approximately 50 acres consisting of infrastructure features and public access facilities. Such infrastructure features include soil cement levees, drop structures, pump stations, water distribution features, and operation and maintenance roads. Public access facilities within these areas would be part of the recreation plan and include parking lots, trails, and environmental education features. These areas have categorically been referred to in the report as "other" and determined to have no habitat value.

Alternative P3. SR/HW

Alternative P3 would restore the Salt River portion of the Phoenix Reach with higher water use vegetation involving more riparian habitat. This alternative would include the construction of a 200 foot wide low flow channel, but would not incorporate the gravel pits. The restoration would consist of 160 acres of cottonwood and willow habitat and 100 acres of wetlands on the bench in the Salt River bottom between the low flow channel and the bank. No improvements would be placed in the low flow channel itself, this area would remain as 130 acres of open edges. Water to support the vegetation on the benches would be brought down from the overbanks. Around the water delivery system, 5 acres of cottonwood and willow habitat would be established. The banks would also support 30 acres of open edges. On the overbank area, 50 feet of overbank on each side of the river would be incorporated into the restoration. Open canals or ditches would also serve to deliver water along the overbanks. Restoration on the overbanks would consist of 10 acres of mesquite habitat, 20 acres of cottonwood and willow habitat, and 10 acres of open edges. Also included in the restoration would be approximately 50 acres consisting of infrastructure features and public access facilities. Such infrastructure features include soil cement levees, drop structures, pump stations, water distribution features, and operation and maintenance roads. Public access facilities within these areas would be part of the recreation plan and include parking lots, trails, and environmental education features. These areas have categorically been referred to in the report as "other" and determined to have no habitat value.

Alternative P4. SR/LW+S

Alternative P4 would restore the entire Phoenix Reach with low water use vegetation. This alternative would include construction of a 200 foot wide low flow channel and include a perennial low flow stream to create aquatic strand habitat. The restoration would consist of 20 acres of mesquite habitat, 80 acres of cottonwood and willow habitat, and 40 acres of wetland marsh habitat on the constructed bench in the river bottom. No improvements would be placed in the low flow channel itself, this area would consist of 130 acres of aquatic strand/shrub associated with the stream in the low flow channel. Water to support the restoration in the river bottom would be brought down from the overbanks. Around the water delivery system, 5 acres of cottonwood and willow habitat would be established. The banks would also support 35 acres of open edges. Above the banks, 50 feet of overbank on each side of the river would be incorporated into the restoration. Open canals or ditches would also serve to deliver water on the overbanks. Restoration on the overbanks would consist of 30 acres of mesquite habitat and 20 acres of open edges. Also included in the restoration would be approximately 50 acres consisting of infrastructure features and public access facilities. Such infrastructure features include soil cement levees, drop structures, pump stations, water distribution features, and operation and maintenance roads. Public access facilities within these areas would be part of the recreation plan and include parking lots, trails, and environmental education features. These areas have categorically been referred to in the report as "other" and determined to have no habitat value.

Alternative P5. SR/HW+S

Alternative P5 would restore the Salt River portion of the Phoenix Reach with high water use vegetation. This alternative would include construction of a 200 foot wide low flow channel; the amount of water supply for this alternative would be sufficient to support a low flow, permanently flowing stream in the low flow channel. The stream would provide aquatic strand habitat similar to the low flow area of a natural riparian system. This alternative would not incorporate the gravel pits. The restoration would consist of 160 acres of cottonwood and willow dominant habitat and 100 acres of wetlands on the constructed bench in the Salt River bottom. The low flow channel with stream would create 130 acres of aquatic strand/shrub habitat within the low flow channel adjacent to the stream. Water to support the vegetation in the bottom would be brought down from the overbank area. Around the water supply delivery system, 5 acres of cottonwood and willow habitat would be established. The banks would also support 30 acres of open edges. Above the banks, 50 feet of overbank on each side of the river would be incorporated into the restoration. Open canals or ditches would also serve to deliver water on the overbanks. Restoration on the overbanks would consist of 10 acres of mesquite habitat, 20 acres of cottonwood and willow habitat, and 10 acres of open edges. Also included in the restoration would be approximately 50 acres consisting of infrastructure features and public access facilities. Such infrastructure features include soil cement levees, drop structures, pump stations, water distribution features, and operation and maintenance roads. Public access facilities within these areas would be part of the recreation plan and include parking lots, trails, and environmental education features. These areas have categorically been referred to in the report as "other" and determined to have no habitat value.

Alternative P6. SR+G/LW

Alternative P6 would restore the entire Phoenix Reach, including the Salt River and the gravel pits, with lower water use vegetation, thereby minimize riparian habitat. This alternative would include construction of a 200 foot wide low flow channel and cut back the banks in the area of the existing gravel pits so that additional bench area is created. The restoration would consist of 50 acres of mesquite habitat, 80 acres of cottonwood and willow habitat, 40 acres of wetlands and 120 acres of open edges on the constructed bench in the Salt River bottom. No improvements would be placed in the low flow channel itself; rather, this area would remain as 130 acres of open edges. The restoration on the banks would consist of 45 acres of open edges. Above the banks, 50 feet of overbank on each side of the river would be incorporated into the restoration. Restoration on the overbanks would consist of 45 acres of mesquite habitat and 35 acres of open edges. Also included in the restoration would be approximately 50 acres consisting of infrastructure features and public access facilities. Such infrastructure features include soil cement levees, drop structures, pump stations, water distribution features, and operation and maintenance roads. Public access facilities within these areas would be part of the recreation plan and include parking lots, trails, and environmental education features. These areas have categorically been referred to in the report as "other" and determined to have no habitat value. Within the gravel pits themselves, an additional 10 acres of cottonwood and willow habitat would be created.

Alternative P7. SR+G/HW

Alternative P7 would restore the entire Phoenix Reach, including the Salt River and the gravel pits, with high water use vegetation emphasizing riparian habitat. This alternative would include construction of a 200 foot wide low flow channel and include the areas of the gravel pits. The restoration would consist of 30 acres of mesquite habitat, 160 acres of cottonwood and willow habitat, and 100 acres of wetland marsh habitat on the constructed bench in the river bottom. No improvements would be placed in the low flow channel itself; rather, this area would remain as 130 acres of open edges. Water to support the vegetation in the river bottom would be brought down from the overbanks. Around the water delivery system, 5 acres of mesquite habitat would be established. The banks would also support 40 acres of cottonwood and willow and 5 acres of open edges. Above the banks, 50 feet of overbank on each side of the river would be incorporated into the restoration. Open canals or ditches would also serve to deliver water on the overbanks. Restoration on the overbanks would consist of 25 acres of mesquite habitat, 20 acres of cottonwood and willow habitat, and 25 acres of open edges. Also included in the restoration would be approximately 50 acres consisting of infrastructure features and public access facilities. Such infrastructure features include soil cement levees, drop structures, pump stations, water distribution features, and operation and maintenance roads. Public access facilities within these areas would be part of the recreation plan and include parking lots, trails, and environmental education features. These areas have categorically been referred to in the report as "other" and determined to have no habitat value. Within the gravel pits themselves, an additional 10 acres of cottonwood and willow habitat would be created. It may be necessary to create additional bench area within the gravel pits in order to support the habitat. The steep banks of the gravel pits may also need to have their slopes reduced.

Alternative P8. SR+G/LW+S

Alternative P8 would restore the entire Phoenix Reach, including the Salt River and the gravel pits, with lower water use vegetation. This alternative would include construction of a 200 foot wide low flow channel, cutting back the banks in the area of the existing gravel pits so that additional bench area is created, and supplying the amount of water needed to support a low discharge, permanently flowing stream in the low flow channel. The restoration would consist of 50 acres of mesquite habitat, 80 acres of cottonwood and willow habitat and 40 acres of wetlands on the constructed bench in the river bottom. The bench would also support 120 acres of open edges. The stream in the low flow channel would create 130 acres of aquatic strand/shrub habitat. Water to support the vegetation in the bottom and the stream would be brought down from the overbanks in delivery system. The banks would also support 45 acres of open edges. Above the banks, 50 feet of overbank on each side of the river would be incorporated into the restoration. Open canals or ditches would also serve to deliver water on the overbanks. Restoration on the overbanks would consist of 45 acres of mesquite habitat and 35 acres of open edges. Also included in the restoration would be approximately 50 acres consisting of infrastructure features and public access facilities. Such infrastructure features include soil cement levees, drop structures, pump stations, water distribution features, and operation and maintenance roads. Public access facilities within these areas would be part of the recreation plan and include parking lots, trails, and environmental education features. These areas have categorically been referred to in the report as "other" and determined to have no habitat value. Within the gravel pits themselves, an additional 10 acres of cottonwood and willow habitat would be created.

Alternative P9. SR+G/HW+S

Alternative P9 would restore the entire Phoenix Reach including the Salt River and the gravel pits with high water use vegetation. This alternative would include construction of a 200 foot wide low flow channel, cutting back the banks in the area of the existing gravel pits so that additional bench area is created, and supplying the amount of water needed to support a permanently flowing stream in the low flow channel. The restoration would consist of 30 acres of mesquite habitat, 160 acres of cottonwood and willow habitat, and 100 acres of wetlands on the constructed bench in the river bottom. The stream in the low flow channel would create 130 acres of aquatic strand habitat. Water to support the vegetation in the bottom and the stream would be brought down the banks in delivery system. The banks would support 40 acres of cottonwood/willow habitat and 5 acres of mesquite habitat. Above the banks, 50 feet of overbank on each side of the river would be incorporated into the restoration. Open canals or ditches would also serve to deliver water on the overbanks. Restoration on the overbanks would consist of 25 acres of mesquite habitat, 20 acres of cottonwood and willow habitat, and 25 acres of open edges. Also included in the restoration would be approximately 50 acres consisting of infrastructure features and public access facilities. Such infrastructure features include soil cement levees, drop structures, pump stations, water distribution features, and operation and maintenance roads. Public access facilities within these areas would be part of the recreation plan and include parking lots, trails, and environmental education features. These areas have categorically been referred to in the report as "other" and determined to have no habitat value. Within the gravel pits themselves, an additional 10 acres of cottonwood and willow habitat would be created.

Table 5.2 Phoenix Reach Alternative Matrix

Area	Acreage						Total Acres
	Mesquite	Cottonwood Willow	Wetland Marsh*	Aquatic Strand	Open Edges	Other	
Alternative P1 No Action							
Low Flow Channel	-	-	-	-	-	130	**130**
Bench	-	-	-	-	-	270	**270**
Bank	-	-	-	-	-	40	**40**
Overbank	-	-	-	-	-	60	**60**
Access Areas	-	-	-	-	-	50	**50**
Gravel Pits	-	-	-	-	-	-	-
Totals	**0**	**0**	**0**	**0**	**0**	**550**	**550**

Table 5.2 Phoenix Reach Alternative Matrix
(continued)

Area	Acreage						Total Acres
	Mesquite	Cottonwood Willow	Wetland Marsh*	Aquatic Strand	Open Edges	Other	
Alternative P2 SR/LW							
Low Flow Channel	-	-	-	-	130	-	**130**
Bench	20	80	40	-	120	10	**270**
Bank	-	-	-	-	35	5	**40**
Overbank	30	-	-	-	20	10	**60**
Access Areas	-	-	-	-	50	-	**50**
Gravel Pits	-	-	-	-	-	-	-
Totals	**50**	**80**	**40**	**0**	**355**	**25**	**550**
Alternative P3 SR/HW							
Low Flow Channel	-	-	-	-	130	-	**130**
Bench	-	160	100	-	-	10	**270**
Bank	-	5	-	-	30	5	**40**
Overbank	10	20	-	-	10	20	**60**
Access Areas	-	-	-	-	50	-	**50**
Gravel Pits	-	-	-	-	-	-	-
Totals	**10**	**185**	**100**	**0**	**220**	**35**	**550**
Alternative P4 SR/LW+S							
Low Flow Channel	-	-	-	130	-	-	**130**
Bench	20	80	40	-	120	10	**270**
Bank	-	-	-	-	35	5	**40**
Overbank	30	-	-	-	20	10	**60**
Access Areas	-	-	-	-	50	-	**50**
Gravel Pits	-	-	-	-	-	-	-
Totals	**50**	**80**	**40**	**130**	**225**	**25**	**550**

Table 5.2 Phoenix Reach Alternative Matrix
(continued)

Area	Acreage						Total Acres
	Mesquite	Cottonwood Willow	Wetland Marsh*	Aquatic Strand	Open Edges	Other	
Alternative P5 SR/HW+S							
Low Flow Channel	-	-	-	130	-	-	**130**
Bench	-	160	100	-	-	10	**270**
Bank	-	5	-	-	30	5	**40**
Overbank	10	20	-	-	10	20	**60**
Access Areas	-	-	-	-	50	-	**50**
Gravel Pits	-	-	-	-	-	-	**-**
Totals	**10**	**185**	**100**	**130**	**90**	**35**	**550**
Alternative P6 SR+G/LW							
Low Flow Channel	-	-	-	-	130	-	**130**
Bench	50	80	40	-	120	10	**300**
Bank	-	-	-	-	45	5	**50**
Overbank	45	-	-	-	35	30	**110**
Access Areas	-	-	-	-	50	-	**50**
Gravel Pits	-	10	-	-	-	230	**240**
Totals	**95**	**90**	**40**	**0**	**380**	**275**	**880**
Alternative P7 SR+G/HW							
Low Flow Channel	-	-	-	-	130	-	**130**
Bench	30	160	100	-	-	10	**300**
Bank	5	40	-	-	5	-	**50**
Overbank	25	20	-	-	25	40	**110**
Access Areas	-	-	-	-	50	-	**50**
Gravel Pits	-	10	-	-	-	230	**240**
Totals	**60**	**230**	**100**	**0**	**210**	**280**	**880**

Table 5.2 Phoenix Reach Alternative Matrix
(continued)

Area	Acreage						Total Acres
	Mesquite	Cottonwood Willow	Wetland Marsh*	Aquatic Strand	Open Edges	Other	
Alternative P8 SR+G/LW+S							
Low Flow Channel	-	-	-	130	-	-	**130**
Bench	50	80	40	-	120	10	**300**
Bank	-	-	-	-	45	5	**50**
Overbank	45	-	-	-	35	30	**110**
Access Areas	-	-	-	-	50	-	**50**
Gravel Pits	-	10	-	-	-	230	**240**
Totals	**95**	**90**	**40**	**130**	**250**	**275**	**880**
Alternative P9 SR+G/HW+S							
Low Flow Channel	-	-	-	130	-	-	**130**
Bench	30	160	100	-	-	10	**300**
Bank	5	40	-	-	-	5	**50**
Overbank	25	20	-	-	25	40	**110**
Access Areas	-	-	-	-	50	-	**50**
Gravel Pits	-	10	-	-	-	230	**240**
Totals	**60**	**230**	**100**	**130**	**75**	**285**	**880**

* Includes areas of open water.

FIGURE 5.7
ALTERNATIVE P9
SR + G/HW+S

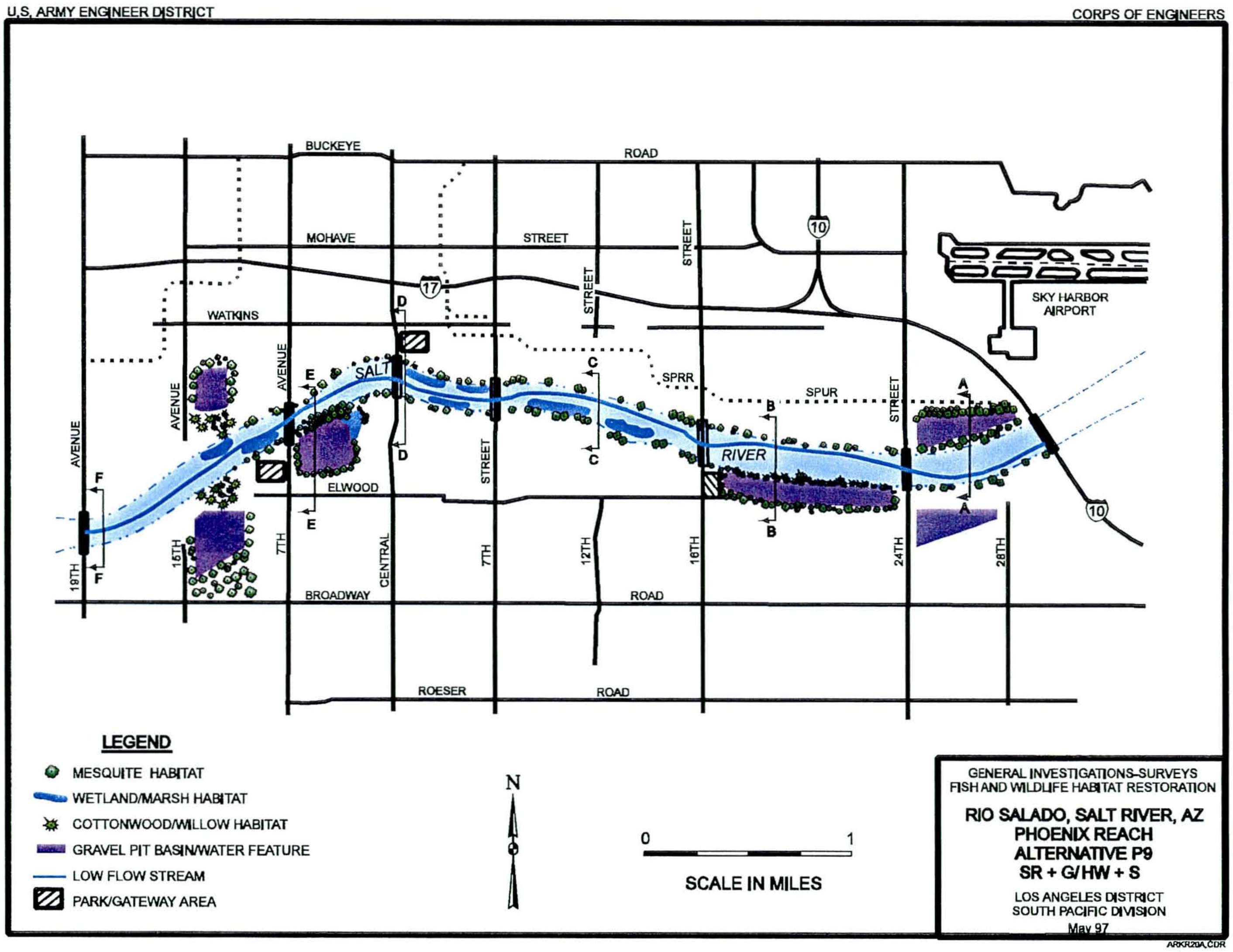
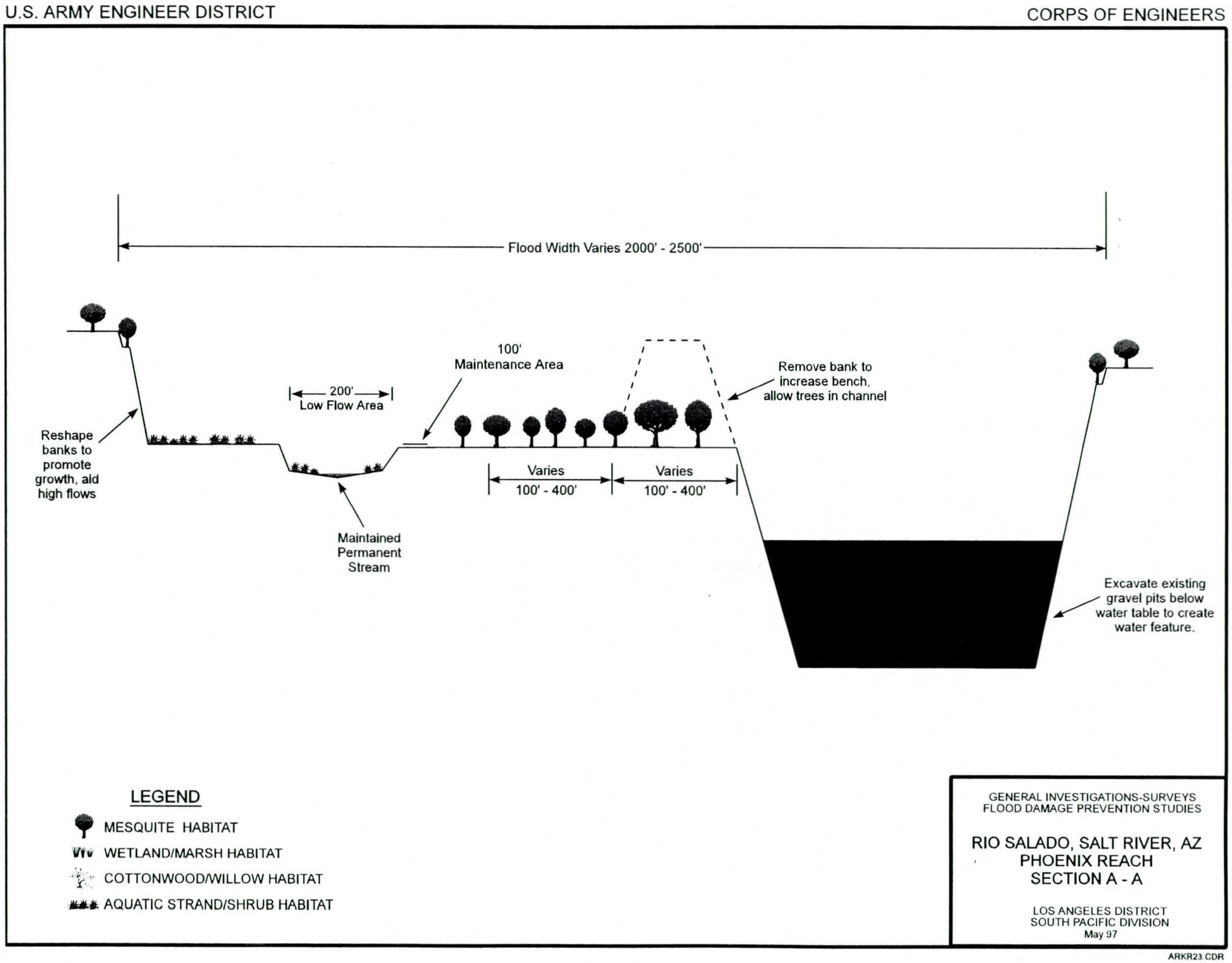
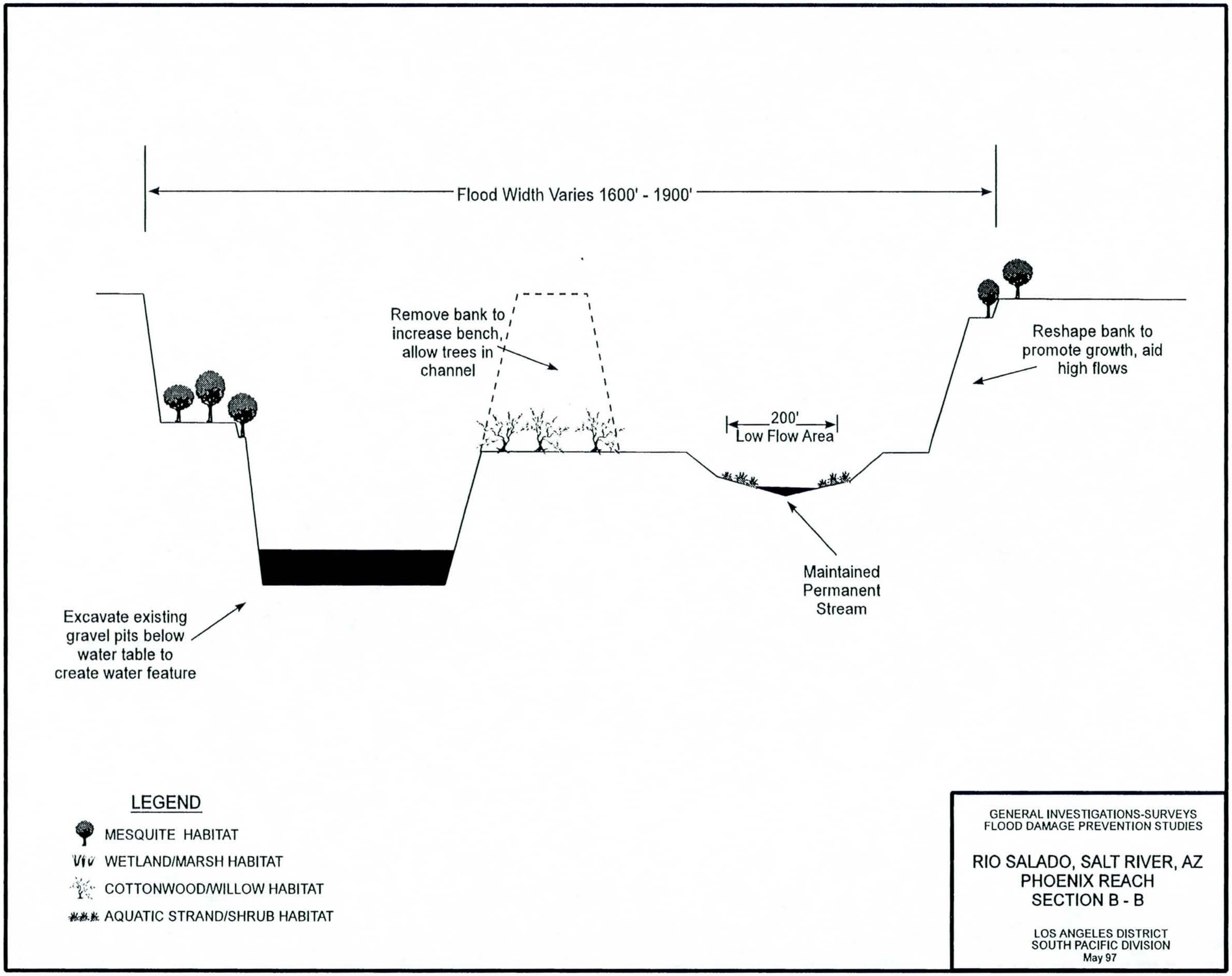


FIGURE 5.8
PHOENIX REACH
SECTION A-A



U.S. ARMY ENGINEER DISTRICT

CORPS OF ENGINEERS



ARKR31.CDR

FIGURE 5.9
PHOENIX REACH
SECTION B-B

FIGURE 5.10
PHOENIX REACH
SECTION C-C

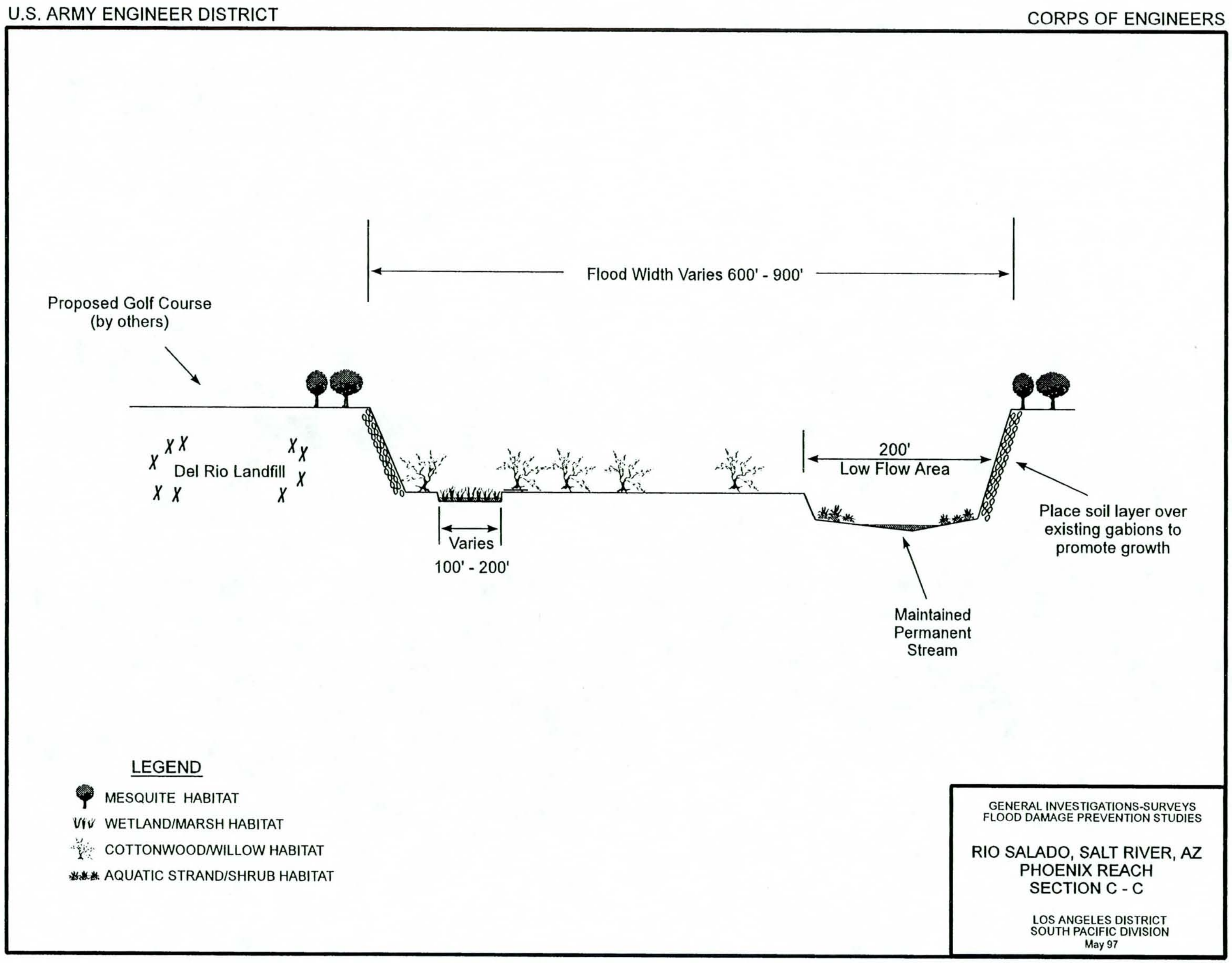
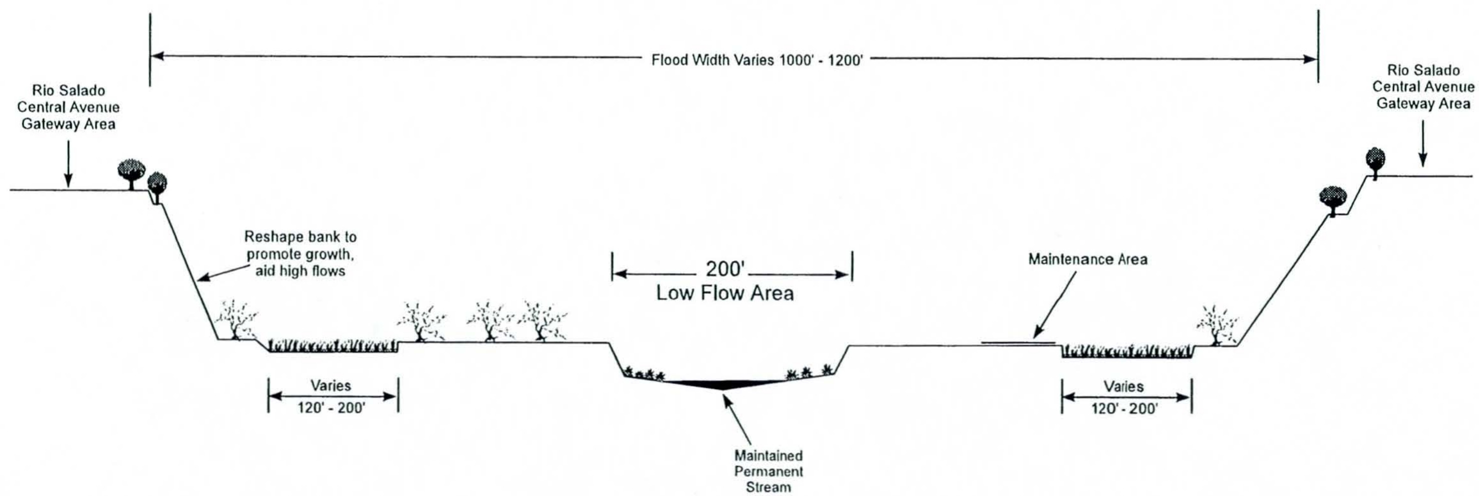


FIGURE 5.11
PHOENIX REACH
SECTION D-D

U.S. ARMY ENGINEER DISTRICT

CORPS OF ENGINEERS



LEGEND

- MESQUITE HABITAT
- WETLAND/MARSH HABITAT
- COTTONWOOD/WILLOW HABITAT
- AQUATIC STRAND/SHRUB HABITAT

GENERAL INVESTIGATIONS-SURVEYS
FLOOD DAMAGE PREVENTION STUDIES

RIO SALADO, SALT RIVER, AZ
PHOENIX REACH
SECTION D - D

LOS ANGELES DISTRICT
SOUTH PACIFIC DIVISION
May 97

ARKR27.CDR

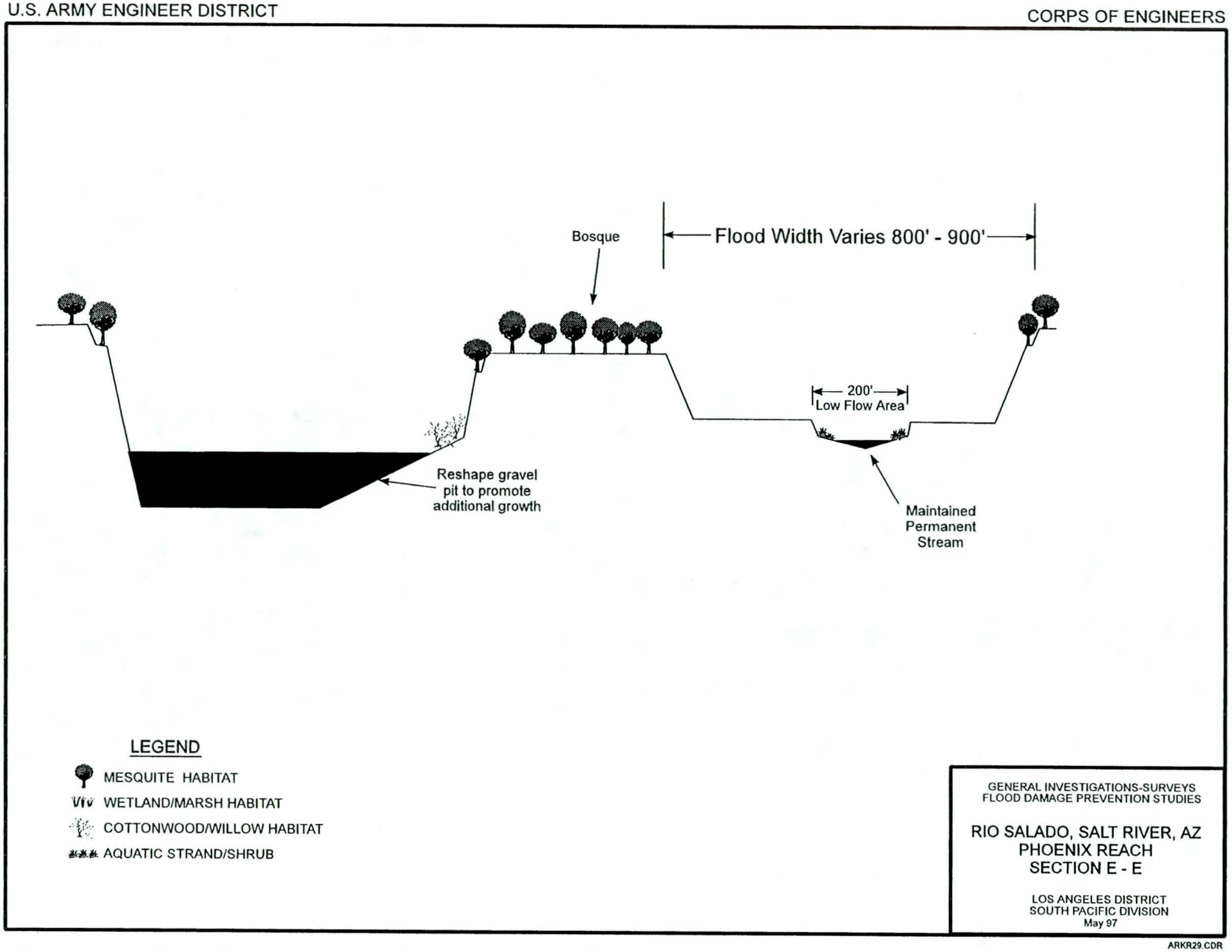


FIGURE 5.12
PHOENIX REACH
SECTION E-E

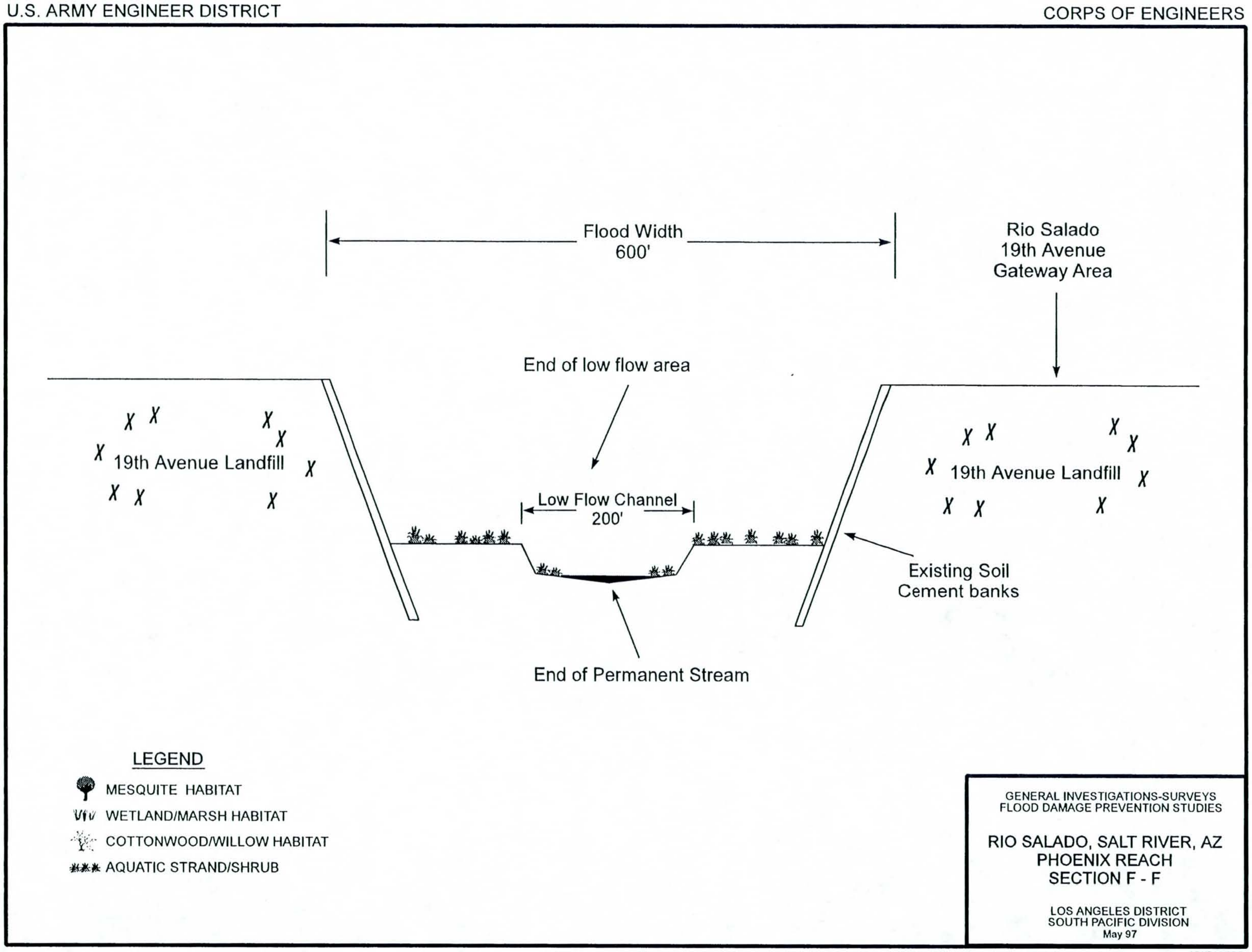


FIGURE 5.13
PHOENIX REACH
SECTION F-F

E. Benefits of Alternatives

An assessment of habitat value was performed for each of the proposed alternatives. A modified habitat evaluation procedure analysis was conducted. The evaluation of the proposed types of habitat included consideration of their location within the study area, acreage and anticipated habitat units. The evaluation of the riparian ecosystem habitat types was based upon criteria established during the reconnaissance study. The evaluation was based upon accepted methodologies and performed by a team of personnel with professional experience and qualifications in the Southwestern Sonoran Desert area of Arizona.

A Habitat Suitability Index (HSI) was assigned to each of the habitat types for the IBW and Salt River areas. The HSI is number between 0.0 and 1.0. It was assigned to each habitat type to reflect the expected maximum value of the habitat during the life of the project. The assigned HSI value takes into account the relative value of the habitat areas within the urban environment, but does not differentiate between the value at project year one, the value when mature, and the value over time considering replacement of habitat when required due to flood damages or other habitat maintenance and replacement. It was determined that the maximum estimate for each alternative would suffice for this analysis, since it was assumed that fluctuations in Habitat Value would be roughly the same for each alternative and would therefore not change the results of the incremental cost analysis. The HSI value was then multiplied by the number of acres for each habitat type to establish a Habitat Unit (HU). The total Habitat Value (HV) for each alternative was based on a summation of the HU's for each type of habitat in the alternative. **Tables 5.3 and 5.4** present the results of the habitat assessment analysis. A more detailed analysis will be carried out for the selected plans in terms of Average Annual Habitat Units (AAHUs) that take into account the frequency and amount of periodic habitat destruction and replacement due to flood events. Please refer to the Habitat Valuation Analysis for a complete discussion of this method of habitat valuation.

The individual habitat value of each type of habitat is increased in a diverse ecosystem. For example, open edges have zero habitat value unless it is found adjacent to other habitat types. Open edges are an integral part of a habitat, but has little value to wildlife unless there are also areas that provide cover and foraging opportunities. A similar condition exists in the presence of a perennial stream. By including a perennial stream two additional habitat types are introduced to the system, open water and aquatic strand/scrub. The result is a more natural and complete system, and an increased overall value of the ecosystem. The habitat suitability index (HSI) for each habitat type is, therefore, increased by a small margin for each alternative that includes a perennial stream.

The results of the habitat evaluation indicates that the high water use alternatives yield greater habitat units than the low water use alternatives. All four of the high water use alternatives resulted in higher habitat units than any of the four low water use alternatives. This is indicative of the value of alternatives emphasizing riparian habitat. For the Tempe reach, the alternative resulting in the highest habitat benefit was T5 with 71 habitat units. For the Phoenix reach, the alternative yielding the highest habitat benefit was Alternative P9 with 362 habitat units.

Table 5.3 Tempe Alternatives Habitat Evaluation Matrix

Area	Acreage						Total **
	Mesquite		Cottonwood Willow	Wetland Marsh*	Aquatic Strand	Open Edges	
Alternative T1 No Action							
Indian Bend Wash	-	-	-	-	-	-	**0**
Salt River	-	-	-	-	-	-	**0**
Totals	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Habitat Suitability Index	-	-	-	-	-	-	
Habitat Units	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Alternative T2 IBW/LW							
Indian Bend Wash	20	-	-	-	-	10	**30**
Salt River	-	-	-	-	-	-	**0**
Totals	**20**	**0**	**0**	**0**	**0**	**10**	**30**
Habitat Suitability Index	0.6	-	-	-	-	0.2	
Habitat Units	**12**	**0**	**0**	**0**	**0**	**2**	**14**
Alternative T3 IBW+SR(US+DS)/LW							
Indian Bend Wash	20	-	-	-	-	10	**30**
Salt River	-	10	-	-		50	**60**
Totals	**20**	**10**	**0**	**0**	**0**	**60**	**90**
Habitat Suitability Index	0.6	0.45	-	-	-	0.2	
Habitat Units	**12**	**4.5**	**0**	**0**	**0**	**12**	**28.5**
Alternative T4 IBW+SR(DS)/HW							
Indian Bend Wash	20	-	-		50	10	**80**
Salt River		-	10	8		12	**30**
Totals	**20**	**0**	**10**	**8**	**50**	**22**	**110**
Habitat Suitability Index	0.6	-	0.6	0.7	0.58	0.2	
Habitat Units	**12**	**0**	**6**	**5.6**	**29**	**4.4**	**57**

Table 5.3 Tempe Alternatives Habitat Evaluation Matrix
(continued)

Area	Acreage						Total **
	Mesquite		Cottonwood Willow	Wetland Marsh*	Aquatic Strand	Open Edges	
Alternative T5 IBW+SR(US+DS)/HW							
Indian Bend Wash	20	-	-	-	50	10	**80**
Salt River	-	-	20	16	-	24	**60**
Totals	**20**	**0**	**20**	**16**	**50**	**34**	**140**
Habitat Suitability Index	0.6	-	0.6	0.7	0.58	0.2	
Habitat Units	**12**	**0**	**12**	**11.2**	**29**	**6.8**	71
Alternative T6 SR(DS)/HW							
Indian Bend Wash	-	-	-	-	-	-	-
Salt River	-	-	10	8	-	12	**30**
Totals	**0**	**0**	**10**	**8**	**0**	**12**	**30**
Habitat Suitability Index	-	-	0.6	0.7	-	0.2	
Habitat Units	**0**	**0**	**6**	**5.7**	**0**	**2.4**	**14**

* Includes areas of open water.

**Does not include areas classified as "other"

Table 5.4 Phoenix Alternatives Habitat Evaluation Matrix

Area	Acreage						Total **
	Mesquite	Cottonwood Willow		Wetland Marsh*	Aquatic Strand	Open Edges	
Alternative P1 No Action							
Salt River	-	-	-	-	-	-	-
Gravel Pits	-	-	-	-	-	-	-
Totals	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Habitat Suitability Index	-	-	-	-	-	-	
Habitat Units	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Alternative P2 SR/LW							
Salt River	50	80	-	40	-	355	**525**
Gravel Pits	-	-	-	-	-	-	-
Totals	**50**	**80**	**0**	**40**	**0**	**355**	**525**
Habitat Suitability Index	0.5	0.5	-	0.6	-	0.2	
Habitat Units	**25**	**40**	**0**	**24**	**0**	**71**	**160**
Alternative P3 SR/HW							
Salt River	10	185	-	100	-	220	**515**
Gravel Pits	-	-	-	-	-	-	-
Totals	**10**	**185**	**0**	**100**	**0**	**220**	**515**
Habitat Suitability Index	0.5	0.6	-	0.6	-	0.25	
Habitat Units	**5**	**111**	**0**	**60**	**0**	**55**	**231**

Table 5.4 Phoenix Alternatives Habitat Evaluation Matrix
(continued)

Area	Acreage						Total **
	Mesquite	Cottonwood Willow		Wetland Marsh*	Aquatic Strand	Open Edges	
Alternative P4 SR/LW+S							
Salt River	50	80	-	40	130	225	**525**
Gravel Pits	-	-	-	-	-	-	**0**
Totals	**50**	**80**	**0**	**40**	**130**	**225**	**525**
Habitat Suitability Index	0.5	0.6	-	0.6	0.5	0.25	
Habitat Units	**25**	**48**	**0**	**24**	**65**	**56.25**	**218**
Alternative P5 SR/HW+S							
Salt River	10	185	-	100	130	90	**515**
Gravel Pits	-	-	-	-	-	-	**0**
Totals	**10**	**185**	**0**	**100**	**130**	**90**	**515**
Habitat Suitability Index	0.6	0.7	-	0.7	0.6	0.3	
Habitat Units	**6**	**130**	**0**	**70**	**78**	**27**	**311**
Alternative P6 SR+G/LW							
Salt River	95	80	-	40	-	380	**595**
Gravel Pits	-	-	10	-	-	-	**10**
Totals	**95**	**80**	**10**	**40**	**0**	**380**	**605**
Habitat Suitability Index	0.5	0.5	0.7	0.6	-	0.2	
Habitat Units	**47.5**	**40**	**7**	**24**	**0**	**76**	**195**
Alternative P7 SR+G/HW							
Salt River	60	220	-	100	-	210	**590**
Gravel Pits	-	-	10	-	-	-	**10**
Totals	**60**	**220**	**10**	**100**	**0**	**210**	**600**
Habitat Suitability Index	0.5	0.6	0.6	0.6	-	0.25	
Habitat Units	**30**	**132**	**6**	**60**	**0**	**52.5**	**281**

Table 5.4 Phoenix Alternatives Habitat Evaluation Matrix
(continued)

Area	Acreage						Total **
	Mesquite	Cottonwood Willow		Wetland Marsh*	Aquatic Strand	Open Edges	
Alternative P8 SR+G/LW+S							
Salt River	95	80	-	40	130	250	**595**
Gravel Pits	-	-	10	-	-	-	**10**
Totals	**95**	**80**	**10**	**40**	**130**	**250**	**605**
Habitat Suitability Index	0.5	0.6	0.7	0.6	0.5	0.25	
Habitat Units	**47.5**	**48**	**7**	**24**	**65**	**62.5**	**255**
Alternative P9 SR+G/HW+S							
Salt River	60	220	-	100	130	75	**585**
Gravel Pits	-	-	10	-	-	-	**10**
Totals	**60**	**220**	**10**	**100**	**130**	**75**	**595**
Habitat Suitability Index	0.5	0.7	0.7	0.7	0.6	0.3	
Habitat Units	**30**	**154**	**7**	**70**	**78**	**22.5**	**362**

* Includes areas of open water.
**Does not include areas classified as "other"

F. Cost of Alternatives

A cost estimate was prepared for each of the restoration alternatives. The cost estimate for each of the alternatives is presented in **Appendix G, Design and Cost**. The primary cost items included in the alternatives are as follows:

> <u>Infrastructure Improvements</u>: For the Phoenix Reach this consisted primarily of the low flow channel. The low flow channel helps reduce damages to the primary restoration features from peak discharges and inundation. The estimate for the low flow channel includes excavation, concrete grade control structures and soil cement or concrete stabilized alluvium for the low flow channel bank and toe protection. Preliminary design details for this low flow channel are presented in **Appendix B, Hydraulics**. The primary infrastructure requirements for Tempe include pipe drains and a pump for the high water alternatives. A gravity drain pipe is required to divert IBW restoration outfall water into the Salt River. A pump and drain pipe are required to bypass water from the Salt River upstream of Town Lake to the downstream restoration area. This would provide a

continuous flow for the wetland marsh, maintain the optimal water level upstream, and prevent undesirable inundation of habitat.

Habitat Creation: The estimate includes cost per acre to plant and establish the various types of restoration habitat types. These include mesquite bosque, cottonwood-willow dominant, and wetland-marsh.

Water Supply: The estimated first cost of developing the water supply, annual cost of water, and annual OMRR&R costs related to water for each of the alternatives have been included in the estimate. An analysis of water supply alternatives and costs has been conducted by both Tempe and Phoenix. The water supply analysis for Tempe and Phoenix are presented in **Appendix H, Water Supply Analysis and Cost**. It is important to note that the cost of developing the water supply and the associated operation and maintenance costs are highly dependent upon treatment costs. Better water quality than anticipated in the aquifer could significantly reduce the water supply costs since treatment costs could be reduced or eliminated. Costs displayed here represent a maximum expected cost, assuming water treatment is required. The actual costs could be substantially less than those reported here.

Costs for a water delivery and irrigation system were not included in the preliminary analysis because these costs were assumed to be incrementally equivalent for each alternative. As the cost of the conveyance system would depend upon the amount of water that was conveyed, it was assumed that water costs would be an equivalent distinguishing factor for alternative comparison and incremental analysis. Excluding these costs was also a simplifying assumption to avoid having to develop a specific system for each alternative, which is more appropriate to a design level of detail. Design and cost of the water conveyance system to support the habitat will be developed upon selection of a plan so that a conveyance/irrigation system can be developed specifically for that plan.

Real Estate Costs: Real estate costs were not included in the preliminary alternative analysis because it was determined that real estate would not drive the plan formulation process. The majority of the land within the study area is within the Salt River itself. Since this land is mostly in the river bottom as well as within the 100-year flood plain, development of these areas would not be possible. For these reasons, it was assumed that the real estate could be acquired at a low cost. In addition, an integral part of the alternative selection process is based upon an incremental cost analysis of habitat and water supply costs. Since the alternatives examined did not differ in location or land requirements, with the exception of the gravel pits, there would be no incremental real estate costs differences between the alternatives.

PE&D and S&A Costs: The estimate includes estimates for pre-construction, engineering and design costs and estimates for supervision and administration during construction.

Annual Habitat OMRR&R: The estimate includes an estimated amount for replacement and maintenance of the restored habitat. This includes plant replacement and related costs. To provide a basis for estimating this cost, the average annual vegetation damage was estimated in the following manner. It was estimated that the 100-year flood would damage roughly 95 percent of the vegetation in the channel. The largest flood that would not cause appreciable vegetation damage was taken as the flood that would first exceed the capacity of the low flow channel (typically less than a 5-year flood). The damage-discharge relationship was assumed to be a straight line between this event and the 100-year flood. Additional discussion can be found in the **Appendix B, Hydraulics**. Maintenance road costs were not included in this preliminary analysis, as the needs for roads will not differ substantially between alternatives.

A summary of the total economic cost for each of the alternatives is presented in **Tables 5.5 and 5.6**. The total economic cost is presented in the form of an annual cost for each alternative. The total annual cost is the sum of the annualized total gross investment and the annual operation and maintenance costs The total gross investment includes the total first cost plus interest during construction. The annual operation and maintenance costs include those annual costs estimated for water supply and for habitat such as may be required for both general maintenance and replacement. The economic costs have been calculated for an assumed 50-year project life at an amortization rate of 7 3/8%.

Table 5.5
Tempe Reach
Costs by Alternative (in $1,000s)

Alternative	First Cost	Interest During Construction*	Gross Investment	Interest & Amortization**	OMRR&R	Total Annual Cost
T1	NA					
T2	$1,239	$45	$1,284	$97	$65	$162
T3	$1,387	$50	$1,437	$109	$84	$193
T4	$2,723	$99	$2,822	$214	$315	$529
T5	$4,756	$172	$4,928	$374	$440	$814
T6	$1,930	$70	$2,000	$152	$149	$301

** One year construction period assumed for all alternatives*
*** 7 3/8%, 50 Years*

Table 5.6 Phoenix Reach Costs by Alternative (in $1,000s)						
Alternative	First Cost	Interest During Construction*	Gross Investment	Interest & Amortization**	OMRR&R	Total Annual Cost
P1	NA					
P2	$42,174	$3,110	$45,284	$3,438	$1,223	$4,661
P3	$57,465	$4,238	$61,703	$4,684	$2,672	$7,356
P4	$58,491	$4,314	$62,805	$4,768	$2,555	$7,323
P5	$72,817	$5,370	$78,187	$5,935	$4,016	$9,951
P6	$43,646	$3,219	$46,865	$3,558	$1,366	$4,924
P7	$62,896	$4,639	$67,535	$5,127	$3,223	$8,350
P8	$60,272	$4,445	$64,717	$4,913	$2,734	$7,647
P9	$77,186	$5,692	$82,878	$6,292	$4,555	$10,847

* *Two year construction period assumed for all alternatives*
** *7 3/8%, 50 Years*

G. Alternative Screening

Alternative Summary Information

Table 5.7 presents the costs and environmental outputs of the alternatives. This information was used in the alternative screening process.

Table 5.7 Rio Salado Study Area (Both Reaches) Alternative Summary Information			
Alternative	Annual Costs ($1,000s)	HUs	Cost/HU ($1,000s)
T1	0	0	0
T2	$162	14	$11.57
T3	$193	28.5	$6.77
T4	$529	57	$9.28
T5	$814	71	$11.46
T6	$301	14	$21.50

Table 5.7 Alternative Summary Information
(continued)

Alternative	Annual Costs ($1,000s)	HUs	Cost/HU ($1,000s)
P1	0	0	0
P2	$4,661	160	$29.13
P3	$7,356	231	$31.84
P4	$7,323	218	$33.59
P5	$9,951	311	$32.00
P6	$4,924	195	$25.25
P7	$8,350	281	$29.72
P8	$7,647	255	$29.98
P9	$10,847	362	$29.96

Incremental Analysis

An incremental cost analysis was performed on the alternatives utilizing the results of the habitat evaluation analysis and the estimated annual costs of the alternatives. An incremental cost analysis is an iterative process that compares each successive alternative's costs with its environmental outputs. In the first iteration of the analysis, the most cost effective alternative is selected. The most cost effective alternative is that which has the lowest cost per habitat unit (HU) output. Any remaining alternatives that produce more habitat units than the alternative selected in the previous iteration are then compared to each other. The incremental cost difference and incremental habitat unit output difference, between each of the remaining alternatives and the previously selected alternative, is then determined. The alternative with the lowest incremental cost per incremental habitat unit output is selected as the most cost effective alternative. This process is then repeated until no alternatives produce more habitat units than the previously selected alternative. Although the incremental cost analysis does not provide a discrete decision criterion, it does serve as a tool that can assist in the plan formulation and evaluation process. A detailed discussion of the incremental cost analysis is presented in **Appendix C, Economics**.

The results indicate the strong dependancy of water supply costs in maximizing the increases in habitat benefits for this type of an ecosystem. The high water use alternatives, emphasizing riparian habitat, produce significantly higher habitat value units than the low water alternatives. Not surprisingly, the cost of the high water use alternatives are also significantly higher. This is largely due to the first cost of developing the water source and the annual cost of supplying the water demand.

Tempe Reach

As presented in **Appendix C, Economics**, the cost effectiveness and incremental cost analysis evaluation yielded four alternatives in the Tempe Reach for final selection consideration. The incremental cost analysis results for Tempe are presented in **Table 5.8.**

Table 5.8
Tempe Reach
Incremental Cost Analysis Results*

Alternative	Incremental Cost ($1,000s)	Incremental Output (HUs)	Incremental Cost/HU ($1,000s)	Selection Process Description
T1	0	0	0	⇦ basis of incremental comparison
T2	$162	14	$11.57	
T3	$193	28.5	$6.77	⇦ most cost effective
T4	$529	57	$9.28	
T5	$814	71	$11.46	
T6	$301	14	$21.50	
T3	$0	0	0	⇦ basis of incremental comparison
T4	$336	28.5	$11.79	⇦ most cost effective-2nd iteration
T5	$621	42.5	$14.61	
T4	$0	0	0	⇦ basis of incremental comparison
T5	$285	14	$20.36	⇦ most cost effective-3rd iteration

* This table incorporates information from Tables 10 and 11 of Appendix C, Economics.

The incremental cost analysis indicates that the three most cost effective alternatives are alternatives T3 [IBW+SR(U+D)/LW], T4 [IBW+SR (DS) /HW], and T5 [IBW+SR(U+D)/HW]. Alternatives T3 and T5 provide restoration to all three parts of the Tempe study area, including Indian Bend Wash and the Salt River both upstream and downstream of Tempe Town Lake. These alternatives are differentiated based upon the use of high vs. low water use vegetation. Alternative T4 is similar to alternative T5, but does not include restoration of the Salt River upstream of Tempe Town Lake.

Phoenix Reach

None of the Phoenix alternatives provide the same level of output for different costs or have the same costs for different levels of output, so no alternatives were eliminated from consideration based upon these criteria. **Table 5.9** below displays the incremental cost of the alternatives.

Table 5.9
Phoenix Reach
Incremental Cost Analysis Results

Alternative	Incremental Cost ($1,000s)	Incremental Output (HUs)	Incremental Cost/HU ($1,000s)	Selection Process Description
P1	0	0	0	⇦ basis of incremental comparison
P2	$4,661	160	$29.13	
P3	$7,356	231	$31.84	
P4	$7,323	218	$33.59	
P5	$9,951	311	$32.00	
P6	$4,924	195	$\boxed{\$25.25}$	⇦ most cost effective
P7	$8,350	281	$29.72	
P8	$7,647	255	$29.98	
P9	$10,847	362	$29.96	
P6	$0	0	0	⇦ basis of incremental comparison
P4	$2,399	23	$104.30	
P3	$2,432	36	$67.56	
P8	$2,723	60	$45.38	
P7	$3,426	86	$39.84	
P5	$5,027	116	$43.34	
P9	$5,923	167	$\boxed{\$35.47}$	⇦ most cost effective-2nd iteration

* This table incorporates information from Tables 12 and 13 of Appendix C, Economics.

Based upon the incremental analysis, alternatives P6 and P9 were determined to be most cost effective. Alternative P6 has the lowest annual cost per habitat unit output, and alternative P9 has the lowest incremental cost for additional habitat units when compared to the alternatives that are more productive than P6. Alternative P6 [SR+G/LW] restores both the Salt River and the gravel pit areas with low water use vegetation. Alternative P9 is the most comprehensive alternative and features the establishment of high water use vegetation along the Salt River and in the gravel pit areas, and also includes a perennial stream in the low flow channel.

No comparison can be made between the results of incremental analysis results for habitat units in the Southwest Sonoran Desert and elsewhere in the United States. Due to the scarceness of riparian habitat in the southwest, any increases are considered more valuable and significant than habitat values elsewhere. Riparian habitat is considered the fastest disappearing forest type in the United States.

Incremental Analysis Excluding Gravel Pit Areas

Subsequent to performing the incremental cost analysis, it was determined that the gravel pit areas would not be available for incorporation into the project. Six different gravel pits, totaling

330 acres were to be included in the restoration area. The initial response from owners of these areas was that the gravel pits were either already abandoned or were near the end of their economic life. However, recent conversations with the owners of the two principal sand and gravel companies indicate that the continued pace of the economy in the metropolitan area has changed their plans. Two of the pits will continue in operation for mineral extraction and others are either presently being filled or are planned for filling in the near future. The companies stated that it is their intention to use the filled sites for redevelopment. The continued mining and redevelopment plans result in the lands being too costly for acquisition, even at a later date. Therefore, none of the original six gravel pits are being considered in the proposed project. As a result, alternatives P6 through P9 have since been eliminated from consideration. The remaining alternatives for the Phoenix Reach are displayed in **Table 5.10**.

Table 5.10
Phoenix Reach
Incremental Cost Analysis Results Excluding Gravel Pits

Alternative	Incremental Cost ($1,000s)	Incremental Output (HUs)	Incremental Cost/HU ($1,000s)	Selection Process Description
P1	0	0	0	⇦ basis of incremental comparison
P2	$4,661	160	$29.13	⇦ most cost effective
P3	$7,356	231	$31.84	
P4	$7,323	218	$33.59	
P5	$9,951	311	$32.00	
P2	$0	0	0	⇦ basis of incremental comparison
P4	$2,662	58	$45.90	
P3	$2,695	71	$37.96	
P5	$5,290	151	$35.03	⇦ most cost effective-2nd iteration

* This table incorporates information from Tables 14 and 15 of Appendix C, Economics.

Based upon the final incremental cost analysis for the remaining Phoenix alternatives, alternatives P2 and P5 were determined to be most cost effective. Alternative P2 has the lowest annual cost per habitat unit output, and alternative P5 has the lowest incremental cost for additional habitat units when compared to the alternatives that are more productive than P2. P2 [SR/LW] restores the Salt River with low water use vegetation. Alternative P5 [SR/HW+S] is the most comprehensive alternative and features the establishment of high water use vegetation along the Salt River, and also includes a perennial stream in the low flow channel.

Detailed Alternative Screening

The results of the incremental cost analysis during plan formulation provided valuable information with respect to the habitat value benefits and costs for each of the alternatives. Once the most cost effective alternatives were determined, these alternatives progressed into a detailed screening analysis. Ideally, based on the results of the incremental analysis, the selected plan for the Phoenix Reach would be Alternative P5 since it yielded the highest net habitat benefits of those plans determined to be cost effective. Likewise, the selected plan for the Tempe Reach would be Alternative T5.

The alternatives formulated for the incremental analysis did not identify specific locations for the various habitat types and acreages. In addition, several other constraints emerged as a result of the incremental cost analysis that directly impacted the final selection of the specific restoration plan. The constraints are as follows:

1) water cost constraints,
2) open water location limitations, and
3) habitat blocks and low flow channel location within the river.

These additional constraints did not affect Alternative T5, but did require some changes to Alternative P5 in order to maximize habitat benefits. The effects that these constraints have upon the configuration of the selected plan are described below.

1) Water Cost Constraints. The City of Phoenix is the non-Federal sponsor for the proposed restoration of the Phoenix Reach. The non-Federal sponsor is responsible for the non-Federal share of the first costs and 100% of the annual operation and maintenance costs. Based on the results of the incremental analysis, the estimated non-Federal annual ownership costs associated with supplying the water, and maintaining and replacing habitat were considered to be paramount to the estimated first costs of the project. One of the largest annual costs in Alternative P5 is the cost for water to supply the restoration features. Water requirements were subsequently reduced by changing the quantity of the types of habitat to be restored. The acreage of wetland habitat was reduced which resulted in a lower water use scenario. The quantity of mesquite habitat was increased and used to replace higher water use habitats such as wetlands and cottonwood-willow. The overall quantity of wetland marsh was reduced from 100 acres to 58 acres.

The size of the perennial stream, which is required to support the aquatic strand/scrub habitat, was also reduced to approximately one-half of its original length. The aquatic strand/scrub habitat is considered a vital and necessary component of the riparian plant community model attempting to be restored; this type of habitat requires a near continuous perennial stream for its existence. The previously formulated alternatives used in the incremental cost analysis had considered a perennial stream for the entire 5-mile length of the low flow channel, or not at all. By reducing the amount of aquatic strand/scrub habitat, a significant reduction in the water requirements occurred while still providing for this valuable riparian component to be included in the proposed plan. The selected plan calls for roughly 5.8 mgd of water at an annual cost of roughly $1,017,000. In addition to meeting the technical planning constraints, the selected plan also appears to fit well within the non-Federal sponsor's funding feasibility range. The estimated cost of the selected plan is anticipated to have broad based public support and be implementable from a willingness-to-pay perspective.

2) Open Water Location Limitations. Two limitations as to where open water could be located have also reduced the length of the proposed perennial stream in the Phoenix Reach in addition to the water cost concerns mentioned above. They are: (1) the aforementioned FAA regulation that any open water must be outside of the 10,000 foot runway radius, and (2) concerns that water infiltrating near the 19th Avenue superfund site could adversely impact the groundwater in the area.

Sky Harbor International Airport is located on the north bank of the Salt River between the Tempe Reach and the Phoenix Reach. To comply with the FAA regulations, there could be no open water between the I-10 Freeway crossing and 24th Street within the Phoenix Reach. The Selected Plan meets this constraint. There is no open water, such as a perennial stream, in this area. This area now includes predominantly mesquite, cottonwood/willow, and some marsh in order to maximize habitat values while removing open-water habitat.

The 19th Avenue Superfund site is located adjacent to the north bank of the river channel at the western end of the Phoenix Reach. Extensive work was recently completed at this site including the construction of a cap, the widening of the river channel, and the construction of levees to prevent flood and rain water from adversely affecting the site. Because the infiltration of water near this site could adversely impact the existing contamination, surface water features are not planned near the landfill.

3) Habitat Blocks and Low Flow Channel Location. Coordination with the resource agencies indicated that it would be advantageous for the restored habitat to consist of large blocks, and for these blocks to be connected if possible. The final location of the low flow channel within the river limited the locations in which habitat could be restored in this manner. Habitat was primarily located in available areas between the low flow channel and the main bank. The proposed plan utilizes the available space to maximize the size of the habitat blocks and connect them where possible.

The selected plan was developed utilizing the incremental cost analysis information to produce a cost effective plan that would maximize habitat values while complying with the non-Federal funding constraints and other physical constraints associated with the study area. A detailed description of the selected plans is given in Chapter VI. The selected plan for the Phoenix Reach will create approximately 262 habitat units at an annual cost of $7.857 million. This represents an average annual cost of just under $30,000 per habitat unit created, which is less than any of the other possible Phoenix Reach alternatives considered (see **Table 5.10**), with the exception of Alternative P2. It should, however, be noted that the cost estimate for the selected plan includes items excluded from the preliminary cost estimates, such as a water distribution system and real estate costs. Therefore, this plan is very competitive when compared to the other alternative examined.

VI. DESCRIPTION OF THE SELECTED PLANS

A. Tempe Reach Selected Plan

The Selected Plan for the Tempe Reach is Alternative T5 (IBW+SR(U+D)/HW). This is the most comprehensive plan analyzed. It includes restoration of Indian Bend Wash and the Salt River both upstream and downstream of Tempe Town Lake with high water use vegetation. This plan was selected because it most closely meets the planning objectives identified for this study, including:

- Restoration of threatened and endangered species habitat;
- Restoration of the Study Area to a more natural condition through the installation of plant species that are native to, and occurred historically, in riparian streams and washes in the region; and
- An increase of recreation opportunities.

The selected plan also includes more of the selected management measures, including:

- Varied mix of plant and habitat types;
- Maximization of areas available for restoration; and
- Continual flow measures for wetlands.

The previous section within Chapter V, "Plan Formulation," provides the justification and incremental analysis information related to this plan's selection.

Plan Features

Table 6.1 shows the final configuration of the proposed plan for the Tempe Reach.

Table 6.1 Selected Plan: Tempe Reach

Area	Acreage						Total Acres
	Mesquite	Cottonwood Willow	Wetland Marsh*	Aquatic Strand	Open Edges	Other	
Indian Bend Wash	20	-	-	50	10	-	80
Upstream Salt River	5	10	8	-	12	-	35
Downstream Salt River	5	10	8	-	12	-	35
Totals	**30**	**20**	**16**	**50**	**34**	**0**	**150**

* Includes areas of open water.

Since the formulation of Alternative T5, it was determined that approximately ten additional acres of overbank along the Salt River could be restored with mesquite habitat. The HSI assigned to this habitat is 0.45, therefore this additional habitat provides an additional 4.5 habitat units (HUs) to the project. This habitat can be added at an annual cost of $2,700 per HU. This cost includes contingency, PED, S&A, IDC, and pro-rata O&M. This amount does not include a share of the real estate costs or the capital costs for the wells and water distribution system since it is assumed that these costs would be essentially the same even if the additional10 acres of mesquite habitat were not planted. This incremental average annual cost is very low compared with the average annual cost/HU for the overall Selected Plan of nearly $9,100. This can be attributed to the fact that over one third of the first cost of the project is associated with the gravity drain, pump and pipe system, and conveyance pipeline. The selected plan features restoration of 30 acres of mesquite habitat, 20 acres of cottonwood and willow habitat, 16 acres of wetlands, 50 acres of aquatic strand/scrub habitat, and 34 acres of open edge habitat.

Water Supply

The best alternative to meet the water demands for the Tempe Reach is to drill one or two new water supply wells. The average water demand for the Tempe Reach is currently estimated at 1.51 million gallons per day (MGD). The new well or wells would be dedicated to supply this project only. The most probable location for the well or wells would be in the vicinity of the intersection of Indian Bend Wash and Curry Road. The aquifer units in this area appear to be sufficient to support the required level of groundwater production. Monitor well and production well data from nearby well sites indicate that the groundwater in this area is of suitable quality for any designated use. Because groundwater within one mile of this site has been impacted by volatile organic compounds (VOCs), further investigation will be required to determine any potential groundwater quality issues. A NPDES permit for discharge of any well water to the project would be required when a site is selected. The cost allocated to water supply includes complete development of this water source. Further analysis of other potential water supply options is still required before a preferred option can be selected.

The riparian area in the Salt River upstream of Tempe Town Lake would be partially supplied by water from Indian Bend Wash. A 2 foot diameter reinforced concrete pipe (RCP) would be placed from the Indian Bend Wash left bank toe to the Salt River right bank toe. A minimum RCP diameter of 2 foot was used for maintenance purposes; a valve can be placed at the upstream end to adjust the flow. The pipe would be approximately 350 feet long with a slope of 0.015. Riprap would be placed at the downstream end to dissipate energy and minimize scour. Another 3 foot diameter, 350 foot long RCP would be placed from upstream of the Tempe Town Lake to a proposed pumphouse on the left bank of the Salt River. This would supply water to the riparian area in the Salt River downstream of Tempe Town Lake. From the pumphouse, a 3 foot diameter, 3,600 foot long RCP would be placed below the ground along the left bank of the Salt River and would tie into an existing 3 foot diameter pipe that drains into the Salt River downstream of Tempe Town Lake.

Benefits

The expected habitat value of the Selected Plan was evaluated in two different ways. **Table 6.2** represents the type of habitat evaluation used in the incremental cost analysis. In addition, Average Annual Habitat Units (AAHUs) were calculated for this alternative. This is a more detailed method of habitat valuation in that it takes into consideration occurrences when habitat is damaged, destroyed, and replaced due to flood events, and the related reduction in habitat value. The habitat value is calculated over fifty years, assuming periodic damage and reestablishment. It was determined that the selected plan would provide 44.9 AAHUs. Additional information can be found in **Appendix D, Habitat Evaluation**.

Table 6.2 Habitat Evaluation for the Selected Plan: Tempe Reach

	Mesquite		**Cottonwood Willow**	**Wetland Marsh***	**Aquatic Strand**	**Open Edges**	**Other**	**Total**
Indian Bend Wash	20	-	-	-	50	10	-	80
Salt River	-	10	20	16	-	24	-	70
Total Acreage	20	10	20	16	50	34	0	150
HSI**	0.6	0.45	0.6	0.7	0.58	0.2	0	
Habitat Units	**12**	**4.5**	**12**	**11.2**	**29**	**6.8**	**0**	**75.5**

* Includes areas of open water

** Habitat Suitability Index

The average annual cost per habitat unit for the selected plan is approximately $9,100. Although this average cost is higher than that for Alternative T3 ($6,700/HU), the selected plan provides more than 2.5 times the number of total habitat units. The conceptual habitat restoration plan for the Tempe Reach is presented on **Plates 6-1 and 6-2.**

Detailed Cost Estimate

Table 6.3 provides a detailed cost estimate for the selected plan for the Tempe Reach. This table is a result of MCASES-level cost estimates. These costs are not directly comparable to the preliminary cost estimates included in the Incremental Cost Analysis, since they have been refined and include additional items not included in the preliminary estimates.

Table 6.3
Detailed Cost Estimate
Tempe Reach Selected Plan

Mob/Demob & Prep Work	$300,000
Mesque Bosque/Upland	$330,000
Cottonwood/Willows	$255,100
Wetland Marsh (incl. Soil Liner)	$376,300
Water Supply (2.85 MGD)	$703,000
24"RCP Gravity Drain	$118,800
Pump & Pipe System	$660,000
36" Conveyance Pipe Line	$672,300
Water Distribution/Irrigation System	$480,700
Operation & Maintenance Roads	$379,000
Sub-Total	$4,275,000
Contingency (20%)	$855,000
Sub-Total	$5,130,000
Planning, Engineering, & Design (PE&D) (7%)	$359,000
Sub-Total	$5,489,000
Supervision & Administration (6.5%)	$357,000
Total First Cost -- Construction (Rounded)	**$5,846,000**
Monitoring Plan (1%)	$58,000
Adaptive Management (1%)	$58,000
Real Estate (Including Contingency)	-0-
Total First Cost	**$5,962,000**
Interest During Construction (1 Yr Constr. Period)	$209,000
Gross Investment	**$6,171,000**
Annual Cost (50 Yrs, 7 1/8%)	**$454,000**
Associated Non-Federal Annual Costs	$154,000
Annual OMRR&R (Habitat)	$76,000
Total OMRR&R	**$230,000**
Total Annual Cost	**$684,000**

B. Phoenix Reach Selected Plan

Plan Features

The selected plan meets the planning objectives identified for this study while complying with the non-Federal funding constraints and other physical constraints associated with the study area. The proposed plan includes the restoration of a total of approximately 550 acres. This includes about 440 acres in the Salt River channel and 110 acres along the overbanks of the channel. The acreage of habitats and other areas planned for the Phoenix Reach are displayed in **Table 6.4.**

Table 6.4 Selected Plan: Phoenix Reach

Area	Acreage						Total Acres
	Mesquite	Cottonwood Willow	Wetland Marsh*	Aquatic Strand	Open Edges	Other	
Low-Flow Channel	-	-	9	51	70	-	130
Bench/Bank	110	79	49	-	57	15	310
Overbank	20	20	-	-	10	10	60
Access Areas	-	-	-	-	50	-	50
Totals	**130**	**99**	**58**	**51**	**187**	**25**	**550**

* Includes areas of open water.

The proposed restoration of the Phoenix Reach would involve the construction of a low-flow channel in the river bottom and the establishment of open-water, wetland marsh, cottonwood-willow, open edges, and mesquite habitat in the river bottom and on the banks and overbanks of the Salt River. The plan also includes the construction of operation and maintenance roads on the benches, banks, and overbanks of the river which would provide access to the project features. Restoration of the Phoenix Reach includes the creation of a series of shallow pools in the low-flow channel connected by a perennially flowing stream. Three parking areas are planned on the overbanks of the channel to provide public access to the restoration project. The plan for the restoration of the Phoenix Reach is shown in **Plates 6-3 to 6-7.**

The previous section within Chapter V, "Plan Formulation," provides the justification and incremental analysis information related to this plan's selection. There are approximately 20 acres of proposed mesquite habitat distributed on the overbank areas of the Selected Plan for the Phoenix Reach, an increase of 10 acres from Alternative P5. The HSI assigned to this habitat is 0.5, therefore the additional habitat provides 5 additional HUs to the project. This habitat can be added at an annual cost of $2,700. This cost includes contingency, PED, S&A, IDC, and pro-rata O&M. This amount does not include a share of the real estate costs or the capital costs for the wells and water distribution system since it is assumed that these costs would be essentially the same even if the additional10 acres of mesquite habitat were not planted. This incremental average annual cost is very low compared with the average annual cost/HU for the overall Selected Plan of nearly $30,000. This can be attributed to the fact that about half of the first cost of the project is associated with excavating the low flow channel and constructing drop structures.

Low Flow Channel

The existing Salt River channel has a slope of 0.002 (ft/ft) with an average channel basewidth of 500 to 900 feet. The proposed low flow channel was designed as an entrenched trapezoidal channel with an average basewidth of 200 feet. A basewidth of 300 ft was used under the bridges to accommodate the proposed islands within the low flow channel. Gradual transitions

(10:1) would be used to connect the 200 and 300 ft basewidths of the low flow channel. The low flow channel was designed to limit the velocity associated with 12,200 cfs to 6 feet per second (ft/s) to avoid the potential for scouring of the bed. A maximum low flow discharge of 12,200 cubic feet per second (cfs) was agreed upon by the study team as being the design target discharge based on a step 4 release schedule found in the Modified Roosevelt Dam Water Control Diagram. This particular discharge corresponds to between a 50- and 100-year flood for flow duration times of 30 days. However, in terms of peak flows, a discharge of 12,200 cfs corresponds to less than a 5-year flood. The approximate 100-year peak discharge on the Salt River is 166,000 cfs.

The low flow channel is designed to have a natural vegetation bottom, consisting of opportunistic emergent vegetation. The channel would have a 1V:2H slope soil cement embankment throughout the channel except under each bridge crossing, where it would have a 1V:3H slope soil cement embankments. The embankments would also have a minimum 5 foot toe down and an 8 foot thickness for machinery movability. There is no indication that the selected plan would have any impact on bank erosion potential when compared to the without-project condition.

The low flow channel design also includes approximately 2.5 miles of permanent open water features as an important part of the riparian system. This open water in the low flow channel would consist of low discharge perennial stream (5 cfs) that would connect four shallow ponds. The design features in support of these features includes overexcavation of the low flow channel at the pond locations, and small inlet and outlet structures upstream and downstream of the pond locations to guide the stream. It is expected that the lakes, inlet and outlet structures would have to be restored periodically after major flood events.

The selected plan includes a total of four drop structures within the low flow channel and two additional drop structures located outside the low flow channel in side-drain outlet structures. The drop structures would be made of 30 inch thick Roller Compacted Concrete (RCC). The structures vary in height and would have a 5 foot toe down.

Islands

The selected plan includes five islands within the low flow channel. The islands located below bridge crossings would be designed to create nesting and feeding habitat for birds while simultaneously providing protection for bridge supports. The ideal design would include gently-sloped shores that allow such birds as American avocet (*Recurvirostra americana*) and least sandpiper (*Calidris minutilla*) to forage in the island's shallow waters under a wide range of river-flow conditions. The islands should be made of sand mixed with some organic material to allow some vegetative growth which supports a healthy insect population for foraging birds. Currently, there is no plan to vegetate the islands; however, it is anticipated that vegetation will establish itself naturally. The natural scouring anticipated from periodic flood flows should keep the vegetation in the short-lived successional stage. The limited vegetation combined with the protection the islands offer from human intrusion and terrestrial predators should make the islands ideal for shorebird nesting. The islands could also be used by waterfowl for resting and preening during their migration periods due to the clear field of view available on the islands.

Some islands could be designed with gravel bars to create micro-habitats which support aquatic invertebrates (e.g., snails) and amphibians, which would attract birds that forage on these larger prey items such as lesser yellowlegs (*Tringa flavipes*).

Shallow Lakes

A series of four shallow lakes connected by a small perennial stream would be over excavated within the low flow channel between the proposed grade control structures downstream of 7th Avenue and upstream of 16th Street. These lakes provide increased open water features as part of the environmental restoration. These lakes would be approximately 2 to 3 acres in surface area and would be located under the bridges and around the proposed islands. Each lake is approximately 0.25 miles long, 66 to 100 feet wide, and 3 feet deep. The lakes will be excavated and lined with clay and sand. The liner will be installed below the estimated scour depth to insure its long-term resistance to damage from flood flows. Please refer to **Appendix B, Hydraulics** for details on the scour analysis.

A small stream with approximately a 5 cfs capacity would connect the lakes. This stream is expected to meander naturally, finding its own route to the next downstream lake. Based on EM 1110-2-1418, the stream would be expected to have an average basewidth of 5 feet and an average depth of 1 foot. Each lake would have two collector levees and one lake outlet structure. The purpose of the collector levees is to direct water from the channel into the lake. The collector levees would be approximately 68 feet long 4 feet tall with a 2 foot crest. The levees would extend three feet below the ground surface and would be covered with riprap of a gradation of 9 inch maximum and 0.5 inch minimum. The outlet structure would be 12 feet long and 1 foot deep with a 5.5 foot weir connecting to the lake. The outlet structure would direct the flows toward the center of the low flow channel. It is expected that the lakes and the collector/outlet structures would have to be restored periodically after flood events.

Junction Structures

There are approximately 24 side drainage inlets of varying sizes within the Phoenix Reach. Side drain aprons were designed to turn the flows parallel to the low flow channel towards the vegetated terrace. The side drain aprons would consist of small soil cement lined trapezoidal channels that would turn the flow. Riprap energy dissipators would be located downstream of these channels. The side drain aprons were not designed to carry the full capacity of the side drain; excess flow would spill into the vegetated terrace area. The channels were designed using normal depth. A 2.5 ft soil cement drop structure at the downstream end of the side drain will be used to prevent headcutting of the side drain. It is expected that flows from the side drains would disperse within the terrace and would eventually flow into the low flow channel farther downstream. The integrity of the low flow channel banks would not be compromised due to the low velocities of the flows and the because the banks would be lined with soil cement that would extend 5 ft below the channel invert.

Water Supply

The proposed water source for the Phoenix Reach is from local groundwater. Screening level groundwater flow modeling has been completed to study potential future local groundwater changes due to the proposed restoration project. The plan includes a water supply and delivery system consisting of six extraction wells sized to meet the water budget requirements for the selected plan. The six extraction wells are proposed on the north and south banks of the Salt River at 24th Street, 16th Street, and Central Avenue. However, additional groundwater investigation will be required before the production wells are actually sited. Each well would provide approximately 1 million gallons per day (mgd) on average. The selected plan would use an average of 5.82 mgd of groundwater to supply the wetland marsh, low flow channel perennial stream, and lakes system. The distribution system for this water will emphasize gravity flow to irrigate the wetlands, mesquite habitat, cottonwood/willow habitats, and to provide water for the low-flow channel and open water system. The proposed gravity distribution system for the Phoenix Reach would consist of a six to eight foot wide and two foot deep partially lined canal on both the north and the south banks of the Salt River from 24th street to 7th avenue. The canal will be constructed in six independent segments, with each segment associated with a single supply well. Each segment will have two turnout structures and associated piping to allow water to be delivered from the canals by gravity to the wetlands on the terraces and the water features in the low flow channel. In addition to the gravity system, six high pressure irrigation pump stations, one at each well, would pressurize an 8-inch water main along the top of the bank for most of the length of the project. This water main would supply water to an extensive drip/bubbler irrigation system.

Dames and Moore has recently completed an extensive survey of groundwater quality throughout the Phoenix metropolitan area (Reference 50). The purpose of this survey was to determine the quality of the existing groundwater in the immediate vicinity of the project. The survey findings show that (1) heavy metal, total dissolved solids (TDS), and salinity levels appear to be acceptable when compared to applicable water quality standards in the study area, (2) VOC levels have some areas of concentration near the project, and (3) two critical areas were identified where insufficient data is available to assess groundwater quality. These areas are between 7th Avenue and 7th Street south of the Salt River and between 16th Street and 32nd Street south of the Salt River. Based on the findings of the survey, the City of Phoenix has proposed the installation of test/monitoring wells in the vicinity of the proposed project supply wells. The purpose of these wells would be to identify locations where the existing contamination levels are low. This information would be used to site the supply wells in the most cost effective locations to minimize required well-head treatment. The costs that are shown in the **Appendix H, Water Supply Analysis and Cost** assume that well-head treatment would be necessary to meet NPDES requirements for the discharge of this groundwater. In general, the Dames and Moore survey confirms that the previously estimated water treatment costs are indeed conservative and appear satisfactory for the baseline project cost estimate. A more detailed analysis will be carried out in the design phase of project construction.

A three-dimensional groundwater flow model was developed for the Phoenix Reach. The model was used to investigate the potential future local groundwater changes due to the restoration project. It was determined that approximately 39 percent of the water used by the proposed project will be lost through evapotranspiration, while 61 percent of the water will recharge back to the aquifer. The Selected Plan is expected to lower the groundwater elevations between 0 to 8 feet within the project area, however, it is not expected that the project will adversely affect the nearby landfill sites. There are currently 22 agriculture wells operated by the Roosevelt Irrigation District (RID) in the modeling area between 19th Avenue and 51st Avenue. In 1996, these wells pumped 63.6 mgd of groundwater. The pumping of these wells has lowered groundwater elevations and created a pumping trough. The Selected Plan for the Phoenix Reach will require less than one tenth of the water currently pumped by RID.

A potential future water supply exists to the north of the project area. The Motorola 52nd Street Superfund Site consists of a large plume of TCE-contaminated shallow groundwater extending westward from 52nd Street for several miles and approximately 2-3 miles north of the project area. A portion of the plume is currently being captured by a groundwater pump-and-treat system called Operable Unit One (OU-1). An additional groundwater containment system, called Operable Unit Two (OU-2) is currently under design. OU-2 will consist of approximately three groundwater extraction wells located immediately west of the Papago Freeway between Van Buren and Roosevelt Street, a treatment facility at the northwest corner of 20th Street and Washington, and approximately four reinjection wells in the vicinity of 19th Street and north of Van Buren.

When it becomes operational, OU-2 is expected to provide approximately 7.5 million gallons per day (mgd) of water treated to drinking water standards at the 20th Street treatment facility. It may be feasible and cost effective to transport this water south to the water distribution system for the Phoenix Reach, and use it as a supplemental water source for the Rio Salado project. The OU-2 system is expected to be operational within the next 3-5 years. At this time, there are still considerable uncertainties about the timing, availability, cost, and duration of this water supply, therefore, it has not been included in the current selected plan. However, as the OU-2 operations become established, the water distribution system design for the Phoenix Reach could be modified to provide access to the treated water. Motorola has expressed an interest in working with the City of Phoenix on this option.

Benefits

The expected habitat value of the Selected Plan was evaluated in two different ways. **Table 6.5** represents the type of habitat evaluation used for the previously developed alternatives. In addition, Average Annual Habitat Units (AAHUs) were calculated for this alternative. This is a more detailed method of habitat valuation in that it takes into consideration occurrences that habitat is damaged, destroyed, and replaced due to flood events, and the related reduction in habitat value. The habitat value is calculated over fifty years, assuming periodic damage and reestablishment. It was determined that the selected plan would provide 201.1 AAHUs. Additional information can be found in **Appendix D, Habitat Evaluation**.

Table 6.5 Habitat Evaluation for the Selected Plan: Phoenix Reach

	Mesquite	Cottonwood Willow	Wetland Marsh*	Aquatic Strand	Open Edges	Other	Total
Total Acreage	130	99	58	51	187	25	550
HSI**	0.5	0.7	0.7	0.6	0.3	0	-
Habitat Units	**65**	**69.3**	**41**	**31**	**56**	**0**	**262**

* Includes areas of open water

** Habitat Suitability Index

The conceptual habitat restoration plan for the Phoenix Reach is presented on **Plates 6-3 through 6-7**.

Detailed Cost Estimate

Table 6.6 provides a detailed cost estimate for the selected plan for the Phoenix Reach. This table is a result of MCASES-level cost estimates. These costs are not directly comparable to the preliminary cost estimates included in the Incremental Cost Analysis, since they have been refined and include additional items not included in the preliminary estimates.

Table 6.6
Detailed Cost Estimate
Phoenix Reach Selected Plan

Mob/Demob & Prep Work	$1,000,000
Low Flow Channel w/ 4 Drop Structures	$23,824,000
Mesque Bosque/Upland	$1,430,000
Cottonwood/Willows	$1,262,700
Wetland Marsh (WM)	$694,300
Design Development Test Habitat	$500,000
Perennial Stream in Low Flow Channel	$54,000
Liner (9 acr of Open Water assoc. w/ WM and 9 acr of Shallow Ponds assoc. w/ LFC)	$365,400
Collector Levees & Outlets	$23,000
Water Supply (5.82 MGD)	
Well Construction & Piping	$4,560,000
Monitoring Wells	$180,000
Well Control Room	$192,500
VOC (Environmental) Treatment	$8,400,000
Water Distribution/Irrigation System	$10,933,000
Operation & Maintenance Roads	$1,000,000
Sub-Total	$54,419,000
Contingency (20%)	$10,884,000
Sub-Total	$65,303,000
Planning, Engineering, & Design (PE&D) (7%)	$4,571,000
Sub-Total	$69,874,000
Supervision & Administration (6.5%)	$4,542,000
Total First Cost -- Construction (Rounded)	**$74,416,000**
Monitoring Plan (1%)	$744,000
Adaptive Management (1%)	$744,000
Real Estate (Including Contingency)	$3,714,000
Total First Cost	**$79,618,000**
Interest During Construction (1 Yr Constr. Period)	$2,788,000
Gross Investment	**$82,406,000**
Annual Cost (50 Yrs, 7 1/8%)	**$6,066,000**
Associated Non-Federal Annual Cost	$1,017,000
Annual OMRR&R	$774,000
Total OMRR&R	**$1,791,000**
Total Annual Cost	**$7,857,000**

C. Monitoring and Adaptive Management Plan

The purpose of the Monitoring and Adaptive Management Plan is to provide a mechanism to evaluate the effectiveness of the restoration measures implemented in this project and implement adaptive changes, if required to obtain project objectives. As outlined in EC 1105-2-210, the Monitoring Plan is intended to ascertain whether: (1) the project performance criteria is being achieved; (2) the project is functioning in accordance with project objectives; (3) adjustments for unforseen circumstances are needed; and (4) changes to structures or their operation or management techniques are required. The complete Monitoring and Adaptive Management Plan is presented as Appendix G of the Environmental Impact Statement.

The Monitoring and Adaptive Management Plan provides a description of: the habitats to be restored, the density and composition of the plantings to restore habitat, surveys to monitor the expected, natural re-introduction of native wildlife into the restored habitats, the performance criteria and monitoring protocol to evaluate success of the restoration effort, adaptive management actions (or maintenance activities) that may be performed to ensure a successful restoration effort, and reporting requirements.

The Monitoring and Adaptive Management Plan covers monitoring and adaptive management actions during the first 5 years after initial construction. The monitoring and adaptive management actions described herein, are intended to be cost-shared as an authorized project feature. After the first 5 years, monitoring and/or adaptive management becomes the responsibility of the non-Federal Sponsors at a 100% non-Federal cost.

<u>Restored Habitats</u>

Mesquite Habitat

To restore mesquite habitat, velvet mesquite trees (*Prosopis velutina*) will be planted on the upper terraces (overbank and bank) at a density of 100 plants/acre. Understory plants of the Mesquite Habitat will include elderberry (*Sambucus mexicana*), greythorn (*Zizphus obtusifolia* var. *canescens*), and wolfberry (*Lyceum fremontii*) in approximately equal composition and planted in distributions that the plants would occur in under natural conditions.

Cottonwood/Willow Habitat

The cottonwood/willow habitat-type would be dominated by Fremont cottonwood (*Populus fremontii*) and Goodding willow (*Salix gooddingii*) and planted primarily on the first terrace (i.e., the benches and bank) at densities of 50 plants/acre. The understory would consist of desert broom (*Baccharis sarothroides*), elderberry and other native understory plants. Desert broom is expected to make up at least 50% of the species composition.

Wetland Marsh

The wetland marsh of the Phoenix Reach would be primarily on the first terrace (or bench) and consist of plantings of cattail (*Typha* sp.) and giant bulrush (*Scirpus californicus*). Also, 9 acres of wetland habitat is expected to be associated with a series of pools established in the low-flow channel. In the Tempe Reach the wetland marsh would be in the channel upstream and downstream of Tempe Town Lake. A wide variety of submergent and emergent marshland vegetation is expected to become opportunistically established in and around the marsh.

Aquatic Strand

Aquatic strand vegetation is expected to develop opportunistically along the low-flow channel of the permanent stream. The vegetation of these harsh environments are made up of short-lived successional species that are adapted to periodic flooding, scouring, and soil deposition. Seedlings of cottonwood and willow, desert broom plants, and a variety of annuals, biennials, and short-lived perennials are expected to comprise this habitat-type.

Habitat Monitoring

Mesquite Habitat

For the first 6 months after planting the site, it would be monitored monthly; thereafter, the site would be monitored every other month for a year. The site will remain free of all non-native shrubs throughout this 18 month period. Should the survival rate of plantings indicate that the species composition is less than prescribed, replanting will be undertaken to ensure that the species composition is maintained.

All plantings shall have a minimum of 80% survival the first year and 100% survival the second and third years and/or attain 40% cover after 5 years. Ninety percent cover is expected of Mesquite Habitat in the overbanks after 10 years,. There will be zero tolerance of exotic shrubs during the first 5 years. If the survival and cover requirements are not met during the initial 5 years, the Corps is responsible for replacement planting to achieve these requirements. (Note that the replacement planting cost would be a cost-shared project cost for the first 5 years.)

After 5 years, the Local Sponsors (City of Tempe and City of Phoenix, as appropriate) will be responsible for maintaining the restoration sites for the remaining life of the project. The species composition shall be maintained throughout the life of the project. Site monitoring would be performed yearly throughout the life of the project.

The Mesquite Habitat on the overbank is outside of the 100-year flood event and not expected to be impacted by flood flows; Mesquite Habitat on the banks is only expected to be affected by the larger flood events. (i.e., 20- and 50-year events). After the larger events, the Mesquite habitat sites will be evaluated to determine the extent of the damage to the site and a determination would be made on the extent of the re-vegetation effort. Under natural conditions, velvet mesquite woodlands depends on large floods to disperse seeds in the upper terraces, and late summer rains to inundate germination sites (cf. Stromberg et al. 1991).

Cottonwood/Willow Habitat

The survival rate, percent cover and, monitoring frequency outlined above for Mesquite Habitat would be used for other riparian plantings. As with the Mesquite Habitat restoration site, the Local Sponsors would take over monitoring responsibilities of the site after 5 years. Monitoring would be performed yearly on the site throughout the life of the project.

All but 20 acres of the 199 acres of Cottonwood/Willow Habitat will be planted in the flood-prone lower terraces. As such, it is expected to be regularly affected by flooding events (as typical of natural cottonwood/willow habitats). Cottonwood/Willow sites will be evaluated after large storm events to determine the need for revegetation.

Wetland Marsh Habitat

The monitoring frequency and protocol outlined above for Mesquite Habitat and Cottonwood/Willow restoration sites would be followed for Wetland Marsh sites. Although some planting of marsh vegetation will occur, most wetland vegetation is expected to establish naturally around the permanent source of open water. Maintaining this constant source of open water will be crucial to the success of the restoration of this habitat type. As such, the conveyance system of ditches, canals, and pipes will be inspected during vegetation monitoring to ensure a consistent supply of water to the wetlands.

Aquatic Strand Habitat

As this habitat is expected to establish opportunistically near the permanent stream, no specific monitoring is planned. The condition of the low-flow channel and the system to convey water to the channel to establish the permanent stream, however, will be inspected (as proposed for the wetland habitat) to ensure the establishment of the stream.

Wildlife Monitoring

Restored habitats are expected to support native wildlife. The high quality wetland marsh and cottonwood/ willow habitats are expected to support the diverse assemblage of wildlife that are associated with these habitat-types. Monitoring of wildlife abundance and diversity is proposed to assess whether habitats actually attract and support significant populations of a wide variety of native wildlife, as expected. Since open edges and aquatic strand habitat-types are expected to provide only limited habitat value, no wildlife monitoring is proposed for these habitat-types.

Aquatic invertebrate surveys will be used primarily as indicators of the quality of the water in the permanent stream and the wetland marshes. Data from groundwater well monitoring will also be used to document the quality of water being used for permanent stream and wetland marshes.

Aquatic invertebrates will be sampled throughout the length of the permanent stream at various locations (in riffle/runs and in pools) during late spring and late summer for the first 5 years after initial construction. Water quality measurements (at minimum, Total Dissolved Solids, pH, turbidity, Oxygen and temperature) will also be taken at the time of sampling. The documented evidence of the abundance and diversity of aquatic insects will be used to verify quality of water in the permanent stream and the health of the stream environment.

Aquatic insects surveys and water quality measurements of the wetland marshes will also be conducted during late spring and late summer for the first 5 years after initial construction. As with the permanent stream monitoring, aquatic surveys will be used to verify the quality of water in the marshes and the health of the marsh's aquatic environment.

Bird surveys will be performed in the restored cottonwood/willow, mesquite bosque, and wetland habitat types during each of the four season for the first 5 years following construction. The abundance/ diversity of bird species will be used as an indicator of whether wildlife habitat has developed as predicted and supporting a diverse assemblage of native avifauna.

Small mammal trapping (live or snap) will be conducted during the summer for the first five years to document the diverse species expected to re-colonize restored habitats.

Success Criteria, Reporting & Adaptive Management

The success or failure of the restoration effort will be measured against two parameters which should indicate whether the goal of this restoration effort is being achieved; these parameters are: (1) whether the plant species compositions and/or percent cover requirements outlined for the various habitat types are met, and (2) whether native wildlife re-colonize the restored habitats. The ability of the restoration sites to naturally regenerate will also be considered as a key criterion indicating that the site has been successfully restored.

Monitoring will occur as identified above; Monitoring Reports would be prepared at the end of the year by the Corps/Local Sponsor for the first 5 years after initial construction. The need to make adjustments to the constructed project will be based on the results of the Monitoring Reports. If the restored habitats achieve the plant species composition identified and achieve the diversity of native wildlife expected, no modifications will be made.

The Corps and/or the Local Sponsor will be responsible for collecting monitoring data and preparing annual Monitoring Reports. A Technical Committee consisting of, at least, U.S. Fish and Wildlife Service, Arizona Department of Game and Fish, and the local Audubon Society, may assist in collection of monitoring data, review monitoring data results, and providing recommendations of possible adaptive management measures.

The Technical Committee will recommend adaptive management measures to the existing project's design should either wildlife habitat or wildlife abundance/diversity not achieve the identified goal and objectives. If designed vegetation species composition are not achieved: replanting, additional irrigation, and/or removal of vegetation (especially exotics) may be necessary. The use of herbicides should only be used if more natural options are unsuccessful.

Should aquatic invertebrate surveys indicate that the permanent stream or wetland marshes are providing poor aquatic habitat, adjustments to the water quantity and/or quality may need to be made. This could include a re-design or modification of the water delivery system, decrease or increase of watering frequency or duration, measures to improve water quality, or construction modifications of the stream channel or the wetland.

Should wildlife surveys indicate that the restored habitats are not attracting or supporting the abundance and diversity of species expected, adjustments to the prescribed vegetation species composition or modification of the vegetative structure (i.e., overstory and understory layers) may be necessary. This could include vegetation manipulative measures such as plant removal or replanting, and could include placing brush piles in the project area.

Annual Monitoring Reports and any adaptive management measures recommended by the Technical Committee will be forwarded to an Executive Committee which will consist of, at least, a representative of the City of Phoenix, the City of Tempe, and the U.S. Army Corps of Engineers. The Executive Committee will decide how to implement adaptive management measures recommended by the Technical Committee.

D. Risk and Uncertainty Analysis

The alternatives have been formulated to address the risk and uncertainty associated with this type of an environmental project. These risks can be described both in terms of desirable and undesirable consequences. Many of these risks are described in terms of the planning constraints, and the plan features and resulting performance that address the identified constraints. Other risks involve the Federal and non-Federal investment as related to the expected project benefits and accomplishments.

In order to minimize the uncertainty of this restoration project, the features described as part of the selected plan have a significant basis in the application of traditional, proven analysis and technologies. The monitoring and adaptive management plan has been formulated to measure and quantify the performance of the project during the establishment period.

In accordance with Corps of Engineers guidelines for plan formulation, the alternatives herein have been formulated to address risks and uncertainties associated with environmental restoration projects within a flood plain. The analysis identifies those variables that helped determine the ultimate design of a project from the initial hydrologic assumptions (such as loss-rates, rainfall-runoff) through hydraulic design (such as n-values, maintenance diligence by the responsible parties), economic analysis (incremental cost analysis) and environmental analysis (habitat values, revegetation rates). The risk and uncertainty involves potential variations in the expected range of project responses if these variables result in different values than those assumed in the project planning.

The risks can be described both in terms of desirable and undesirable consequences. If a habitat area has a quicker revegetation rate than expected, higher habitat values would result sooner than originally predicted. It is important that the uncertainties related to the expected project benefits and accomplishments resulting from both the Federal and non-Federal investment be understood.

Whenever possible, the features described as part of the selected plan have been designed using established criteria and guidelines in order to minimize the uncertainty of this restoration project. Since environmental restoration is extremely site dependent, and since the analytic techniques have not yet benefitted from a large historic data base from similar projects, there are certain areas where risks and uncertainties may be less predictable. These are as follows:

- The success of the restoration project is highly dependant upon the capability of the non-Federal sponsors to provide a continued water supply over the life of the project. Estimated annual costs to supply this water supply are included in the project costs. During the design phase, non-Federal obligations and responsibilities will be detailed to insure the success of the project.

- Flood flows in the river provide both positive and negative aspects for the project. In a natural riparian system, flood flows are a necessary and an integral component of the habitat and plant communities. The proposed project, involves a significant Federal and non-Federal investment to initially re-establish the desired habitat. Annual costs have been included in the cost estimate to maintain the habitat value of the initial investment. Removal of vegetation by flood flows at a different discharge scenario than estimated would increase/decrease the maintenance cost assumptions.

- The return on the project's investment is highly dependent on the creation of habitat for which habitat values have been predicted. Variation in the response of the project's habitat would change the predicted value derived from the project. Localized success of plantings within the habitat zones could differ depending on soil conditions, local irrigation conditions, and maintenance diligence. The adaptive management plan has been formulated to respond to changing conditions.

E. Maintenance Considerations

General

All project features located within the Salt River, including vegetation and infrastructure, are potentially subject to damage from long periods of flood inundation and significant high flows. Annual maintenance will be required to ensure the continued success of the project. Periodic clearing of the low flow channel would also be necessary to maintain the existing channel capacity. The low flow channel is designed to contain aquatic strand/scrub habitat and not large trees.

Average Annual Vegetation Damage

Assumptions on average annual vegetation damage presented in the following paragraphs were coordinated with environmental specialists on the study team. Vegetation within the channel would be periodically damaged due to flows exceeding the capacity of the low flow channel. This periodic occurrence would result in an operation and maintenance cost. To provide a basis for estimating this cost, the average annual vegetation damage has been estimated. It was estimated that the 100-year flood would damage about 95 percent of the vegetation in the channel. The largest flood that would not cause appreciable vegetation damage was taken as the flood that would first exceed the capacity of the low flow channel (typically less than a 5-year flood). The damage-discharge relationship was assumed to be a straight line between this event and the 100-year flood. A damage-frequency curve was developed by relating the discharges in the damage-discharge relationship to a discharge-frequency curve from the **Appendix A, Hydrology**. The average annual vegetation damage was calculated by mathematically integrating the area under the established damage-frequency curve. **Table 6.7** shows the calculated average annual vegetation damage. Note that different reaches have different average annual damages due to local topography and whether or not a low flow channel is proposed.

Table 6.7 Average Annual Vegetation Damage

Reach (miles)	Average Annual Vegetation Damage (%)
Phoenix Reach - Station 212.12 to 214.99	8
Phoenix Reach - Station 215.09 to 215.65	7
Phoenix Reach - Station 215.75 to 216.33	7
Tempe Reach - Station 220.06 to 220.54	8
Tempe Reach - Station 222.65 to 222.93	10
Indian Bend Wash Outlet Channel	11

A sensitivity analysis was done to determine how sensitive the average annual damage is to the degree of damage done during the 100-year flood. Instead of using the criteria that 95 percent of the vegetation would be damaged during the 100-year flood, 70 percent was assumed. The same procedure for calculating the average annual vegetation damage was done and the resulting percentage was 7 percent (instead of 8 percent using the original assumptions). Thus, it can be seen that the average annual vegetation damage is not very sensitive to the assumed percent of vegetation damaged during the 100-year flood.

F. Associated Non-Federal Considerations

Throughout the life of the project the non-Federal sponsors must provide sufficient water for construction, operation, and maintenance of the project. The average quantity of water that is estimated to be continually necessary for such purposes is 5.82 million gallons per day (MGD) for the Phoenix reach and 1.51 MGD for the Tempe reach. The cost of providing such water is an associated non-Federal cost of the project, and 100 percent of these costs will be paid by the non-Federal sponsors. These costs are currently estimated to be $1,017,000 annually for the Phoenix reach and $154,000 annually for the Tempe Reach. These costs are not shared as a part of the total project costs.

G. Recreation Plan

The recreation plan formulated for the Rio Salado restoration will provide passive recreation and environmental education opportunities incidental to the proposed restoration plan. The goal of the recreation component is to provide opportunities for visitors of all ages and from varied backgrounds to enjoy this unique resource while developing an awareness, knowledge and understanding of desert riparian habitats and its interrelatedness to the environment as a whole. The riparian habitat that would be created as a result of the proposed restoration plan is unlike any other resource within the metropolitan area. Visitors to this day-use area would have the opportunity to participate in a wide variety of recreation pursuits. More details on the proposed recreation plans can be found in **Appendix I, Recreation**. The specific objectives of the recreation plans are to:

(1) Ensure that recreation features are incidental to the primary restoration purpose.

(2) Provide opportunities for visitors of all physical capabilities to enjoy the resource.

(3) Develop an awareness, knowledge and understanding of desert riparian habitats.

(4) Share the important role of the Salt River in the history and development of the Valley.

(5) Create a wide variety of passive means to enjoy the resource, including viewing, picnicking, education, or exploring by foot, horseback or bicycle.

Phoenix Reach Recreation Plan

For planning purposes the recreation component has been divided into three primary areas: *The Bank; The Terrace; and The Riverbed*. Each of these areas provides a different venue for recreational opportunities ranging from *Active, Moderate and Passive* which coincide with learning opportunities allowing participants to learn; see; and experience the resource first hand.

The Bank provides experiences including hiking, biking, horseback riding, and leisure walking, in a restored desert riparian habitat.

The Terrace is the area where the habitat has the most direct access to a permanent water source to create a self sustaining ecosystem. This area will create a balance between trails and interpretive experiences for man and preservation of native desert fauna and flora in their own habitat.

The Riverbed represents an area unaltered by man, and will change in response to seasonal flows and flooding. People will enter this zone on its terms, and it will contain few manmade features allowing one to observe the natural forces of land and water which define and shape desert rivers.

Table 6.8 shows the City of Phoenix proposed recreation plan for the Phoenix Reach. The City proposed recreation plan contains some features that do not meet Federal policy and guidance for cost sharing. A revised cost-shared plan was developed. **Table 6.9** shows the proposed cost-shared recreation plan for the Phoenix Reach.

Table 6.8. City of Phoenix Proposed Recreation Plan - Phoenix Reach

Description	Quantity	Unit Cost	Total
Parking Lots:			
A	130 spaces	$1000/space	$130,000
B	60 spaces	$1000/space	$60,000
C	60 spaces	$1000/space	$60,000
Information Kiosk:			
Large	3	$15,000/each	$45,000
Medium	5	$7,500/each	$37,500
Small	9	$3,000/each	$27,000
Visitor Center / Interpretive Center	5,000 sf.	$110/sf	$550,000
Overlooks with railing:			
Large (1225 sf.)	2	$40,000/each	$80,000
Medium (625 sf.)	5	$20,000/each	$100,000
Small (225 sf.)	9	$10,000/each	$90,000
Shade Structures:			
Large	3	$60,000/each	$180,000
Medium	5	$30,000/each	$150,000
Small	9	$10,000/each	$90,000
Bridges:			
Large (50' span)	2	$50,000/each	$100,000
Medium (30' span)	2	$30,000/each	$60,000
Small (15' span)	5	$15,000/each	$75,000
Restroom Facility	2	$150,000/each	$300,000
Trails:			
Paved Interpretive	84,480 sf	$3.00/sf	$253,440
Stabilized D.G.	126,730 sf	$0.90/sf	$114,050
Graded Earth	464,640 sf	$0.10/sf	$46,500
Ramps	35,000 sf	$2.50/sf	$87,500
Retaining Walls:			
C.I.P	2,000 lf	$150/lf	$300,000
Gabions	2,000 lf	$80/lf	$160,000
Boulders	4,000 lf	$50/lf	$200,000
Demonstration Gardens	4	$125,000/each	$500,000
Outdoor Classrooms:			
Large Formal (30-70 people)	1	$75,000/each	$75,000
Medium Formal (20-40 people)	1	$40,000/each	$40,000
Small Informal (5-15 people)	2	$20,000/each	$40,000
Interpretive Signage / Displays	250	$300/each	$75,000

Table 6.8. City of Phoenix Proposed Recreation Plan - Phoenix Reach
(continued)

Description	Quantity	Unit Cost	Total
Landscape Material:			
Willow			
36" box	50	$800/each	$40,000
24" box	110	$200/each	$22,000
15 gallon	250	$70/each	$17,500
5 gallon	400	$30/each	$12,000
Landscape Material:			
Mesquite			
36" box	50	$800/each	$40,000
24" box	110	$200/each	$22,000
15 gallon	250	$70/each	$17,500
5 gallon	400	$30/each	$12,000
Landscape Material:			
Riparian Seed Mix	100,000 sf	$0.10/sf	$10,000
Irrigation System	LS		$538,010
Drinking Fountains	10	$5,000/each	$50,000
Benches			
Custom	20	$1,500/each	$30,000
Recycled	60	$800/each	$48,000
Electrical:			
Service	LS		$75,000
Area Lights	10	$4,000/each	$40,000
Subtotal			$5,000,000
Contingency (20%)			$1,000,000
Planning, Engineering, and Design (7%)			$420,000
Supervision and Administration (6.5%)			$417,300
Total			**$6,837,300**

Table 6.9 Cost-Shared Recreation Plan - Phoenix Reach

Description	Quantity	Unit Cost	Total
Parking Lots:			
A	130 spaces	$1000/space	$130,000
B	60 spaces	$1000/space	$60,000
C	60 spaces	$1000/space	$60,000
Information Kiosk:			
Large	3	$15,000/each	$45,000
Visitor Center / Interpretive Center	Square Feet		
Restrooms/Mech. Room	1,500	$220,000[1]	$220,000
Computer Room	1,000	$192,500[2]	
Interpretive Displays	1,000	$55,000[3]	
Entrance Area	500	$27,500[3]	
Admin Office	1,000	$55,000[3]	
Overlooks with railing:			
Large (1225 sf.)	2	$20,000/each	$40,000
Medium (625 sf.)	5	$10,000/each	$50,000
Small (225 sf.)	9	$5,000/each	$45,000
Shade Structures:			
Large	3	$60,000/each	$180,000
Medium	5	$30,000/each	$150,000
Small	9	$10,000/each	$90,000
Bridges:			
Large (50' span)	2	$50,000/each	$100,000
Medium (30' span)	2	$30,000/each	$60,000
Small (15' span)	5	$15,000/each	$75,000
Restroom Facility	2	$150,000/each	$300,000
Trails:			
Paved Interpretive	84,480 sf	$3.00/sf	$253,440
Stabilized D.G.	126,730 sf	$0.90/sf	$114,050
Graded Earth	464,640 sf	$0.10/sf	$46,500
Ramps	35,000 sf	$2.50/sf	$87,500
Retaining Walls:			
C.I.P	2,000 lf	$150/lf	$300,000
Gabions	2,000 lf	$80/lf	$160,000
Boulders	4,000 lf	$50/lf	$200,000

[1] Cost Shared Recreation Feature

[2] Primary Restoration Project Purpose & Cost Feature

[3] 100% Non-Federal Cost

Table 6.9 Cost-Shared Recreation Plan - Phoenix Reach
(continued)

Description	Quantity	Unit Cost	Total
Staging Areas:			
Large Formal (30-70 people)	1	$75,000/each	$75,000
Interpretive Signage / Displays	250	$300/each	$75,000
Landscape Material:			
Willow			
36" box	50	$800/each	$40,000
24" box	110	$200/each	$22,000
15 gallon	250	$70/each	$17,500
5 gallon	400	$30/each	$12,000
Landscape Material:			
Mesquite			
36" box	50	$800/each	$40,000
24" box	110	$200/each	$22,000
15 gallon	250	$70/each	$17,500
5 gallon	400	$30/each	$12,000
Landscape Material:			
Riparian Seed Mix	100,000 sf	$0.10/sf	$10,000
Irrigation System	LS		$129,500
Drinking Fountains	10	$5,000/each	$50,000
Benches			
Custom	60	$1,500/each	$90,000
Recycled	100	$800/each	$80,000
Electrical:			
Service	LS		$75,000
Area Lights	10	$4,000/each	$40,000
Subtotal			$3,573,990
Contingency (20%)			$714,798
Planning, Engineering, and Design (7%)			$300,215
Supervision and Administration (6.5%)			$298,285
Total			**$4,887,288**

Tempe Reach Recreation Plan

The proposed Tempe Reach Cost-Shared Recreation Plan includes recreation features both upstream and downstream of the Town Lake. For planning purposes the recreation component has been divided into three primary units; the Indian Bend Wash Unit, the Salt River Upstream Unit, and the Salt River Downstream Unit.

The Indian Bend Wash Unit would contain recreation features between Curry Road and the junction of Indian Bend Wash with the Salt River. Recreation elements that are proposed within this area include multi-use trails, ramadas, interpretive/environmental education features, a comfort station, and picnic tables. A small parking lot with 55 spaces is proposed near the intersection of Curry and Miller Roads.

Proposed recreation features within the Salt River Upstream Unit include a multi-use path, environmental education features, and an outdoor seating area. Environmental education features are proposed at the confluence of the Indian Bend Wash and the Salt River, at the outdoor seating area, on both sides of the channel at the dam, and on both sides of the channel at the existing grade control structure.

The proposed recreation features in the Downstream Salt River Unit would complete the trail system, provide opportunities for scenic viewing of the downstream restoration area, and to provide a location for passive activities such as picnicking and bird watching. By keeping a majority of the visitors up and out of the restoration area the proposed recreation features will help preserve the integrity of the habitat while allowing people to view the project and wildlife. Other features proposed for this area include two ramadas, a comfort station, and environmental education features.

Table 6.10 shows the proposed cost-shared recreation elements for the Tempe Reach.

Table 6.10 Cost-Shared Recreation Plan - Tempe Reach

Description	Quantity	Unit Cost	Total
Mobilization	LS		$5,000
Parking Lot	55 spaces	$1,500/space	$82,500
Ramada's	5	$25,000/each	$125,000
Comfort Station	1	$125,000/each	$125,000
Miscellaneous (railings, metals, walls)	LS		$70,000
Foot Bridge	1	$35,000/each	$35,000
Misc. (Drinking fountains, picnic tables, etc.)	LS		$45,000
Interpretive Signs	12	$600/each	$7,200
Environmental Education Displays	9	$750/each	$6,750
Subtotal			$501,450
Contingency (20%)			$100,290
Planning, Engineering, and Design (7%)			$42,122
Supervision and Administration (6.5%)			$41,851
Total			**$685,713**

The locally preferred plan contains additional recreational facilities that are not within the Federal interest to provide compared to the proposed cost-shared plan described above. The most dramatic feature in the locally preferred plan is the proposed pedestrian bridge over the downstream dam of the Town Lake. The locally preferred recreation plan for the Tempe Reach is presented on **Plates 6-1 and 6-2.** Details of this plan can be found in **Appendix I, Recreation**. The non-Federal sponsor would be responsible for 100% of any costs associated with locally preferred recreation features beyond the scope of the cost-shared plan.

Economic Analysis

An economic analysis of the proposed recreation plans was carried out and details of this analysis can be found in **Appendix C, Economics**. The estimated costs for the recreation plans are presented in **Table 6.11**.

Table 6.11 Recreation Analysis Estimated Costs			
	Tempe Reach	Phoenix Reach	Total
First Cost*	$686,000	$4,887,000	$5,573,000
Interest During Construction**	$24,000	$171,000	$195,000
Gross Investment	$710,000	$5,058,000	$5,768,000
Annual Cost (7 1/8%, 50 yrs)	$51,600	$372,300	$423,900
O&M***	$147,400	$1,050,000	$1,197,400
Total Annual Cost	$199,000	$1,422,300	$1,621,300

** Including Contingency, PE&D, & S&A*

*** One year construction period assumed*

**** Tempe O&M cost estimate based upon Phoenix O&M/Total First Cost percentage*

Corps guidance (PGL No. 36) specifies that the level of financial participation in recreation development by the Corps at an otherwise justifiable project may not increase the Federal cost of the project by more than ten percent. The total first cost for the recommended restoration project for Tempe is about $5.962 million. This cost would be cost shared on a 65%/35% basis between the Corps and the local sponsor. Hence, the Corps' share of the restoration project cost totals about $3,875,300. Recreation costs are cost shared on a 50%/50% basis between the Corps and the local sponsor. Fifty percent of the first cost of the Tempe recreation plan is $343,000, which would only increase the level of Federal financial participation by about 8.9%.

The total first cost for the recommended restoration project for the Phoenix Reach is about $79.618 million. This cost would be cost shared on a 65%/35% basis between the Corps and the local sponsor. Hence, the Corps' share of the restoration project cost totals about $51.752 million. Fifty percent of the first cost of the Phoenix recreation plan is $2,443,500, which would only increase the level of Federal financial participation by about 4.7%. This analysis indicates that the recreation plans for both Tempe and Phoenix comply with PGL No. 36 cost limitations.

Table 6.12 displays the benefit/cost analysis for the Tempe and Phoenix Reaches.

Table 6.12
Recreation Analysis
Benefit/Cost Analysis

	Tempe Reach	Phoenix Reach	Total
Annual Benefit	$6,204,000	$4,117,000	$10,321,000
Annual Cost	$199,000	$1,422,300	$1,621,300
Net Benefits	$6,005,000	$2,694,700	$8,699,700
B/C Ratio	31.18	2.89	6.37

The recreation analysis is presented in **Appendix I, Recreation**. This appendix includes the recreation demand and visitation analysis, description of the formulated recreation features and a summary of the estimated recreation costs.

VII. PLAN IMPLEMENTATION

This chapter summarizes cost-sharing requirements and procedures necessary to implement the environmental restoration, recreation and incidental flood control features of the selected plans.

A. Study Recommendation

The Selected Plans are ecosystem restoration projects, which also contain recreation and incidental flood control components. Because of their positive environmental contribution, the selected plans are recommended for implementation.

B. Division of Plan Responsibilities

The Water Resources Development Act (WRDA) of 1986 (P.L. 99-662) and various other administrative policies have established the basis for the division of Federal and non-Federal responsibilities in the construction, maintenance, and operation of Federal water resource projects accomplished under the direction of the Corps of Engineers. This is discussed in detail below.

C. Cost Allocation

Cost sharing for construction of this project would be in keeping within current Corps of Engineers policy whereby for environmental restoration projects, the non-Federal sponsors shall provide all lands, easements and rights-of-way and dredged material disposal areas, provides relocations of bridges and roadways; provide alteration of utilities which do not pass under or through the project's structure; and maintain and operate the project after construction. Also, during the construction phase, the non-Federal sponsors shall contribute in cash any additional funds as are necessary so that the non-Federal contribution would be at least 35% of those costs assigned to the structural restoration measures, and 50% of those costs assigned to recreation. The selected plans allow for wellhead treatment of groundwater. Additional studies of groundwater quality will be accomplished during PED. If as a result of these studies, treatment of the groundwater would be required by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (as amended), then the costs of the wellhead treatment would not be part of the Federal cost sharing for this project. In this event, Federal project costs would be reduced accordingly and the costs of the response action would be handled under the Article entitled Hazardous Substances that will be included in the Project Cooperation Agreement. **Table 7.1** presents a summary of apportionment of project first costs between Federal and non-Federal interests for the Selected Plans.

Table 7.1 Cost Apportionment Table
Rio Salado, Salt River, AZ
Riparian Habitat Restoration Project
(Costs x$1000)

	Tempe			Phoenix			Total
	Federal	**Non-Federal**	**Subtotal**	**Federal**	**Non-Federal**	**Subtotal**	
Construction (Construction, S&A, E&D, Contingency, Monitoring, and Adaptive Management)	5,962	0	5,962	75,904	0	75,904	81,866
Construction LERRDs (lands, easements, rights-of-way, relocations, and disposal sites)	0	0	0	0	3,714	3,714	3,714
Total Construction Cost (percentage of total cost)	**5,962** (100%)	**0** (0%)	**5,962**	**75,904** (95.34%)	**3,714** (4.66%)	**79,618**	**85,580**
Additional Cash to Provide Minimum 35% Non-Federal Share	-2,086.7	+2,086.7		-24,152.3	+24,152.3		
Total Cost Shared Amounts for Construction, Lands, and Additional Costs (percentage of total cost)	**3,875.3** (65%)	**2,086.7** (35%)	**5,962**	**51,751.7** (65%)	**27,866.3** (35%)	**79,618**	**85,580**
Recreation Costs (percentage of recreation costs)	343 (50%)	343 (50%)	686	2,443.5 (50%)	2,443.5 (50%)	4,887	5,573
Total First Costs	**4,218.3**	**2,429.7**	**6,648**	**54,195.2**	**30,309.8**	**84,505**	**91,153**

Note: Does not include IDC. Reflects October 1997 price levels.

D. Current and Future Work Eligible for Credit

There is no current work designed or in construction which is part of the Corps' Selected Plans, or which has been approved for credit under Section 104 of Public Law 99-662 .

E. Institutional Requirements

Upon implementation of the cost-shared project, the non-Federal sponsors, the City of Phoenix and the City of Tempe, will prepare the following preliminary financial analysis:

(1) Assess project-related yearly cash flows (both expenditures and receipts where cost recovery is proposed), including provisions for major rehabilitation and

operational contingencies and anticipated but uncertain repair costs resulting from damages from natural events;

(2) Demonstrate ability to finance their current and projected-future share of the project cost and to carry out project implementation operation, maintenance, and repair/rehabilitation responsibilities;

(3) Investigate the means for raising additional non-Federal financial resources including but not limited to special assessment districts; and

(4) Complete any other necessary steps to ensure that they are prepared to execute their project-related responsibilities at the time of project implementation.

In addition, as part of any Project Cost Sharing Agreement, the non-Federal sponsors would be required to undertake to hold and save the Federal Government free from damages due to construction, operation, and maintenance of the project, excluding damages due to the fault or negligence of the Federal Government or its contractors.

F. Environmental Requirements

The Selected Plans would result in discharge of fill material into waters of the United States during the period of construction. It also may result in discharges associated with operation and maintenance activities. A Section 404(b)(1) evaluation will be prepared to address practicable alternatives. An NPDES permit will also be required for any water discharged to the river.

An archeological field survey of the proposed project Area of Potential Effects (APE) has been conducted in accordance with the National Historic Preservation Act of 1966 (36 CFR 800). No cultural resources of any significance were observed within the APE. Based upon this investigation, the Corps of Engineers has determined that the proposed action will have no effect on National Register listed or eligible properties. The required documentation was sent to the Arizona State Historic Preservation Officer (SHPO), and the SHPO has concurred with the Corps' determination of no project effect. The project therefore, is in compliance with the National Historic Preservation Act. This documentation is provided as Appendix E of the Environmental Impact Statement.

If cultural resources are discovered during construction and cannot be avoided, work will be suspended in that area until the properties are evaluated for eligibility for listing in the NRHP in consultation with the Arizona State Historic Preservation Officer (SHPO). If the properties are determined to be eligible for the NRHP, the effects of the proposed construction will be taken into consideration in consultation with the SHPO; and the Advisory Council on Historic Preservation will be provided the opportunity to comment in accordance with 36 CFR 800.11.

Other requirements relating to the Arizona Department of Game & Fish and the Arizona Regional Water Quality Control Board, would need to be addressed by the non-Federal sponsors.

The Cities of Phoenix and Tempe are currently involved in pre-application coordination with the regulatory agencies.

G. Non-Federal Responsibilities

The presently estimated non-Federal share of the total first cost of the project is $32,739,500 which includes $2,429,700 for the Tempe Reach and $30,309,800 for the Phoenix Reach. The non-Federal share includes $3,714,000 in lands and damages which are all within the Phoenix Reach.

In addition, maintenance and operation of the restoration project is estimated to cost the non-Federal sponsors $2,021,000 annually which includes $230,000 annually for the Tempe Reach and $1,791,000 annually for the Phoenix Reach. Annual operation and maintenance of the recreation areas is estimated to cost the non-Federal sponsors $147,000 for the Tempe Reach and $1,050,000 for the Phoenix Reach.

Requirements of non-Federal cooperation are specified below:

(1) As required by Public Law 99-663, the Water Resources Development Act of 1986, as amended by Section 202 of Public Law 104-303, the Water Resources Development Act of 1996, provide 35 percent of total project costs assigned to ecosystem restoration, as further specified below:

a. Provide all lands, easements, rights-of-way, and suitable borrow and dredged or excavated material disposal areas, and perform or ensure the performance of all relocations determined by the Federal Government to be necessary for the construction, operation, and maintenance of the project.

b. Provide all improvements required on lands, easements, and rights-of-way to enable the proper disposal of dredged or excavated material associated with the construction, operation, and maintenance of the project. Such improvements may include, but are not necessarily limited to, retaining dikes, waste weirs, bulkheads, embankments, monitoring features, stilling basins, and dewatering pumps and pipes.

c. Provide any additional amounts as are necessary to make its total contribution equal to 35 percent of total project costs assigned to environmental restoration.

d. Enter into an agreement which provides, prior to construction, 25 percent of preconstruction engineering and design (PED) costs.

e. Provide, during construction, any additional funds needed to cover the non-Federal share of PED costs.

(2) Provide 50 percent of the costs allocated to recreation, as further specified below:

a. Enter into an agreement which provides 25 percent of preconstruction engineering and design (PED) costs. Any adjustment that may be necessary to bring the non-Federal contribution in line with the project cost sharing will be accomplished in the first year of construction.

b. Provide, during construction, any additional funds needed to cover the non-federal share of PED costs.

c. Provide all lands, easements, and rights-of-way, including suitable borrow and dredged or excavated material disposal areas, and perform or assure the performance of all relocations determined by the Government to be necessary for the construction, operation, and maintenance of the recreation features of the project.

d. Provide or pay to the Government the cost of providing all retaining dikes, wasteweirs, bulkheads, and embankments, including all monitoring features and stilling basins, that may be required at any dredged or excavated material disposal areas required for the construction, operation, and maintenance of the recreation features of the project.

e. Provide, during construction, any additional cash as necessary to make its total contribution equal to 50 percent of the costs allocated to recreation.

f. Prevent future recreation features from significantly impacting or interfering with the intended functions of the habitat restoration project.

(3) For so long as the project remains authorized, operate, repair, replace, rehabilitate and maintain the completed project and hydraulic integrity of the system, along with any required long-term dredged or excavated material disposal areas, in a manner compatible with the project's authorized purposes, and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government.

(4) Give the Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the project.

(5) Assume responsibility for operating, maintaining, replacing, repairing, and rehabilitating (OMRR&R) the project or completed functional portions of the project, including mitigation features without cost to the Government, in a manner compatible with the project's authorized purpose and in accordance with

applicable Federal and State laws and specific directions prescribed by the Government in the OMRR&R manual and any subsequent amendments thereto.

(6) Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element.

(7) Hold and save the United States free from all damages arising from the construction, operation, and maintenance of the project and any betterments, except for damages due to the fault or negligence of the United States or its contractors.

(8) Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project to the extent and in such detail as will properly reflect total project costs, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments in 32 CFR Section 33.20.

(9) Perform, or cause to be performed, any investigations for hazardous substances as are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, and maintenance of the project. However, for lands that the Government determines to be subject to the navigation servitude, only the Government shall perform such investigation unless the Federal Government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction.

(10) Assume complete financial responsibility, as between the Federal Government and the non-Federal sponsor, for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, or maintenance of the project. The recommended project allows for wellhead treatment of groundwater to meet NPDES requirements and additional investigations of groundwater quality will be accomplished during PED. If during these studies, a determination is reached that treatment of the groundwater would be required as a CERCLA response, then the costs of the treatment would be a complete financial responsibility of the non-Federal sponsor.

In this event, costs allocated to the Federal Government would be reduced accordingly.

(11) To the maximum extent practicable, operate, maintain, repair, replace, and rehabilitate the project in a manner that will not cause liability to arise under CERCLA.

(12) Prevent future encroachments on project lands, easements, and rights-of-way which might interfere with the proper functioning of the project.

(13) Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way, required for construction, operation, and maintenance of the project, including those necessary for relocations, borrow materials, and dredged or excavated material disposal, and inform all affected persons of applicable benefits, policies, and procedures in connection with said act.

(14) Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 USC 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army."

(15) Provide 35 percent of that portion of total cultural resource preservation mitigation and data recovery costs attributable to ecosystem restoration that are in excess of 1 percent of the total amount authorized to be appropriated for ecosystem restoration, and provide 50 percent of that portion of total cultural resource preservation mitigation and data recovery costs attributable to recreation that are in excess of 1 percent of the total amount authorized to be appropriated for recreation.

(16) Comply with Public law 90-483, as amended, which provides that fair and equitable fees will be assessed the users of specialized sites, facilities, equipment or services provided at substantial Federal expense, refrain from charging entrance or admission fees, and ensure that public use areas at the project are available for use by all members of the general public on a first-come, first-served basis, although group camp areas may be managed on a reservation system.

(17) Comply with Executive Order 11644, "Use of Off-Road Vehicles on the Public Lands", dated 8 February 1972 as amended by Executive Order 11989, dated 24 May 1977, which established policies and provides for procedures to ensure that

the use of off-road vehicles on public land is controlled to protect the resources, promote safety of all users, and minimize conflicts among the various uses.

(18) Restrict gambling on leased project premises on the project to nonprofit organizations (which may conduct limited games of chance under special use permits in conjunction with special events if permissible under state laws and regulations), and regulate the sale of alcoholic beverages in accordance with state and local laws.

(19) For so long as the project remains authorized, provide the quantity of water for such periods that the Government determines is necessary for the construction, operation, and maintenance of the project. The average quantity of water that is estimated to be continually necessary for such purposes is 5.82 million gallons per day (MGD) for the Phoenix reach and 1.51 MGD for the Tempe reach. The cost of providing such water shall be an associated cost of the project, shall be paid 100 percent by the non-Federal sponsors, and shall not be shared as a part of total project costs.

H. Sponsorship Agreements

The City of Phoenix and the City of Tempe have provided a Letter of Intent acknowledging sponsorship requirements for the Rio Salado Project. Prior to the start of construction, the non-Federal sponsors will be required to enter into an agreement with the Federal Government that it will comply with Section 221 of the Flood Control Act of 1970 (P.L. 91-611), and the Water Resources Development Act of 1986 (P.L. 99-662) as amended.

I. Procedures for Implementation

Future actions necessary for authorization and construction of the selected plans are summarized as follows:

(1) This report will be reviewed by the Headquarters of the U.S. Army Corps of Engineers, Washington D.C.

(2) The Chief of Engineers will seek formal review and comment by the Governor of the State of Arizona and interested Federal agencies.

(3) Following State and Agency review, the report will be sent to the Assistant Secretary of the Army for Civil Works.

(4) Upon approval of the Assistant Secretary, the report will be forwarded to the Office of Management and Budget (OMB) to obtain the relationship of the project to programs of the President.

(5) The final report of the Chief of Engineers will then be forwarded by the Assistant Secretary of the Army for Civil Works to Congress.

(6) Congressional review of the feasibility report and possible authorization of the project would follow.

(7) Pending project authorization for construction, the Chief of Engineers could include funds where appropriate, in his budget requests for preconstruction engineering and design of the project. The objective is to ready each project for a construction start established with the feasibility study.

(8) Following receipt of funds, preconstruction engineering and design would be initiated and surveys and detailed engineering designs would be accomplished.

(9) Following Congressional authorization of the project, plans and specifications would be accomplished by the District Engineer.

(10) Subsequent to appropriation of construction funds by Congress, but prior to construction, formal assurances of local cooperation would be required from non-Federal interests.

(11) Bids for construction would be initiated and contracts awarded.

VIII. SUMMARY OF COORDINATION, PUBLIC VIEWS, AND COMMENTS

A. Non-Federal Views and Preferences

The non-Federal views and preferences regarding ecosystem restoration, with some recreation and incidental flood control components, were in general obtained through coordination with the study sponsors and with various local and regional agencies and organizations, neighborhood associations, and the general public. These coordination efforts consisted of a series of public meetings held during the reconnaissance and feasibility study phases, through surveys, through the maintenance of a "point-of-contact" with whom any interest could discuss matters, and a mailing list by which invitations to public meetings were distributed. Announcements for public meetings were made in local newspapers, including date, time, place, and subject matter.

B. Views of the Non-Federal Sponsors

The Cities of Tempe and Phoenix have expressed willingness in continuing to be the non-Federal sponsors for project implementation. They have indicated their support for the project and a willingness to assume cost-shared financial obligations for its implementation.

The non-Federal sponsors fully support the results of the feasibility study. The non-Federal sponsors' interest in implementing ecosystem restoration for Rio Salado is reflected in the many previous studies and reports prepared by the Cities, and by their willingness to enter into a cost-shared feasibility study to determine Federal interest. The scope of the environmental degradation in the Cities of Phoenix and Tempe, and the scope of the desired restoration effort, however, are beyond the non-Federal sponsors' individual means to address and implement.

There currently exists within the community, and with the non-Federal sponsors, significant interest for restoring and maintaining the environmental resources once associated with the river and washes in the metropolitan areas of Phoenix and Tempe. This is demonstrated by their desire to pursue environmental restoration options for the project, and their willingness to accommodate Federal guidance in the selected plans. An Environmental Impact Statement (EIS), addressing existing resources and potential impacts to these resources from implementation of the desired environmental restoration in this study, indicates that the selected plans would have no significant detrimental impact on environmental resources. This is discussed in detail in the EIS.

Locally-preferred options within the study area consisted mainly of desires for a greater percentage of the project devoted to recreation and opportunities for human interaction with the proposed ecosystem resources. The non-Federal sponsors understand the requirement of developing the selected plans, Federal constraints, and that the selected plans differed somewhat from non-Federal desires. The non-Federal sponsors have related their acceptance of the selected plans and modified the Locally Preferred Plans (LPP) to coincide with the selected plans.

C. Financial Analysis

Further project engineering, design, and construction would be conducted in accordance with the cost-sharing principles provided by the Water Resources Development Act of 1986, as amended. The non-Federal sponsors have indicated their ability and willingness to participate in the planning, engineering and design of the selected plans, and to participate in construction of the project.

In accordance with ER 1105-2-100, para. 6-184.b, a preliminary financing plan and statement of financial capability has been prepared by the non-Federal sponsors. The District has reviewed the information, understands the budgetary issues related to financing of the proposed project, and finds that the non-Federal sponsors have the capability to fund their portion of implementation responsibilities. The financing plan and statement of financial capability is provided under separate cover.

D. Summary of Study Management, Coordination, Public Views and Comments

The study team was a multi-disciplinary group that consisted of several functional elements of the Corps and the non-Federal sponsors. The study team included study and project managers, engineers, hydrologic and hydraulic engineers, groundwater specialists, environmental specialists, cost estimators, designers, appraisers, economists, materials, geotechnical specialists, real estate specialists, and landscape architects.

The study was coordinated with a variety of agencies, interest groups and individuals. Feedback from the public was incorporated in the plan formulation and evaluation process. Additional public views are summarized in the EIS. Public views have also been incorporated into the plan formulation and evaluation process. In general, agencies, public interest groups, and individuals have been supportive of the selected plans.

Summary of Public Involvement Activities: Phoenix

The proposed project is located in a portion of Phoenix containing numerous community issues and challenges. Among these are low income residents and aging neighborhoods, obsolete commercial and industrial areas, landfills, and environmental pollution. Because the Rio Salado project has a great potential to stimulate change and improvement in this area, informing and involving the community in planning for the Rio Salado project is a very high priority for the City of Phoenix. Thus, during preparation of this Feasibility Study, several city sponsored activities have been conducted to ensure that the local and city-wide community is aware of the plans for the project and has an opportunity to comment on it. The following is a summary of these activities.

City-wide Team

Since April 1997, an interdepartmental team chaired by Neighborhood Services Department staff has met on a regular basis to plan and implement public involvement strategies for the Rio Salado project. The team includes representatives from the following City departments:

Planning Department,
Parks Department,
Recreation Department,
Library,
Community and Economic Development Department,
Environmental Programs Department,
Intergovernmental Programs Department,
Public Information Department,
Human Services Department,
Police Department, and the
Neighborhood Services Department.

The goal of this group is to ensure that all information about the project is available to participants and to all the community contacts maintained by each department .

Public Involvement Strategies

To date, one-on-one meetings have been held with over 160 stakeholders who represent business, education, environment, government, neighborhood and community interests. Staff has also presented the project to over 40 stakeholder groups, with more than 1,300 attendees, such as: Village Planning Committees, Commission on the Economy, Environmental Quality Commission, neighborhood associations, local service groups and community agencies interested in the project. Special stakeholder events have included a business leader's breakfast hosted by the Community and Economic Development department and a Valley Forward tour of the project area hosted by the Planning Department. The City has also received 160 postage-paid comment cards from the public in response to the public information flyer.

Citizen Telephone Survey

In April 1997, the Public Information Office commissioned a baseline citizen telephone survey to assess public attitude toward the project. Preliminary feedback shows a majority of people (58%) with a positive attitude toward the project. Only 3% were negative with the remainder needing further information.

Public Involvement Tools

The City has prepared several public involvement tools to address and answer public questions or concerns. The materials include a project information brochure, poster boards display graphics, initiation of a project newsletters, and a 10-minute project video. The materials are also available in the Spanish language. Comments continue to be primarily positive with public concerns ranging from the impact of the project on the homeless, to issues of flood control, water quality and public safety.

<u>Summary of Public Involvement Activities: Tempe</u>

Historical Support

Since 1966, the Tempe portion of the Rio Salado project has received tremendous community support for environmental habitat restoration. In fact, Rio Salado was the impetus for founding The Valley Forward Association, a corporate environmental volunteer organization. Arizona State University, Papago Salado and the Southwest Center for Education in the Natural Environment have helped advocate the Rio Salado Project over the last twenty years.

Government Support

Coordination with more than twenty-five government agencies has led to a strong support infrastructure for Rio Salado. Each government agency has its own requirements for public meetings, hearings, and notification, enabling the public to be appraised of Rio Salado from many angles. Agencies working closely with the City of Tempe include the Maricopa Association of Governments, U.S. Army Corps of Engineers, Flood Control District of Maricopa County, Environmental Protection Agency, Arizona Department of Transportation, Arizona Outdoor Recreation Commission, and Arizona Game and Fish Department.

Within the City of Tempe, a Task Force of 25 department representatives meets weekly. The Task Force includes representatives from the following departments: Rio Salado/Economic Development, Engineering, Environment, Public Works, Parks & Recreation, Community Services, Public Art, Transportation/Transit, Water, Public Relations, Planning, Police, Redevelopment, and members from Arizona State University and Flood Control District of Maricopa County.

Public Support & Involvement

In 1979 the Rio Salado Citizens Advisory Board was formed to address public issues in Rio Salado. This committed team of twenty has had less than 50% turn-over since its inception. This dedication has led to a consistency in communication with the public through their representation. The Commission has met monthly for the last eighteen years, and will continue to publicize the project and its components.

In 1995, the City of Tempe held a Rio Salado Expo for citizens to learn more about the project. Comment cards were distributed and compiled by the Rio Salado Commission into a thirteen-page synopsis of the questions and comments regarding the project. Most comments were very positive toward the project. Concerns included: need for native desert habitat, water sources and quality, aircraft, power lines, flood control, need for trees, blight of county island properties, project funding, parking, historic elements such as the flour mill, wildlife and recreation elements. Many of these concerns are addressed in the current feasibility study, and resolved by the design of the project.

The Center for Environmental Studies, Arizona Historical Museum, Audubon Society and Saguaro High School Environmental Program have all done public programs and research documentation related to habitat restoration in Rio Salado. Corporate volunteers from Allied Signal and Salt River Project have worked with civic groups such as Rotary Club, Kiwanas Club, Boy Scouts of America, Girl Scouts of America, Arizona State University Fraternities and Sororities, and local school groups to maintain existing habitat areas. Over 4,000 citizens have demonstrated their support by donating time and/or money to supporting parks and habitats in Rio Salado. The quarterly publication of *Corrientes* has been in circulation for the last nine years to residents and community leaders. The current mailing list of 300 does not reflect the total 5,000 distributed during presentations and public meetings. Project updates are included in water bills that are distributed to all residents, and other local publications have featured progress reports on Rio Salado for various business and civic groups. Brochures are distributed at all events and presentations of the proposed project.

Every spring and fall, Tempe staffs a booth on Rio Salado at the Mill Avenue Merchant's Association Arts Festival, providing information on Rio Salado to several thousand of the 20,000 event attendees. Presentations to neighborhood associations, schools, churches and civic groups has provided continuous input and support for the project. The booth display is also available for one-month durations at local buildings.

Tempe's web pages on Rio Salado (www.tempe.gov/rio) provides information on habitat, the environment, development, recreation, etc. to a worldwide audience of supporters. Comments from the Tempe Guest Book are forwarded to staff for response.

All calls from interested citizens regarding Rio Salado are directed to one of five staff members dedicated solely to this project. These staff members are familiar with all aspects of the project and its progress.

E. Compliance With Executive Order 12898

The primary goal of Executive Order 12898 is to focus Federal attention on the environmental and human health conditions in minority communities and low-income communities with the goal of achieving equity in the siting of Federally-funded facilities that may have adverse environmental impacts. The Phoenix Reach of the Rio Salado Restoration Project lies wholly within the State of Arizona Environmental Justice Project area. In this area it is necessary to comply with an environmental justice strategy that lists programs, planning, and public participation processes related to human health or the environment and should: (1) promote enforcement of all health and environmental statutes; (2) ensure public participation; and (3) improve research and data collection relating to the health of and environment of minority populations and low-income populations.

The Rio Salado Project will be consistent with all the stated goals for the Arizona Environmental Justice Project. Detailed background research and baseline documentation has identified environmental issues within project boundaries. This information in conjunction with extensive public involvement in the plan formulation process has led to the proposed Rio Salado Project. The project will not contribute to any health or environmental hazards, while the proposed restoration and recreation features will have far reaching benefits for these areas. The selected plans have also been presented to and approved by the Arizona Department of Environmental Quality (ADEQ) Environmental Justice Committee.

IX. RECOMMENDATIONS

I recommend that the plan described herein for environmental restoration and recreation be authorized for implementation as a Federal project. The total first cost of the project is currently estimated at $91,153,000 under October 1997 prices ($85,580,000 environmental restoration; $5,573,000 recreation). The Federal share is currently estimated at $58,413,500 ($55,627,000 environmental restoration; $2,786,500 recreation).

I recommend that the plans recommended herein be exempt from regulations of the Clean Water Act, pursuant to Section 404(r) of the Act.

I recommend that the Corps of Engineers participate in cost-shared monitoring and minor modifications as may be required to ensure the success of the project, as identified by the success criteria outlined within the Monitoring and Adaptive Management Plan.

My recommendation is subject to cost sharing, financing, and other applicable requirements of Federal and State laws and policies, including Public Law 99-663, the Water Resources Development Act of 1986, as amended by Section 202 of Public Law 104-303, the Water Resources Development Act of 1996, and in accordance with the following requirements which the non-Federal sponsor must agree to prior to project implementation.

(1) As required by Public Law 99-663, the Water Resources Development Act of 1986, as amended by Section 202 of Public Law 104-303, the Water Resources Development Act of 1996, provide 35 percent of total project costs assigned to ecosystem restoration, as further specified below:

a. Provide all lands, easements, rights-of-way, and suitable borrow and dredged or excavated material disposal areas, and perform or ensure the performance of all relocations determined by the Federal Government to be necessary for the construction, operation, and maintenance of the project.

b. Provide all improvements required on lands, easements, and rights-of-way to enable the proper disposal of dredged or excavated material associated with the construction, operation, and maintenance of the project. Such improvements may include, but are not necessarily limited to, retaining dikes, waste weirs, bulkheads, embankments, monitoring features, stilling basins, and dewatering pumps and pipes.

c. Provide any additional amounts as are necessary to make its total contribution equal to 35 percent of total project costs assigned to environmental restoration.

d. Enter into an agreement which provides, prior to construction, 25 percent of preconstruction engineering and design (PED) costs.

e. Provide, during construction, any additional funds needed to cover the non-Federal share of PED costs.

(2) Provide 50 percent of the costs allocated to recreation, as further specified below:

a. Enter into an agreement which provides 25 percent of preconstruction engineering and design (PED) costs. Any adjustment that may be necessary to bring the non-Federal contribution in line with the project cost sharing will be accomplished in the first year of construction.

b. Provide, during construction, any additional funds needed to cover the non-federal share of PED costs.

c. Provide all lands, easements, and rights-of-way, including suitable borrow and dredged or excavated material disposal areas, and perform or assure the performance of all relocations determined by the Government to be necessary for the construction, operation, and maintenance of the recreation features of the project.

d. Provide or pay to the Government the cost of providing all retaining dikes, wasteweirs, bulkheads, and embankments, including all monitoring features and stilling basins, that may be required at any dredged or excavated material disposal areas required for the construction, operation, and maintenance of the recreation features of the project.

e. Provide, during construction, any additional cash as necessary to make its total contribution equal to 50 percent of the costs allocated to recreation.

f. Prevent future recreation features from significantly impacting or interfering with the intended functions of the habitat restoration project.

(3) For so long as the project remains authorized, operate, repair, replace, rehabilitate and maintain the completed project and hydraulic integrity of the system, along with any required long-term dredged or excavated material disposal areas, in a manner compatible with the project's authorized purposes, and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government.

(4) Give the Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the project.

(5) Assume responsibility for operating, maintaining, replacing, repairing, and rehabilitating (OMRR&R) the project or completed functional portions of the project, including mitigation features without cost to the Government, in a manner compatible with the project's authorized purpose and in accordance with applicable Federal and State laws and specific directions prescribed by the Government in the OMRR&R manual and any subsequent amendments thereto.

(6) Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element.

(7) Hold and save the United States free from all damages arising from the construction, operation, and maintenance of the project and any betterments, except for damages due to the fault or negligence of the United States or its contractors.

(8) Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project to the extent and in such detail as will properly reflect total project costs, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments in 32 CFR Section 33.20.

(9) Perform, or cause to be performed, any investigations for hazardous substances as are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, and maintenance of the project. However, for lands that the Government determines to be subject to the navigation servitude, only the Government shall perform such investigation unless the Federal Government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction.

(10) Assume complete financial responsibility, as between the Federal Government and the non-Federal sponsor, for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, or maintenance of the project. The recommended project allows for wellhead treatment of groundwater to meet NPDES requirements and additional investigations of groundwater quality will be accomplished during

PED. If during these studies, a determination is reached that treatment of the groundwater would be required as a CERCLA response, then the costs of the treatment would be a complete financial responsibility of the non-Federal sponsor. In this event, costs allocated to the Federal Government would be reduced accordingly.

(11) To the maximum extent practicable, operate, maintain, repair, replace, and rehabilitate the project in a manner that will not cause liability to arise under CERCLA.

(12) Prevent future encroachments on project lands, easements, and rights-of-way which might interfere with the proper functioning of the project.

(13) Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way, required for construction, operation, and maintenance of the project, including those necessary for relocations, borrow materials, and dredged or excavated material disposal, and inform all affected persons of applicable benefits, policies, and procedures in connection with said act.

(14) Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 USC 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army."

(15) Provide 35 percent of that portion of total cultural resource preservation mitigation and data recovery costs attributable to ecosystem restoration that are in excess of 1 percent of the total amount authorized to be appropriated for ecosystem restoration, and provide 50 percent of that portion of total cultural resource preservation mitigation and data recovery costs attributable to recreation that are in excess of 1 percent of the total amount authorized to be appropriated for recreation.

(16) Comply with Public law 90-483, as amended, which provides that fair and equitable fees will be assessed the users of specialized sites, facilities, equipment or services provided at substantial Federal expense, refrain from charging entrance or admission fees, and ensure that public use areas at the project are available for use by all members of the general public on a first-come, first-served basis, although group camp areas may be managed on a reservation system.

(17) Comply with Executive Order 11644, "Use of Off-Road Vehicles on the Public Lands", dated 8 February 1972 as amended by Executive Order 11989, dated 24 May 1977, which established policies and provides for procedures to ensure that the use of off-road vehicles on public land is controlled to protect the resources, promote safety of all users, and minimize conflicts among the various uses.

(18) Restrict gambling on leased project premises on the project to nonprofit organizations (which may conduct limited games of chance under special use permits in conjunction with special events if permissible under state laws and regulations), and regulate the sale of alcoholic beverages in accordance with state and local laws.

(19) For so long as the project remains authorized, provide the quantity of water for such periods that the Government determines is necessary for the construction, operation, and maintenance of the project. The average quantity of water that is estimated to be continually necessary for such purposes is 5.82 million gallons per day (MGD) for the Phoenix reach and 1.51 MGD for the Tempe reach. The cost of providing such water shall be an associated cost of the project, shall be paid 100 percent by the non-Federal sponsors, and shall not be shared as a part of total project costs.

The plans presented herein are recommended with such modifications thereof as in the discretion of the Commander, HQUSACE, may be advisable.

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding. However, prior to transmittal to the Congress, the non-Federal sponsors, the States, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

Robert L. Davis
Colonel, Corps of Engineers
District Engineer

X. SUPPORT LETTERS AND FINANCIAL CAPABILITY STATEMENTS OF NON-FEDERAL SPONSORS

This chapter presents the non-Federal support letters from the cities of Phoenix and Tempe. In addition, this chapter also presents the financial capability statements for each of the cities as required to show non-Federal cost sharing capability and intent.

City of Phoenix
OFFICE OF THE CITY MANAGER

February 24, 1998

Winner of the
Carl Bertelsmann
Prize

To: Colonel Robert L. Davis, District Engineer
U.S. Army Corps of Engineers, Los Angeles District
911 Wilshire Blvd.
Los Angeles, California 90017

Dear Colonel Davis,

The City of Phoenix would like to extend its full support of the Feasibility Study recommendation for the Rio Salado project, an environmental restoration project in the Salt River. We understand that this project was completed under the authorities given to the Corps by Congress and by certification of the Reconnaissance Report by the Corps of Engineers Headquarters to move into the feasibility phase of this project.

We feel that the plan contained in the Feasibility Report is an appropriate action to overcome the loss of habitat and resulting blight, environmental deterioration, and poor quality land uses that have been associated with the river corridor. An environmental restoration project is consistent with the City's goals to protect and make available to our citizens the areas of unique and magnificent Sonoran desert in which our city is located.

The Salt River had historically sustained a most significant habitat and wildlife corridor through this desert region. It nourished an advanced Indian culture which demonstrated to early settlers the opportunities for productive use of the waters of the Salt River. The river provided the resource that created the towns that have grown into this metropolitan area of 2 ½ million people. It is our opinion that this proposed project is necessary to restore the environmental components of this great river. Upon completion, we look to this as the first phase of a process that will result in restoration of the river's desert riparian environment throughout the Phoenix metropolitan area. We fully expect that the Rio Salado project will establish a national model for environmental restoration within a metropolitan area.

We understand that the current estimated cost of the Phoenix portion of Rio Salado is $85.5 million dollars and that the local sponsor's share of that is about $31 million. Partnering with the Flood Control District of Maricopa County, we are fully prepared to meet our financial

200 West Washington Street, Phoenix, Arizona 85003 602-262-6941 FAX: 602-261-8327

obligation to ensure completion of this project. We stand prepared to enter into the next phase of this study, for engineering and preconstruction design, and look forward to executing a Project Cooperation Agreement with you in the year 2000 so we can begin construction of the Rio Salado project.

Sincerely,

Sheryl Sculley

Sheryl Sculley
Assistant City Manager

2199802

City of Tempe
P.O. Box 5002
31 East Fifth Street
Tempe, AZ 85280
602-350-8625
602-350-2951 (FAX)

Tempe

Economic Development
Rio Salado

March 4, 1998

Colonel Robert L. Davis
District Engineer, Los Angeles District
U.S. Army Corps of Engineers
911 Wilshire Boulevard
Los Angeles, California 90017

Re: Rio Salado Habitat Restoration Feasibility Study

Dear Colonel Davis:

The City of Tempe extends its support of the Draft Feasibility Study and Environmental Impact Statement prepared in conjunction with the U.S. Army Corps of Engineers and the City of Phoenix as it pertains to the three reaches located in the City of Tempe. The reaches include the Indian Bend Wash from McKellips Road downstream to the confluence with the Salt River. The Salt River from McClintock Road downstream to the Town Lake and from the Town Lake downstream to Priest Drive.

Please feel free to call me if you have any questions.

Sincerely,

Steve L. Nielsen

Steve Nielsen
Rio Salado Project Manager

cc: Mike Ternak

h:\corps\support to davis.doc

STATEMENT OF FINANCIAL CAPABILITY

The City of Phoenix, with the City of Tempe, are local sponsors of a Corps of Engineers project to construct an environmental restoration project. The Phoenix portion is within a five mile reach of the Salt River in Phoenix.

The City is prepared to move forward as local sponsor with the Corps to construct the Rio Salado habitat restoration project in the Salt River, between the I-10 bridge and 19th Avenue. Anticipating Congressional authorization of the project through the 1998 WRDA bill, we are prepared to commit to our local share; 35% of the costs of the PE&D phase, 35% and 50% local match requirements for construction of habitat restoration and recreation features respectively, and 35% of the costs for the adaptive management phase following construction.

Upon completion, the project will be operated and maintained by the Phoenix Parks, Recreation and Library Department as a public park facility. We are aware of our obligations to assume the costs of operation and maintenance of the project upon completion of Corps involvement.

The City of Phoenix currently has a population of 1.24 million people. The current, FY 1997-98, budget is $1.6 billion of which $748 million are in general purpose funds and the balance in special revenue funds, enterprise funds and state and federal grants. The total assessed valuation of property within the city is $5,533 million and the property tax rate is 1.82 mills. The city also imposes a 1.3% sales tax. The Moody's/Standard and Poor's G.O. bond rating is Aa1/Aa+, which has been maintained since the 1990/91 fiscal year. The city is also funding capital projects from a 1988 capital bond approval and anticipates another such proposal to be brought to the voters in the 2000 - 02 time frame.

The city anticipates funding our local share of the project through several contributing sources. We have received staff recommendation from the Flood Control District of Maricopa to assist with funding the flood control elements of the project, specifically the low flow channel. Our requested participation for this element is $23 million. We are also working with private property owners for estimated $3 million of land acquisition needed for the project. We are currently programming costs for our local share of the PE&D work into our annual budget. The balance of the local match requirement will be provided by general revenue sources, participation in the upcoming bond proposal or State assistance for specific elements of the plan.

Sheryl Sculley

Sheryl Sculley, Assistant City Manager
City of Phoenix

2199803

City of Tempe
Economic Development, Rio Salado
P.O. Box 5002
Tempe, AZ 85280
www.tempe.gov/rio
(602) 350-8625
(602) 350-2951 (FAX)

Tempe

March 4, 1998

rio salado

Mr. Mike Ternak, P.E.
US Army Corps of Engineers
3636 North Central Avenue, Suite 740
Phoenix, Arizona 85012-1936

RE: City of Tempe
Rio Salado Riparian Habitat Restoration Project
Statement of Financial Capability, Financing Plan

In 1989, the United States Army Corps of Engineers completed the channelization of the Salt River. This $30 million project was necessary to control flooding throughout the Metropolitan Phoenix Area. Soil cement was added to stabilize the channel banks and rock gabions were installed to create the second levee.

The flood control levee was designed for a 100-year flood event, or 215,000 cubic feet per second (cfs). With improvements to the Roosevelt Dam, the capacity to contain flow within the channel is as high as 280,000 cfs.

The Town Lake Project, which started in Tempe in August, 1997, is being constructed as a focal point to the overall Rio Salado Project. The Salt river bed remains a flood channel due to the installation of rubber dams that can deflate and inflate in 30 minutes. Riparian habitats will be found at the east and west-end dams, and at the Indian Bend Wash entry to the lake. The City of Phoenix will expand the riparian habitats portion of the project to selected areas of the Salt river bed within their city limits.

Sufficient Capital/Ability of the User to Pay

The Rio Salado Riparian Habitat Restoration Project, which will create riparian habitat areas in Tempe and Phoenix, has Tempe reach costs of $6,593,000 for the restoration project itself, and an additional $686,000 for selected recreation plans in the project areas. This is a total of $7,279,000 for the Tempe reach portions. The City of Tempe's participation in this project will be approximately $2,000,000 for U.S. Army Corps of

Engineers' match money and for the construction of the Habitat De-watering System (a lake by-pass pipe system which will carry water from the eastern riparian habitat to the western riparian habitat). The remaining share will be provided by the Federal Government. Tempe funds are secured through the Capital Improvements Budget of the City of Tempe over the next two fiscal years (1998-99 and 1999-00).

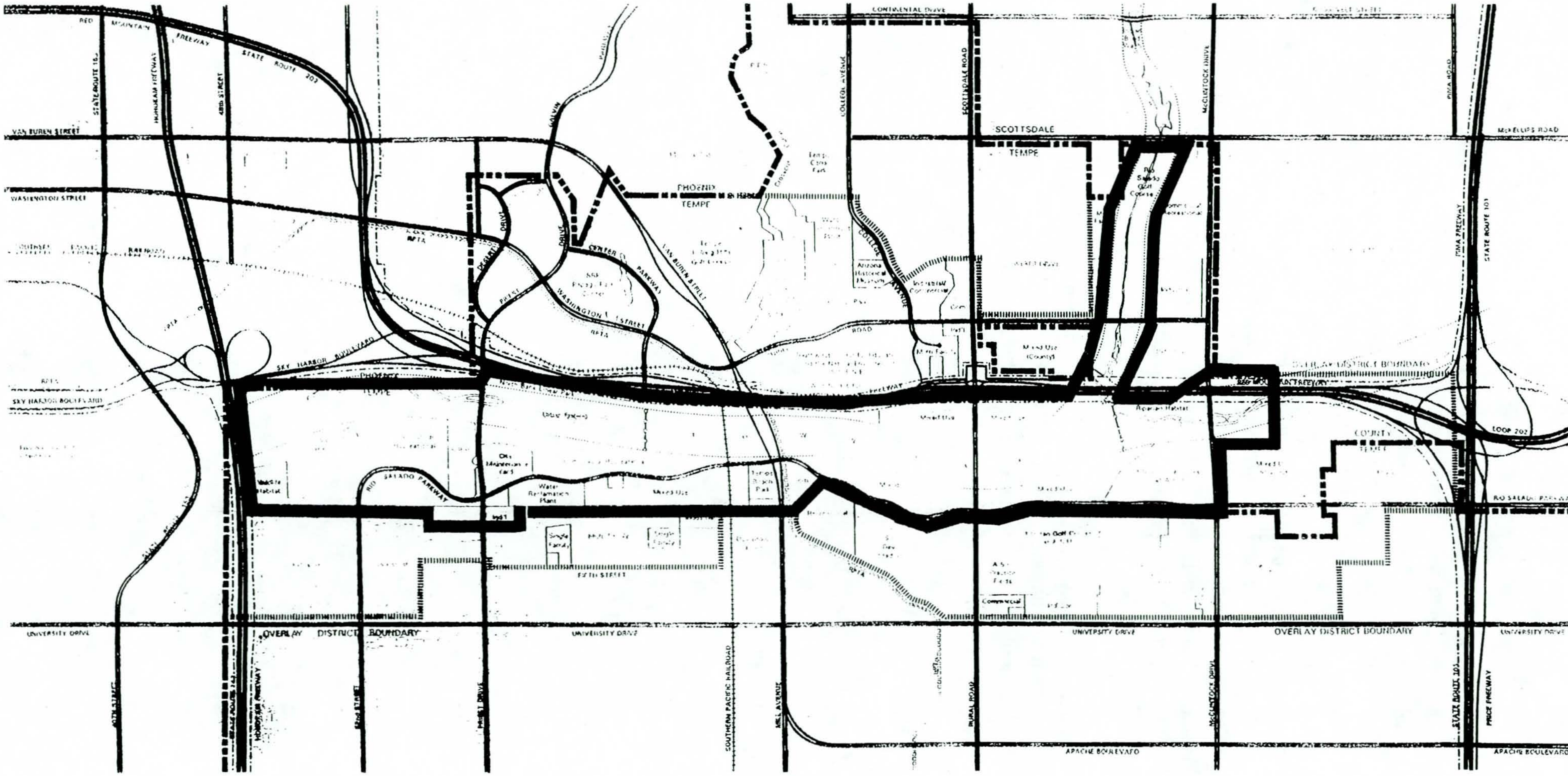
The estimated operating and maintenance costs of $280,000 for the Tempe Reach portion of the Rio Salado Riparian Habitat Restoration Project and $150,500 for the Tempe Reach recreation areas will be paid for out of the Rio Salado Enterprise Fund District and/or the Community Facilities District fund, which accounts for all city taxes (sales, bed, and property taxes) collected from properties located within the district (please see attached map).

The City of Tempe is proud to be a part of the Rio Salado Riparian Habitat Restoration Project. We look forward to working with the U.S. Army Corps of Engineers in the implementation of this project. If you have any questions, please call give us a call at 350-8625.

Sincerely,

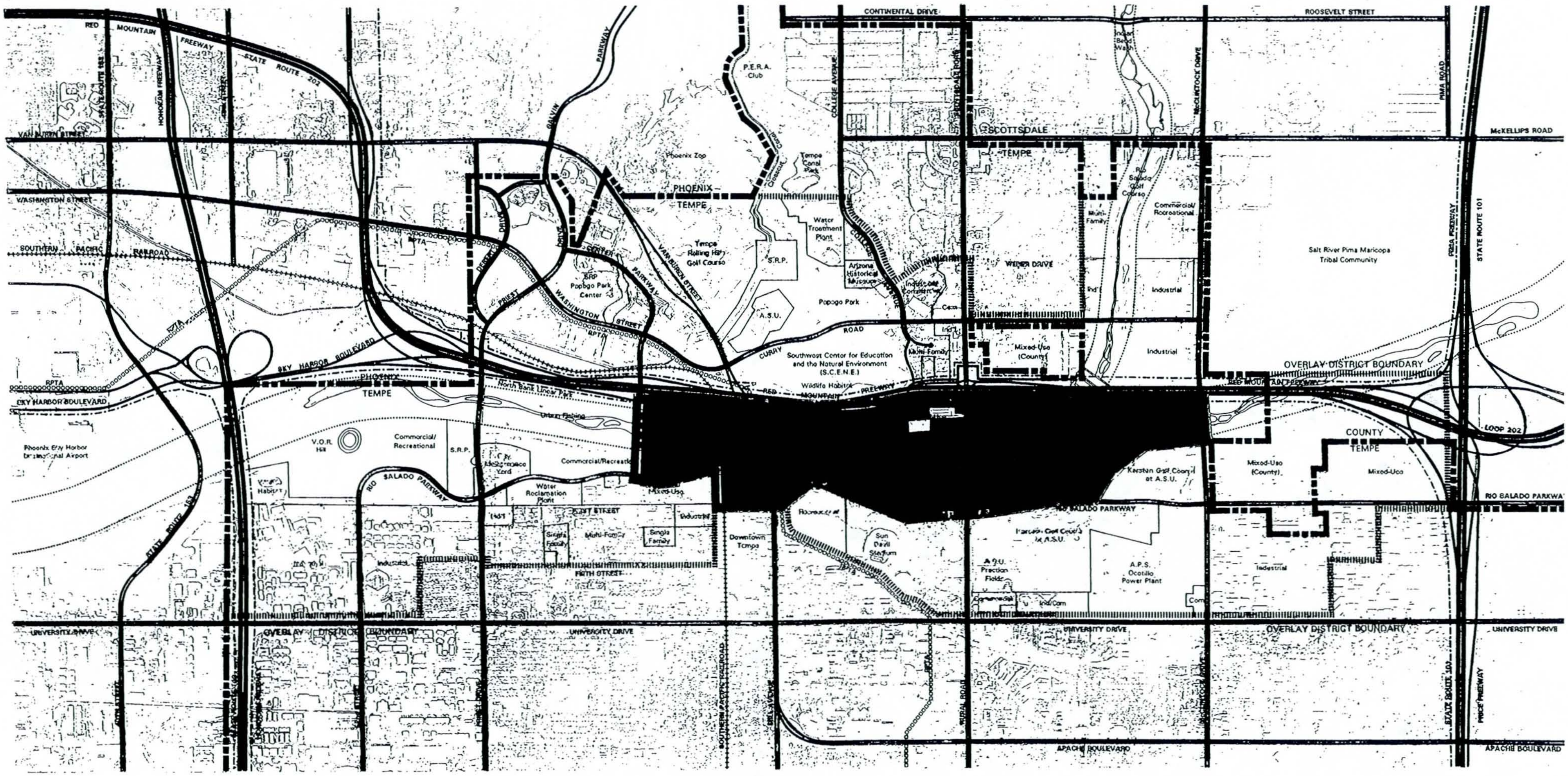
Steve Nielsen
Rio Salado Project Manager
City of Tempe

Enc.



RIO SALADO ENTERPRISE FUND DISTRICT

Tempe Rio Salado Project



rio salado

RIO SALADO COMMUNITY FACILITIES DISTRICT

Tempe Rio Salado Project

XI. REFERENCES

1. Rio Salado, Salt River AZ, Reconnaissance Report , U.S. Army Corps of Engineers, Los Angeles District, South Pacific Division, March, 1995.

2. Rio Salado Phase 2 Planning Study, Maricopa Association of Governments, July 1974.

3. Rio Salado Phase 3, U.S. Army Corps of Engineers, Los Angeles District, May 1978.

4. Summary Report Phoenix Urban Study Final Report, U.S. Army Corps of Engineers, Los Angeles District, December 1981.

5. Potential Water Sources for Rio Salado a Preliminary Memorandum, Rio Salado Development District, May 1982.

6. Rio Salado Draft Evaluation Report Part V - Water, Water Resources Associates, Inc., November 17, 1982.

7. Rio Salado Draft Evaluation Report, Carr, Lynch Associates, November 15, 1982.

8. Central Maricopa County Drainage Area, Arizona, Reconnaissance Study, U.S. Army Corps of Engineers, Los Angeles District, June, 1992.

9. Phoenix Water Reclamation and Reuse Study Tres Rios Demonstration Wetlands Conceptual Design, U.S. Bureau of Reclamation, October, 1993.

10. Geomorphic Assessment of the Lower Salt, Central Arizona , Prepared by Graf, Beyer, and Wasklewicz of Arizona State University for the U.S. Army Corps of Engineers, Los Angeles District, October, 1994.

11. A Vision for the Salt River Corridor, City of Phoenix Planning Department, July, 1994.

12. Special Study of Flood Damage Reduction Measures on the Salt and Gila Rivers, U.S. Army Corps of Engineers, Los Angeles District, December 1981.

13. Rio Salado Channel Improvement Mill Avenue to Hogden Road Simons, Li & Associates, Inc., March, 1989.

14. Gila River and Tributaries Salt-Gila, Arizona Reconnaissance Report, U.S. Army Corps of Engineers, Los Angeles District, December 1989.

15. Salt River Bank Stabilization Reconnaissance Report- Final, U.S. Army Corps of Engineers Los Angeles District, South Pacific Division, February, 1994.

16. Salt-Gila River Land Use and Structures Inventory Granite Reef Dam to Gillespie Dam, The Flood Control District of Maricopa County, March 1, 1994.

17. Section 7 Study for Modified Roosevelt Dam, Arizona, Hydrologic Evaluation of Water Control Plans, Salt River Project to Gila River at Gillespie Dam, U.S. Army Corps of Engineers, Los Angeles District, March, 1996.

18. Tempe Rio Salado Project Phase II, City of Tempe Planning Division, Community Development Department, January 27, 1978.

19. City of Tempe Rio Salado Plan, City of Tempe, May 20, 1982.

20. Economic Impacts of Rio Salado and the Central Arizona Water Control Study's Plan Six Alternative, Economic Planning Division, Valley National Bank of Arizona Rio Salado Development District, June 1983.

21. Rio Salado Master Plan- Final Draft, Carr, Lynch Associates, January, 1985.

22. Tempe Rio Salado Park Plan, Arizona State University College of Architecture & Environmental Design, September 21, 1988.

23. South Phoenix Village Redevelopment Area Plan, City of Phoenix, December 20, 1989.

24. Intensity Density: A Look at Phoenix Over the Next 25 Years, City of Phoenix Planning Department, 1991.

25. Rio Salado Engineering Report, CH2M Hill, August 1992.

26. City of Tempe Rio Salado Town Lake Feasibility Study, Technical Memorandum 8, CH2M Hill, April, 1992.

27. Final Draft Public Art Master Plan Rio Salado Tempe, Arizona, Helene Fried Associates, Reid & Associates Architects & Planners, Inc., Tad Savinar, 1993.

28. The Economic Impact of the Proposed Rio Salado Development, Deloitte & Touche, April, 1994.

29. Rio Salado Economic Development Area, Economic Development Opportunities: An Analysis of Long-Term Potential, City of Phoenix Community and Economic Development Department, September 13, 1994.

30. Plan of Action & Cost Estimates for Investigation and Remediation of Waste Sites Within the Master Plan Area for the Rio Salado Development District, Dames & Moore, September 17, 1987.

31. Final Environmental Assessment East Papago Freeway (State Route 217), Arizona Department of Transportation Environmental Planning Services, August, 1987.

32. Tempe Rio Salado Wildlife Habitat Master Plan, Howard Needles Tammen and Bergendoff, October 22, 1990.

33. Environmental Assessment for that Portion of the Tempe Rio Salado Project, City of Tempe Community Development Department, March 7, 1990.

34. Phase I Environmental Assessment, Rio Salado Development Area, Site Located North of the Salt River and South of Hammond Lane Between 10th and 16th Streets, Phoenix, Arizona, prepared by SCS Engineers for the City of Phoenix, June 21, 1993.

35. Phase I Environmental Assessment, Parcel Located North of Pioneer Street and South of the Salt River Between Central Avenue and 7th Street, prepared by SCS Engineers for the City of Phoenix, June 17, 1993.

36. Site Screening Report, Rio Salado Development Area Bounded by Central Avenue, 16th Street, Watkins Street, and Illini Street, prepared by SCS Engineering for the City of Phoenix, July 30, 1993.

37. Rio Salado Retrospect and Prospect, Herberger Center for Design Excellence, College of Architecture and Environmental Design, Arizona State University, Tempe, Arizona, 1996.

38. Proceedings from the Sixth Annual Meeting of Bird Strike Committee USA, American Association of Airport Executives, July, 1996.

39. Order 5200.5A, Waste Disposal Sites on or Near Airports, U.S. Department of Transportation, Federal Aviation Administration, June, 1996.

40. Gila River Basin, Arizona - Indian Bend Wash - Design Memorandum No. 1 - General Design Memorandum Phase II Project Design for Indian Bend Wash, U.S. Army Corps of Engineers, Los Angeles District, May, 1975.

41. Revised Sudden Gate Opening Analysis for Rio Salado Town Lake, prepared by CH2M Hill for the Arizona Department of Water Resources, November, 1996.

42. Town Lake Capacity and Needs Study: Rio Salado Project, prepared by BRW Inc. and Moffatt & Nichol Engineers for the City of Tempe, 1996.

43. Riparian Ecosystems: Their Ecology and Status, prepared by Brinson, M.M., Swift, B.L., Plantico, R.C., and J.S. Barclay for the US Department of the Interior Fish and Wildlife Service, 1981.

44. The Importance of Riparian Systems to Amphibians and Reptiles in California Riparian Systems, prepared by Brode, J.M. and B.B. Bury. eds. R. Warner and K. Hendrix. University of California Press, Los Angeles, CA, 1984.

45. The Ecology of Riparian Habitats of the Southern California Coastal Region; A Community Profile, prepared by Faber, P.A., Kelley, E., Sands, A., and B.M. Massey for the US Fish and Wildlife Service, 1989.

46. The Impact of Federal Programs on Wetlands, Vol. II, A Report to Congress by the Secretary of the Interior, for the US Department of the Interior, 1994.

47. Riparian Resources of the Central Valley and Californian Desert: A report on their nature, history, status, and future (Draft) prepared by Warner, R. for the California Department of Fish and Game, 1983.

48. Riparian Resources of the Central Valley and California Desert prepared by Warner, R.E. and K.M. Hendrix for the California Department of Fish and Game, 1985.

49. Riparian Ecosystem Recovery in Arid Lands, Strategies and References by Mark K. Briggs. The University of Arizona Press, Tucson, AZ, 1996.

50. Groundwater Quality Survey, Rio Salado Habitat Restoration Project, Dames and Moore, October 3, 1997.

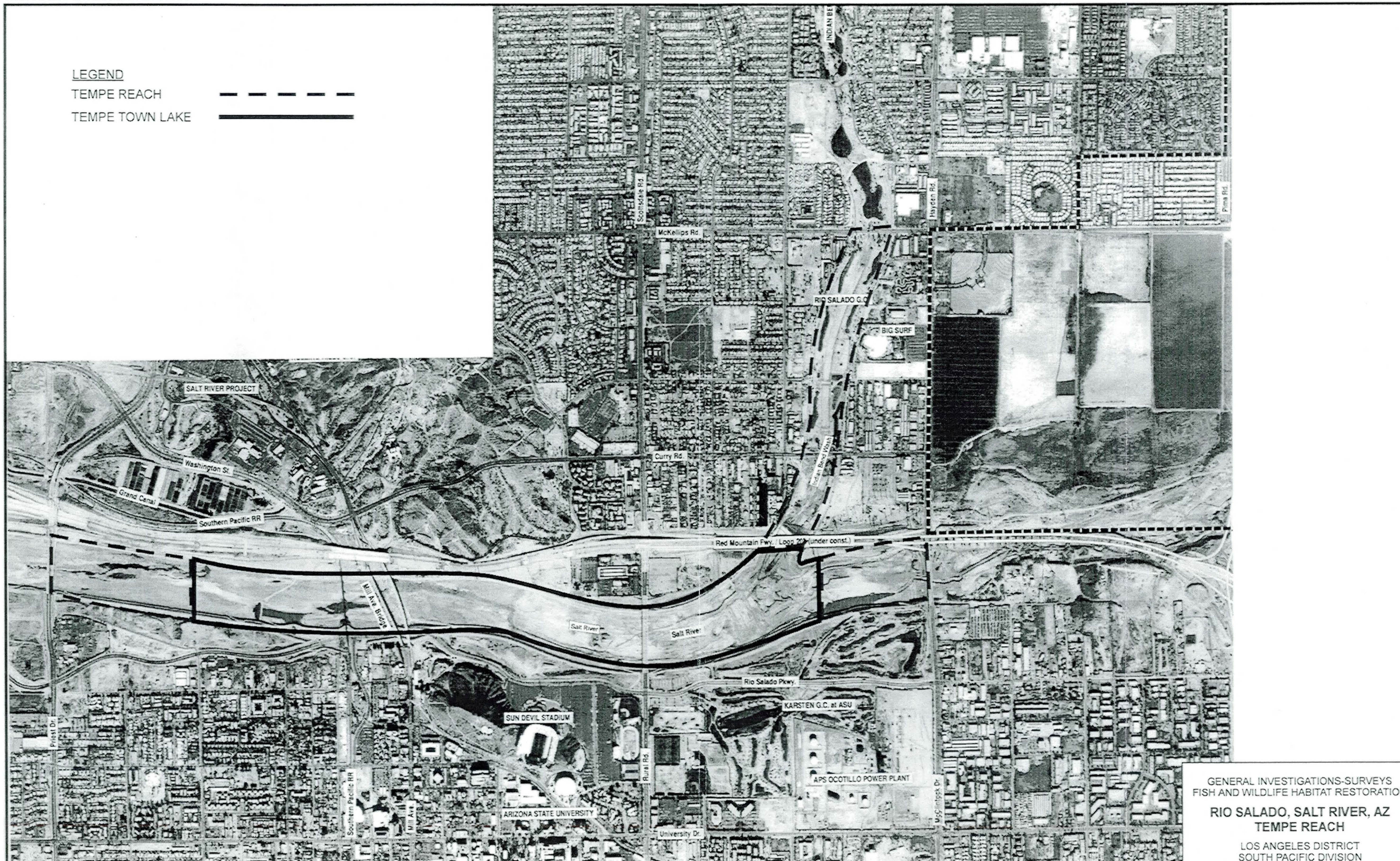
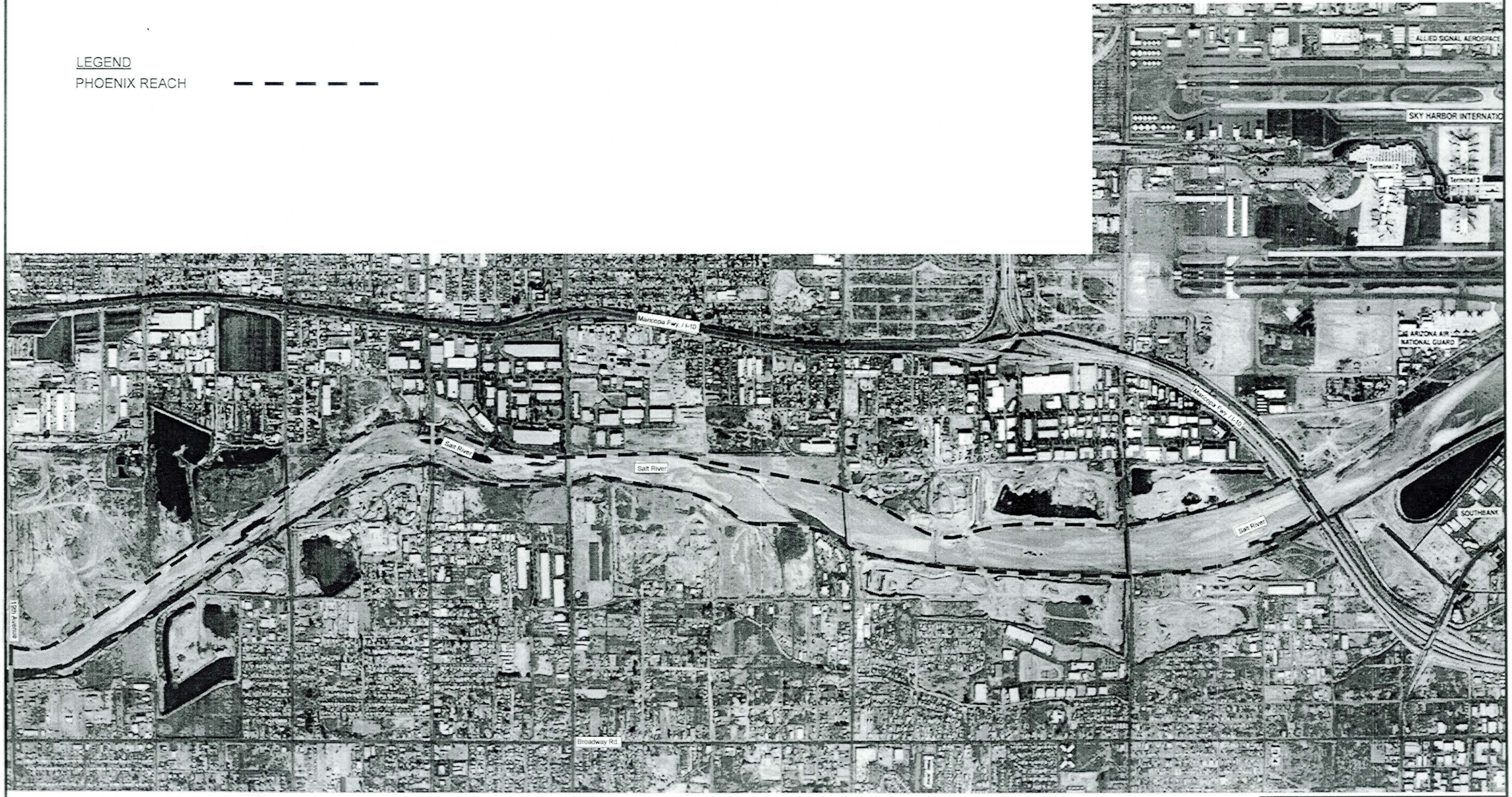

LEGEND
TEMPE REACH
TEMPE TOWN LAKE
SALT RIVER PROJECT
Washington St.
Grand Canal
Southern Pacific RR
Mill Ave Bridge
Salt River
Salt River
Scottsdale Rd.
McKellips Rd.
Hayden Rd.
Pima Rd.
RIO SALADO G.C.
BIG SURF
Curry Rd.
Indian Bend Wash
Red Mountain Fwy. / Loop 20 (under const.)
Rio Salado Pkwy.
KARSTEN G.C. at ASU
SUN DEVIL STADIUM
APS OCOTILLO POWER PLANT
ARIZONA STATE UNIVERSITY
University Dr.
Rural Rd.
McClintock Dr
Priest Dr.
Southern Pacific RR
Mill Ave.
GENERAL INVESTIGATIONS-SURVEYS
FISH AND WILDLIFE HABITAT RESTORATION
RIO SALADO, SALT RIVER, AZ
TEMPE REACH
LOS ANGELES DISTRICT
SOUTH PACIFIC DIVISION

PLATE 2-1

LEGEND

PHOENIX REACH



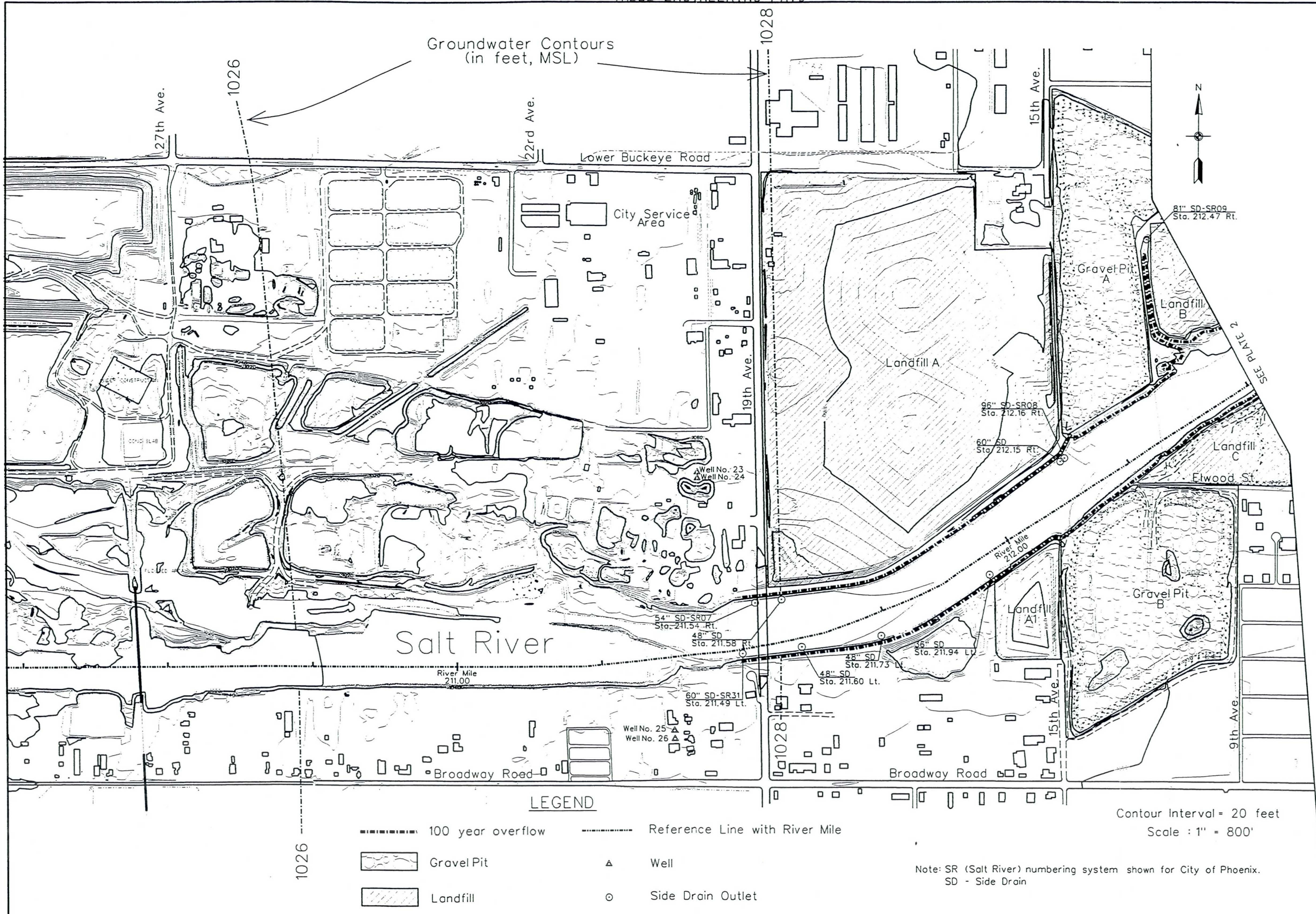
GENERAL INVESTIGATIONS-SURVEYS
FISH AND WILDLIFE HABITAT RESTORATION

RIO SALADO, SALT RIVER, AZ
PHOENIX REACH

LOS ANGELES DISTRICT
SOUTH PACIFIC DIVISION

PLATE 2-2

VALUE ENGINEERING PAYS



RIO SALADO, ARIZONA
FEASIBILITY REPORT

RIVER MILE 211.00 TO 212.51

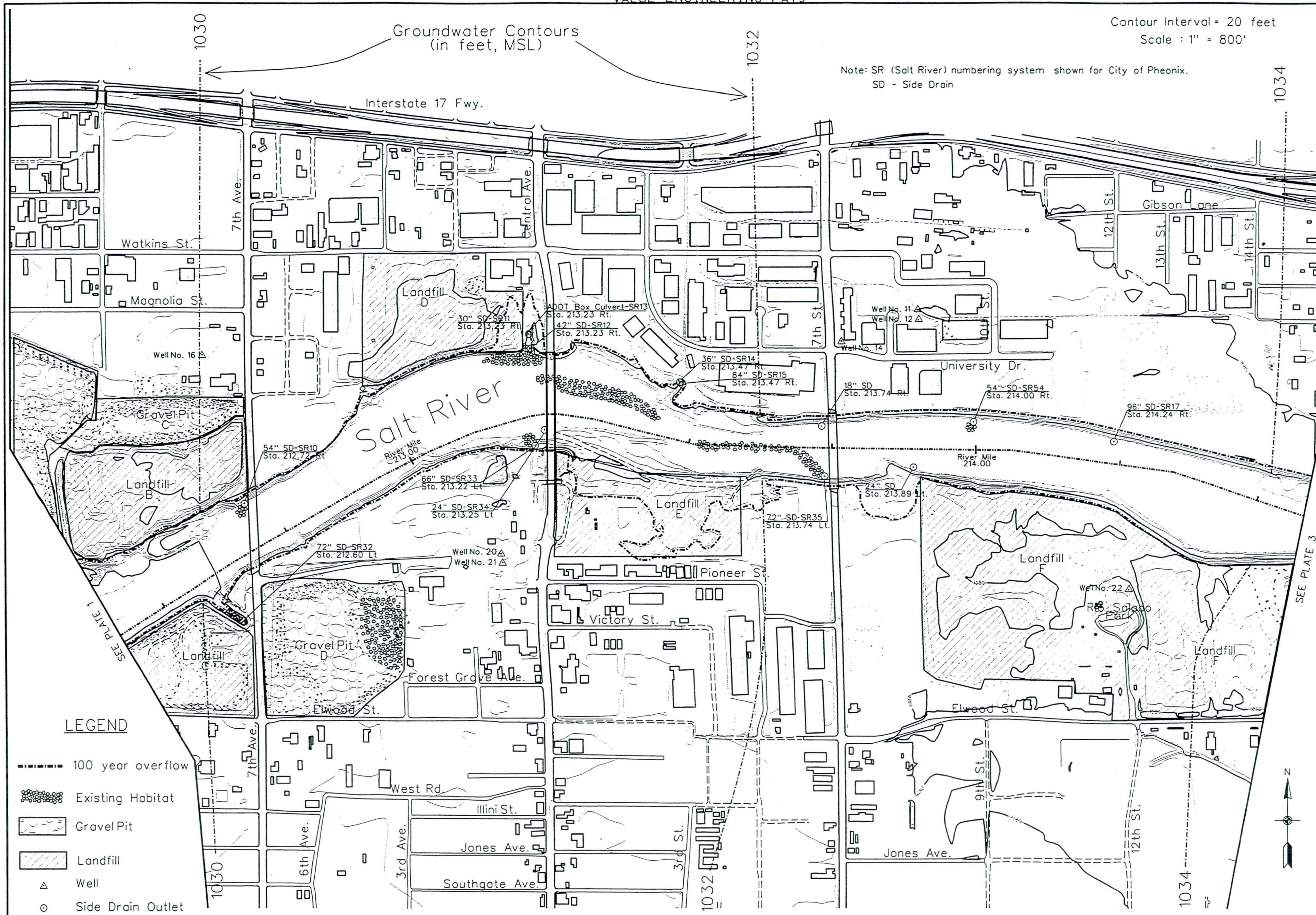
EXISTING CONDITIONS

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

PLATE 4-1

SAFETY PAYS

VALUE ENGINEERING PAYS



SAFETY PAYS

REVISIONS
SYMBOL | DESCRIPTIONS | DATE | APPROVAL

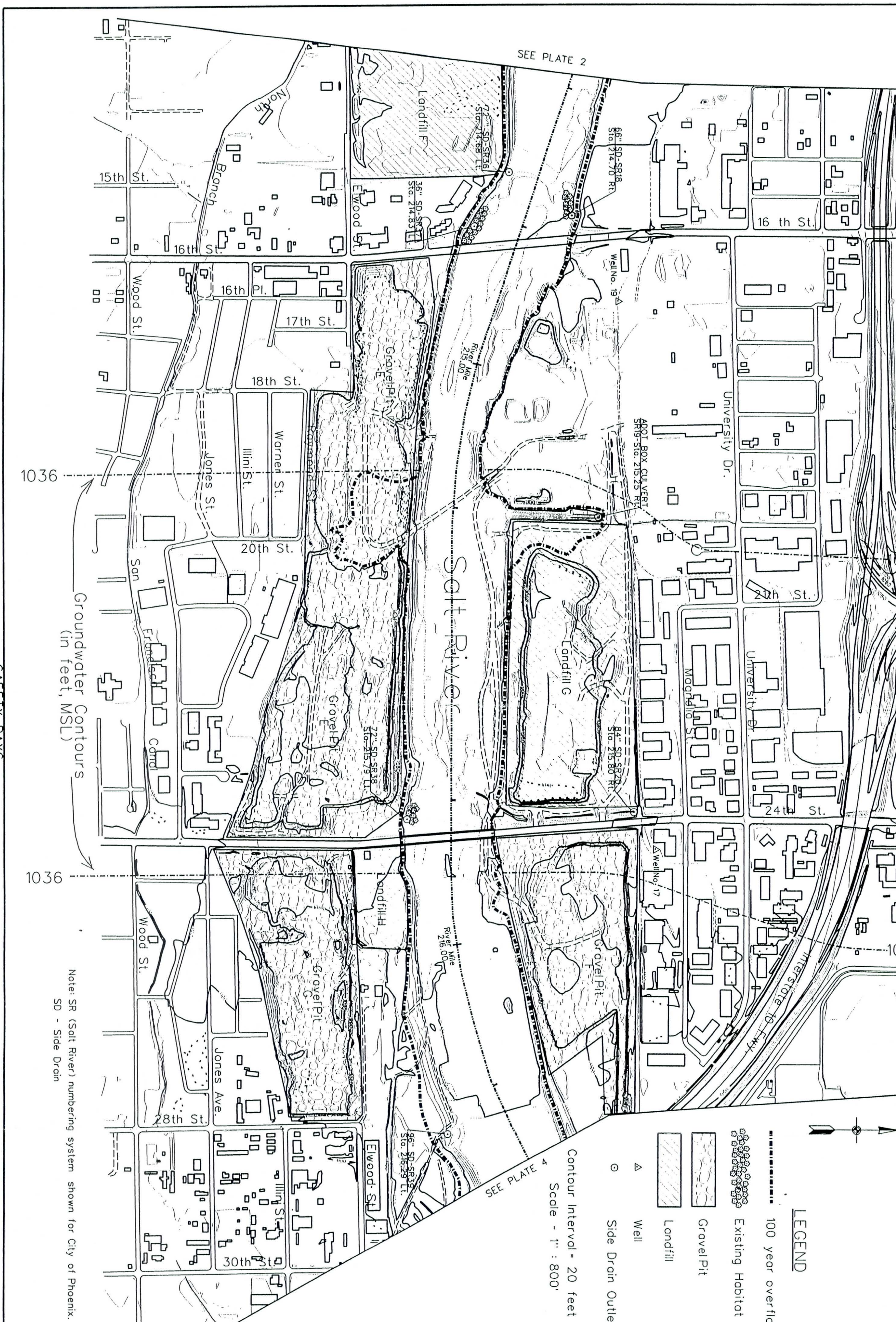
RIO SALADO, ARIZONA
FEASIBILITY REPORT
RIVER MILE 212.40 TO 214.58
EXISTING CONDITIONS

DESIGNED BY:
DRAWN BY:
CHECKED BY:
CADD FILE NAME:

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

SUBMITTED BY:
XXX
CHIEF, XXX BRANCH
DISTRICT FILE NO.
SPEC. NO.

PLATE 4-2



SAFETY PAYS

ENGINEERING PAYS

PLATE 4-3	U.S. ARMY ENGINEER DISTRICT LOS ANGELES CORPS OF ENGINEERS	DESIGNED BY: DRAWN BY: CHECKED BY:	RIO SALADO, ARIZONA FEASIBILITY REPORT	SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	SUBMITTED BY: XXX CHIEF, xxx BRANCH		RIVER MILE 214.49 TO 216.40				
	DISTRICT FILE NO.	SPEC. NO. / CADD FILE NAME:	EXISTING CONDITIONS		REVISIONS		

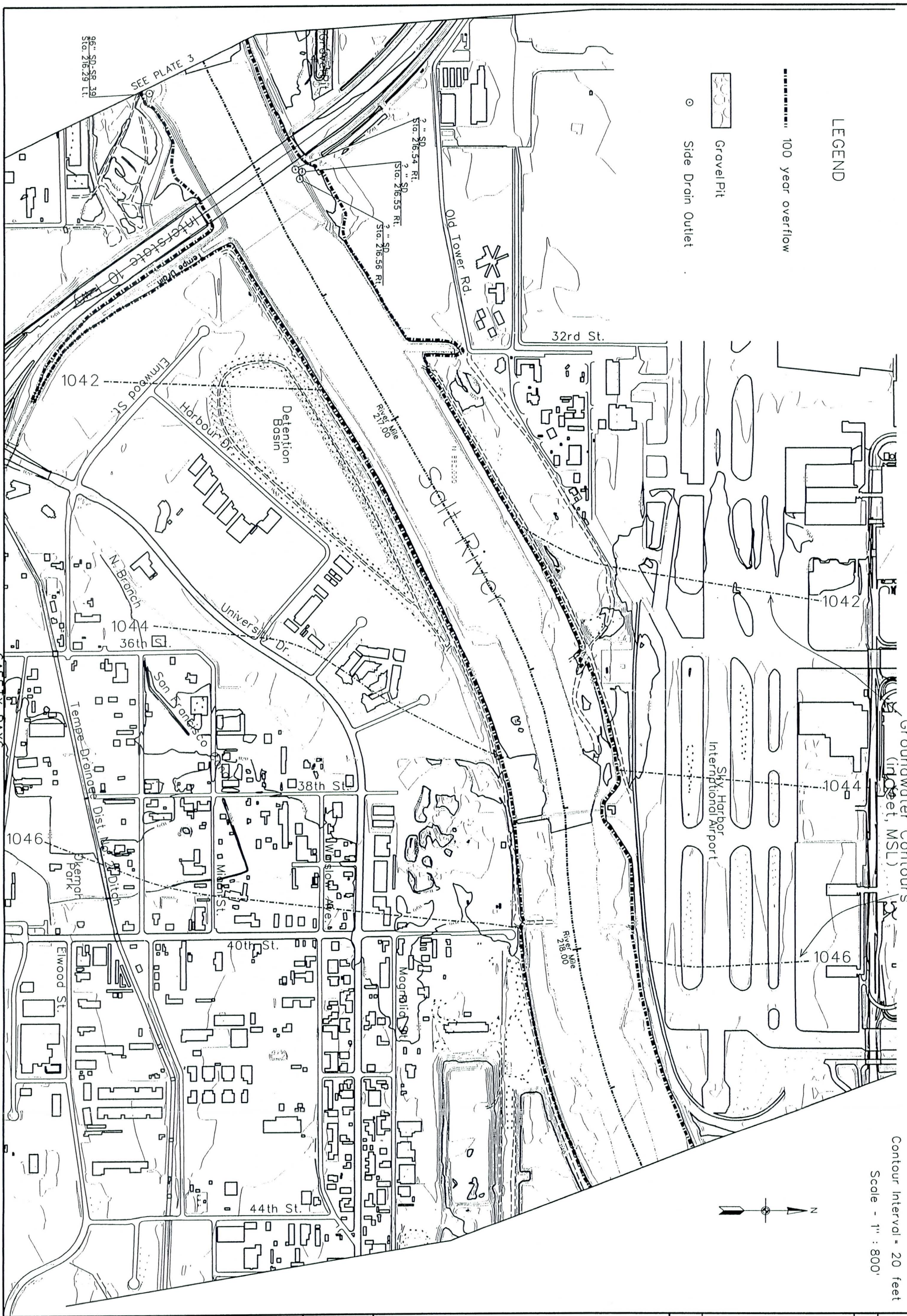
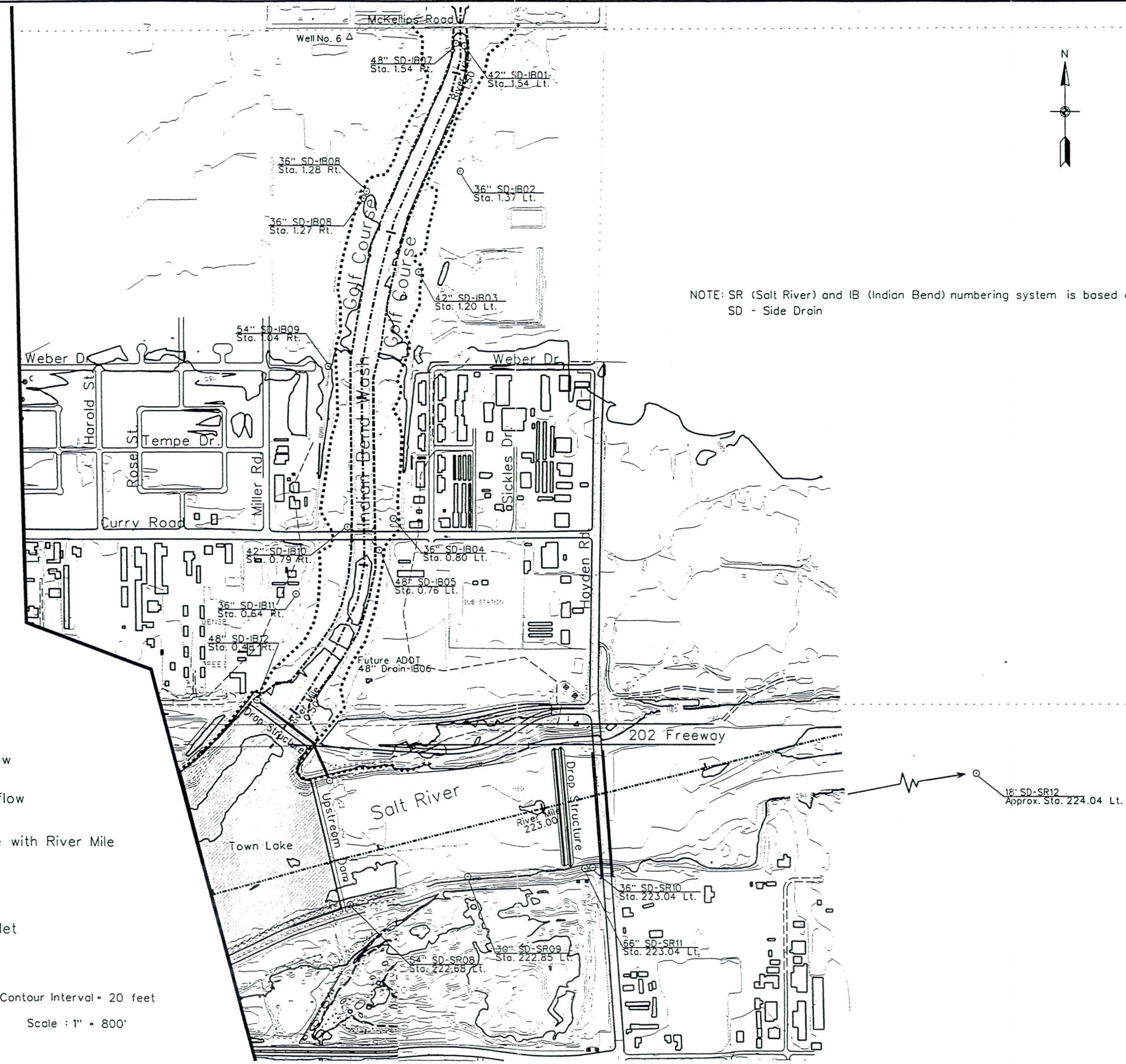


PLATE 4-4	U.S. ARMY ENGINEER DISTRICT LOS ANGELES CORPS OF ENGINEERS	DESIGNED BY: DRAWN BY: CHECKED BY:	RIO SALADO, ARIZONA FEASIBILITY REPORT
	SUBMITTED BY: XXX CHIEF, xxx BRANCH		RIVER MILE 216.29 TO 217.00
	DISTRICT FILE NO. / SPEC. NO.	CADD FILE NAME:	EXISTING CONDITIONS

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		



NOTE: SR (Salt River) and IB (Indian Bend) numbering system is based on City of Tempe.
SD - Side Drain

LEGEND

- 5 year overflow
- 100 year overflow
- Reference Line with River Mile
- △ Well
- ⊙ Side Drain Outlet

Contour Interval = 20 feet

Scale : 1" = 800'

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

RIO SALADO, ARIZONA
FEASIBILITY REPORT

TEMPE REACH

EXISTING CONDITIONS

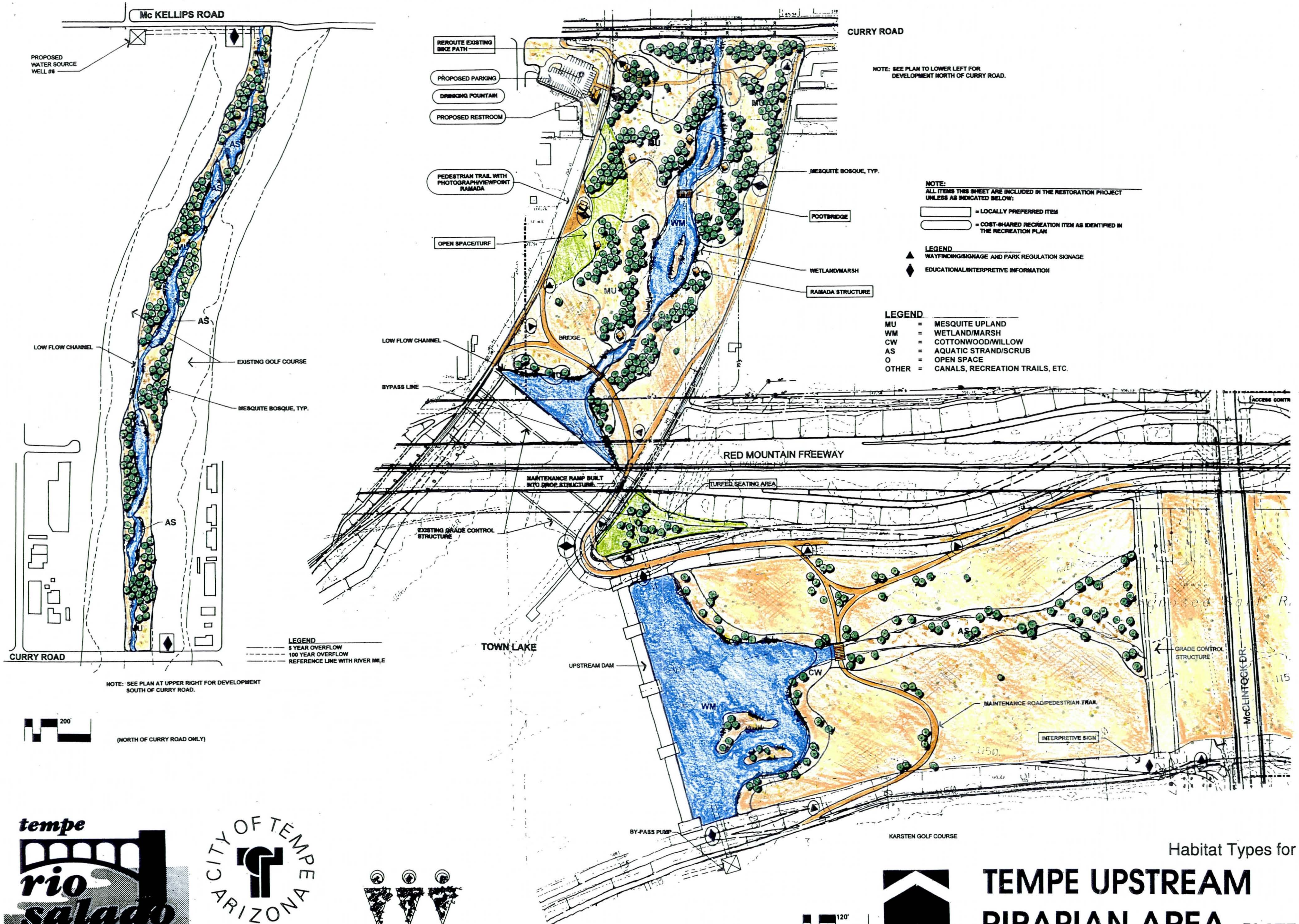
DESIGNED BY:
DRAWN BY:
CHECKED BY:

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

SUBMITTED BY:
XXX
CHIEF, XXX BRANCH

DISTRICT FILE NO. | SPEC. NO. | CADD FILE NAME:

PLATE 4-5



tempe rio salado

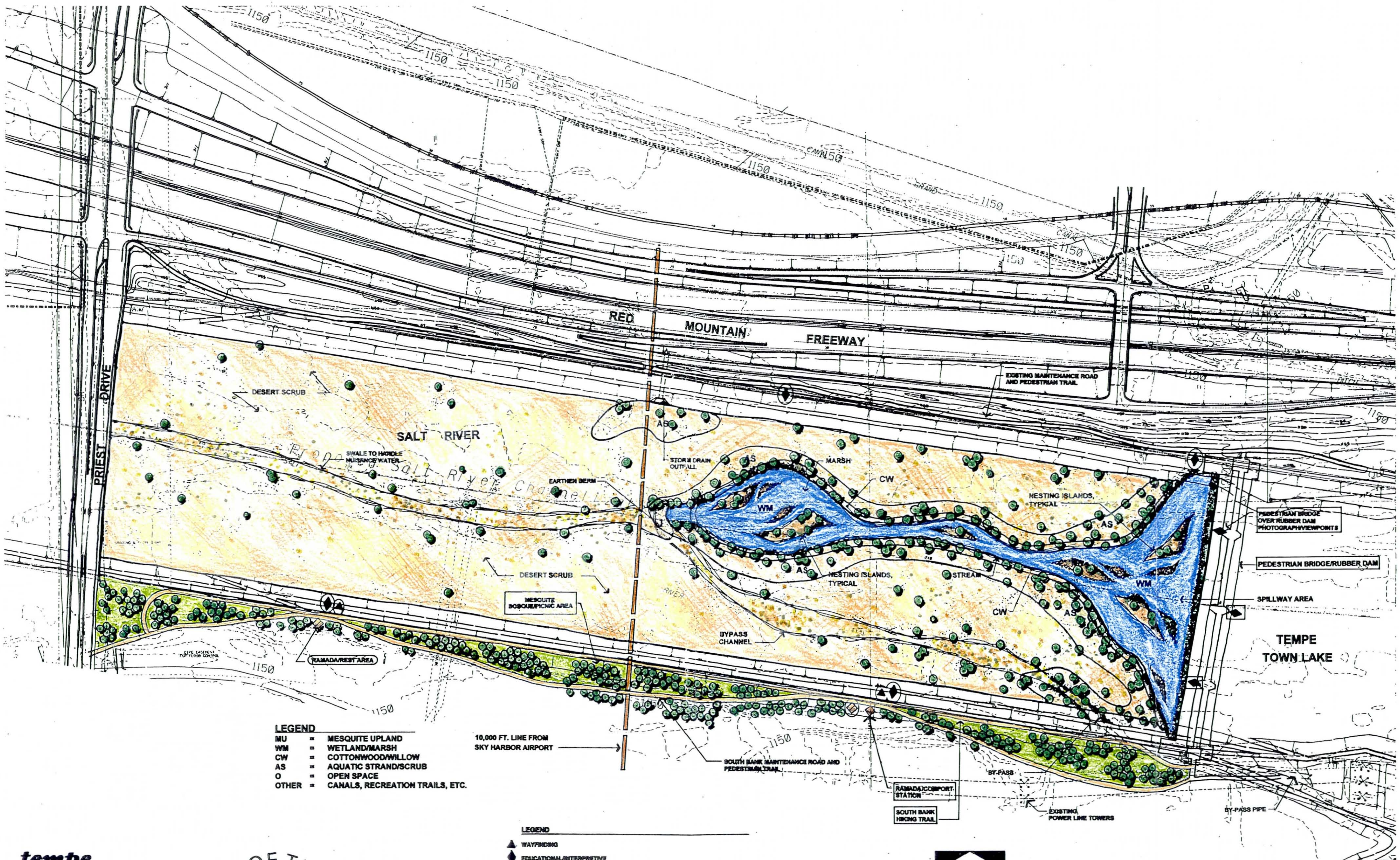
CITY OF TEMPE ARIZONA

Community Development Department

Logan Simpson & Dye

Habitat Types for the

TEMPE UPSTREAM RIPARIAN AREA PLATE 6-1



LEGEND

▲ WAYFINDING

◆ EDUCATIONAL/INTERPRETIVE

NOTE:
ALL ITEMS THIS SHEET ARE INCLUDED IN THE RESTORATION PROJECT UNLESS AS INDICATED BELOW:

▭ = LOCALLY PREFERRED ITEM

⬭ = COST-SHARED RECREATION ITEM AS IDENTIFIED IN THE RECREATION PLAN

tempe rio salado

CITY OF TEMPE ARIZONA
Community Development Department

Logan Simpson & Dye

NORTH

120'

11/12/97

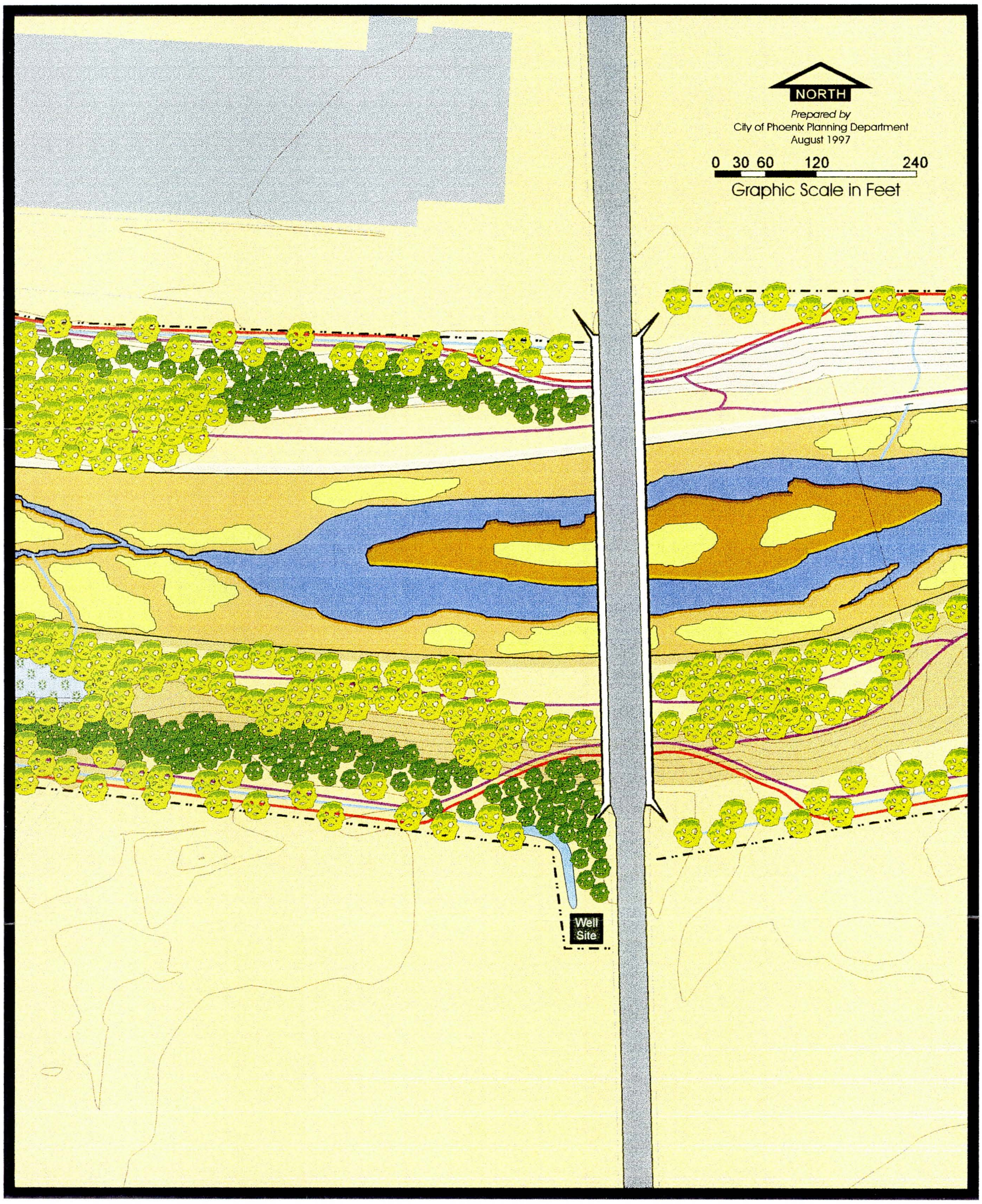
Habitat Types for the
TEMPE DOWNSTREAM RIPARIAN AREA
PLATE 6-2

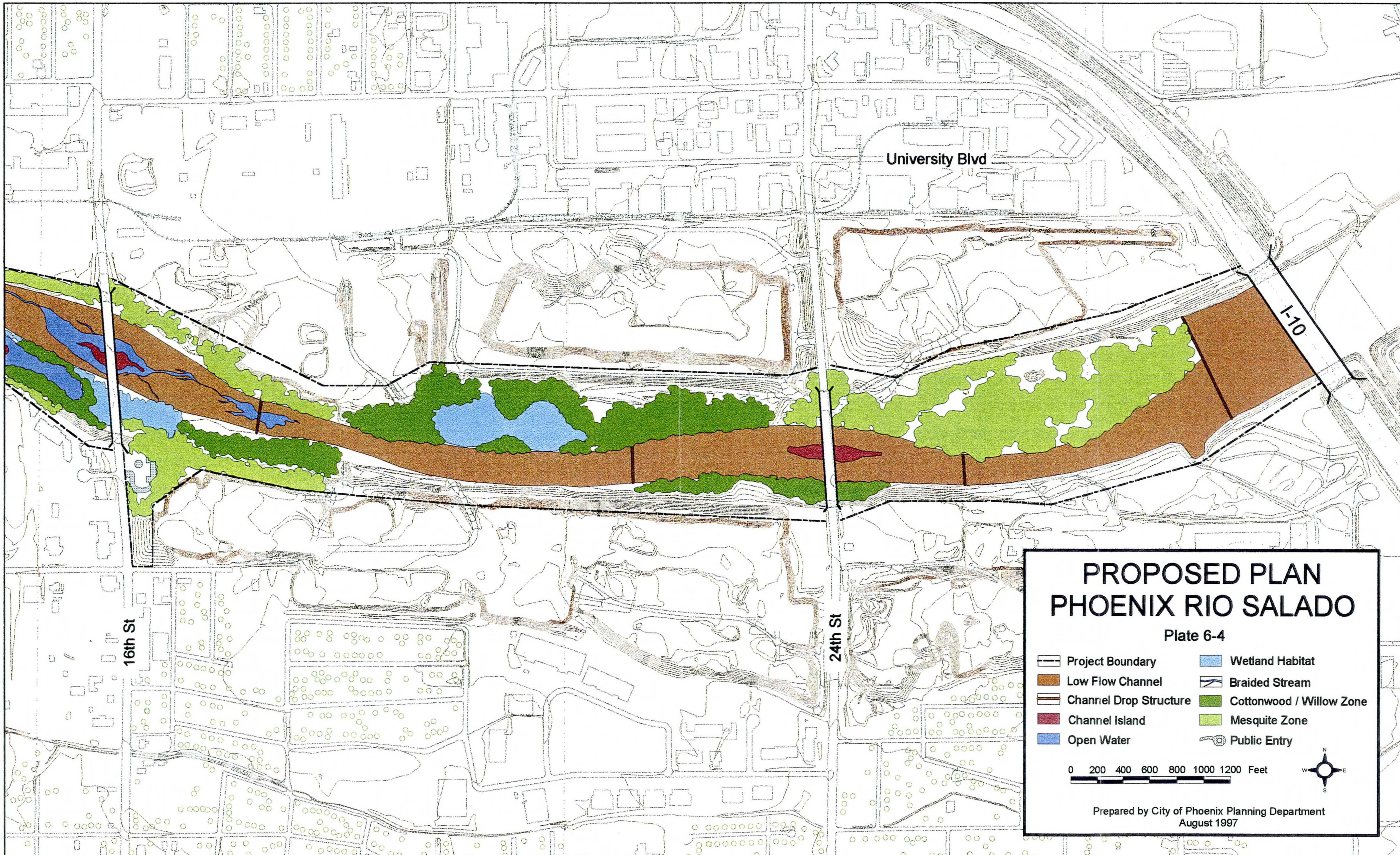
Plate 6-3

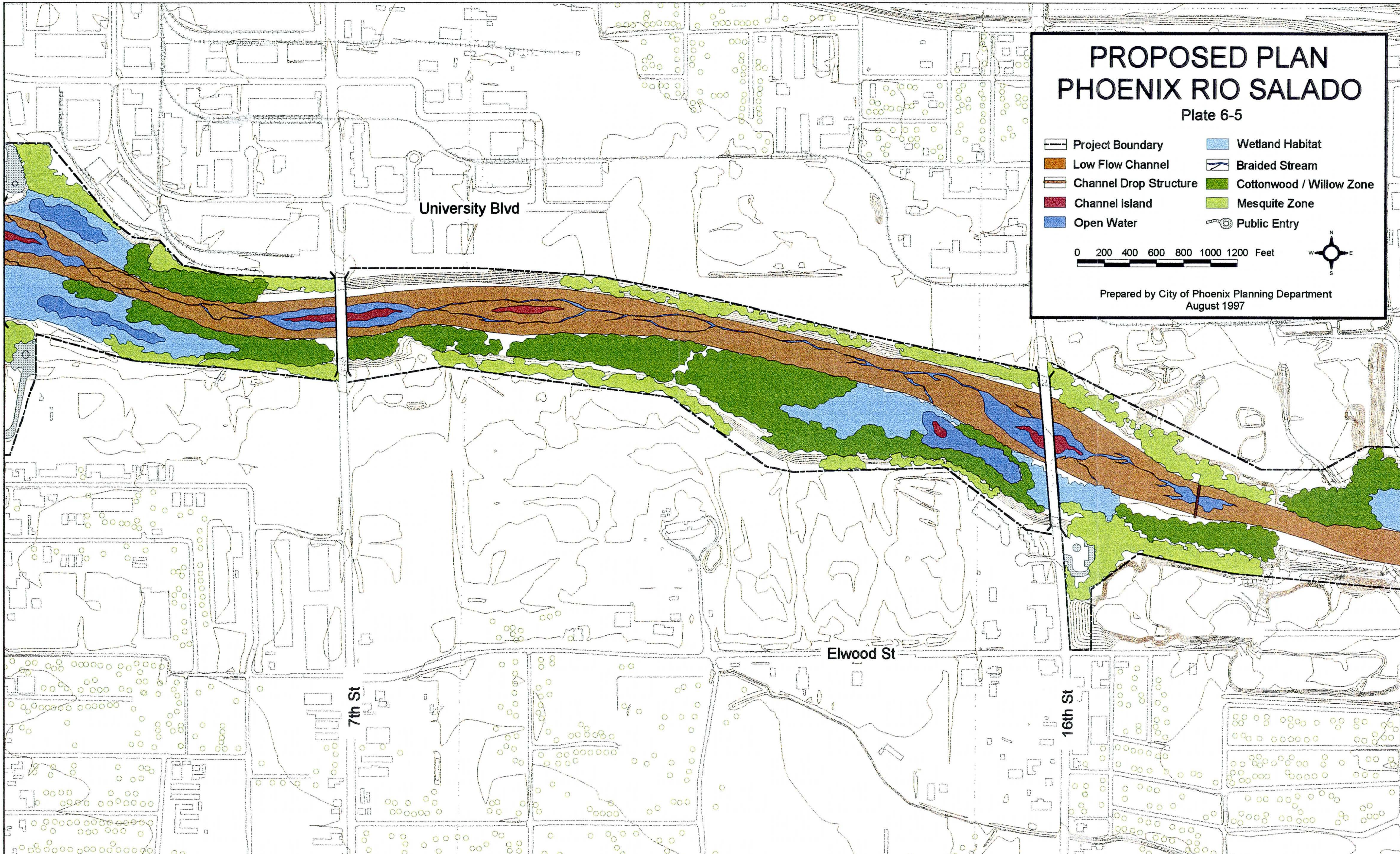
PHOENIX RIO SALADO

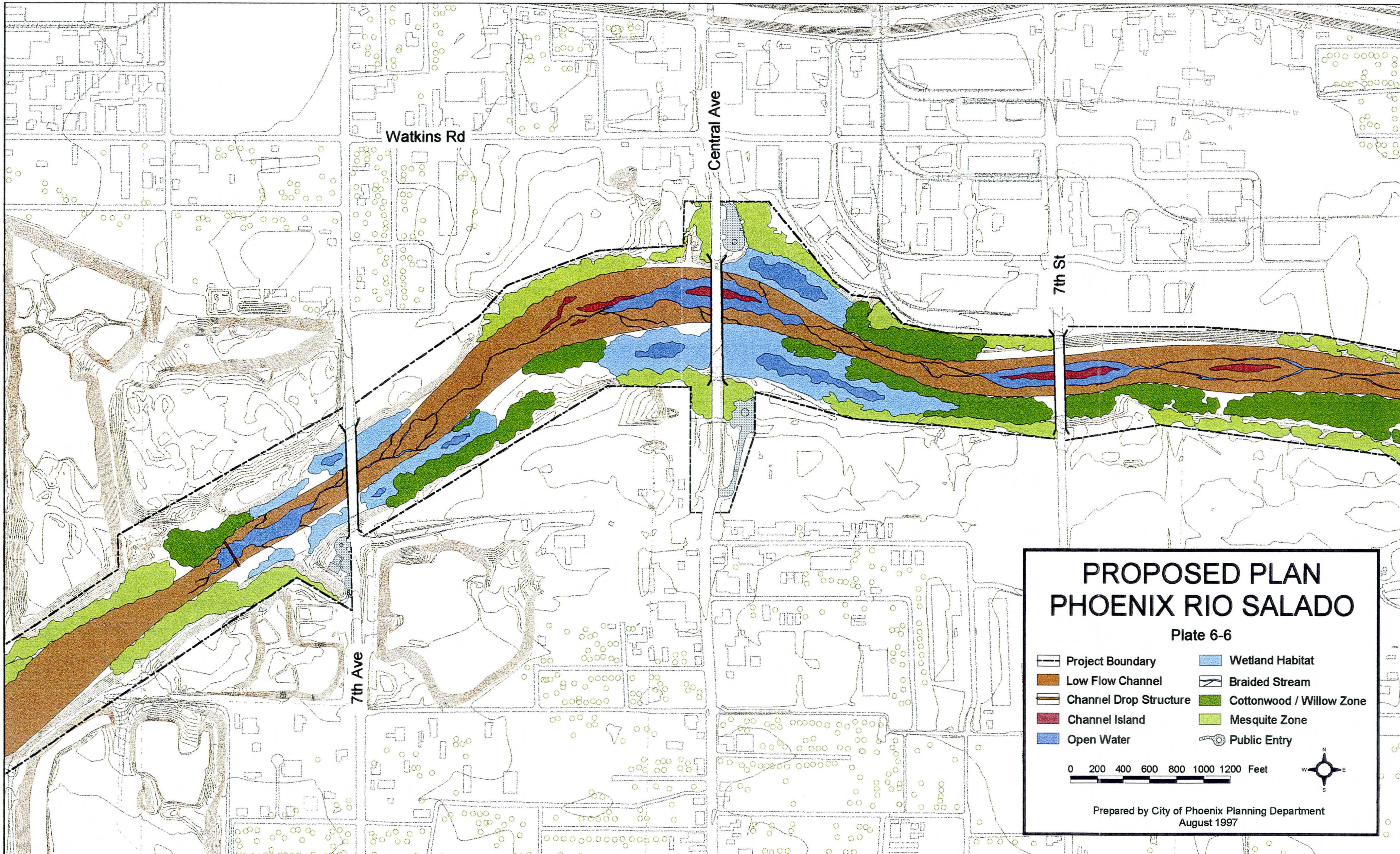
Detail View

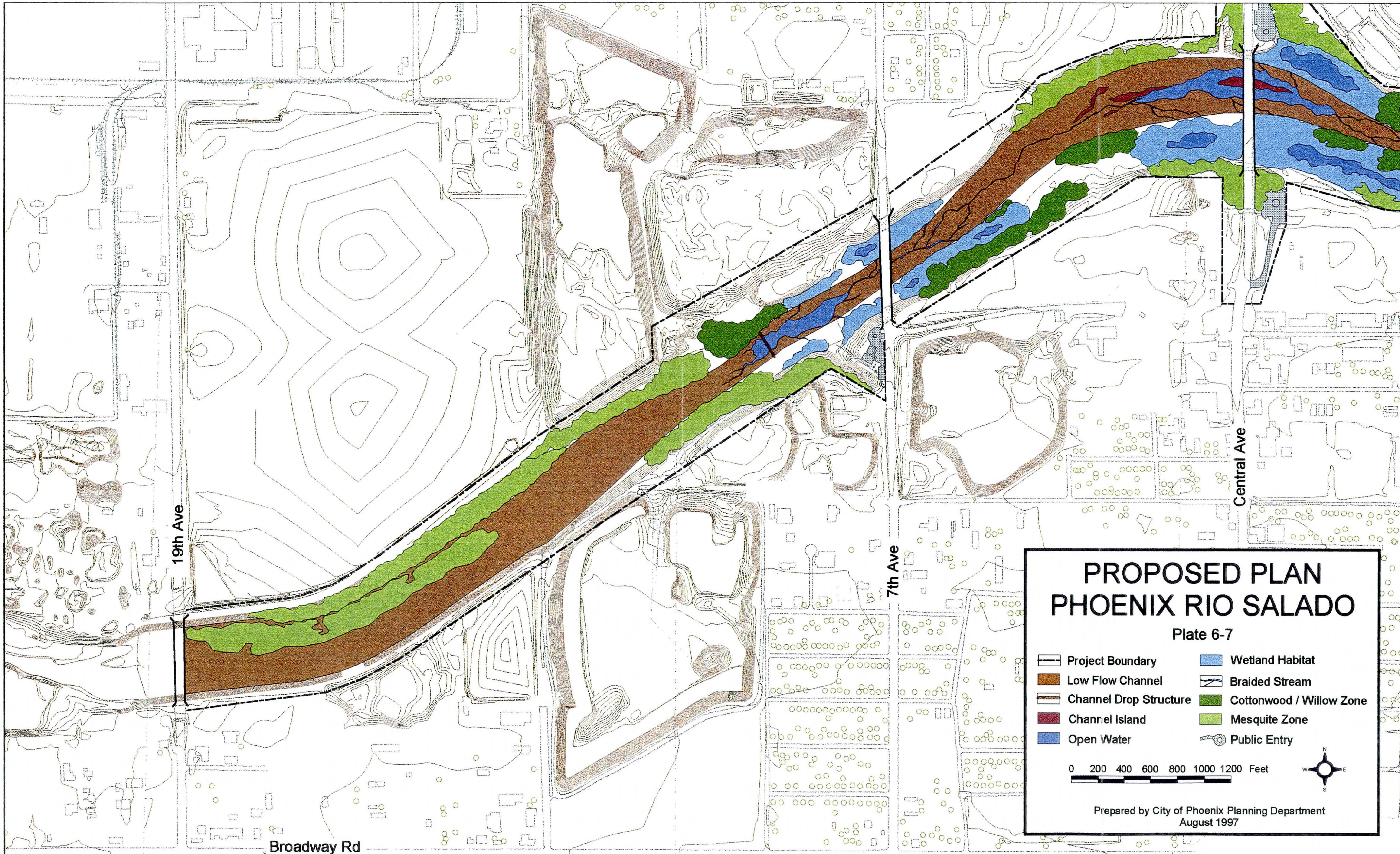
- Project Boundary
- Low Flow Channel
- Channel Island
- Open Water
- Grasslands
- Water Delivery Canal
- Water Storage Pond
- Horse / Jogging Trail
- Service Road / Walking & Biking Trail
- Wetland Habitat
- Braided Stream
- Cottonwood / Willow Zone
- Mesquite Zone




University Blvd
I-10
16th St
24th St
PROPOSED PLAN
PHOENIX RIO SALADO
Plate 6-4
Project Boundary
Low Flow Channel
Channel Drop Structure
Channel Island
Open Water
Wetland Habitat
Braided Stream
Cottonwood / Willow Zone
Mesquite Zone
Public Entry
0 200 400 600 800 1000 1200 Feet
N
W
E
S
Prepared by City of Phoenix Planning Department
August 1997


PROPOSED PLAN
PHOENIX RIO SALADO
Plate 6-5
Project Boundary
Low Flow Channel
Channel Drop Structure
Channel Island
Open Water
Wetland Habitat
Braided Stream
Cottonwood / Willow Zone
Mesquite Zone
Public Entry
0 200 400 600 800 1000 1200 Feet
N
W
E
S
Prepared by City of Phoenix Planning Department
August 1997
University Blvd
Elwood St
7th St
16th St


Watkins Rd
Central Ave
7th St
7th Ave
PROPOSED PLAN
PHOENIX RIO SALADO
Plate 6-6
Project Boundary
Low Flow Channel
Channel Drop Structure
Channel Island
Open Water
Wetland Habitat
Braided Stream
Cottonwood / Willow Zone
Mesquite Zone
Public Entry
0 200 400 600 800 1000 1200 Feet
N
W
E
S
Prepared by City of Phoenix Planning Department
August 1997



19th Ave
7th Ave
Central Ave
Broadway Rd
PROPOSED PLAN
PHOENIX RIO SALADO
Plate 6-7
Project Boundary
Low Flow Channel
Channel Drop Structure
Channel Island
Open Water
Wetland Habitat
Braided Stream
Cottonwood / Willow Zone
Mesquite Zone
Public Entry
0 200 400 600 800 1000 1200 Feet
Prepared by City of Phoenix Planning Department
August 1997

Final

Environmental Impact Statement
Rio Salado Environmental Restoration

Salt River and Indian Bend Wash, Cities of Phoenix and Tempe, Maricopa County, Arizona

Prepared for:

U.S. Army Corps of Engineers
Los Angeles District

Prepared by:

Aspen Environmental Group
Agoura Hills, California

(Contract No. DACA09-95-D-0015
Delivery Order 0024)

March 1998

FINAL
ENVIRONMENTAL IMPACT STATEMENT
FOR THE PROPOSED
RIO SALADO ENVIRONMENTAL RESTORATION
CITIES OF PHOENIX AND TEMPE, ARIZONA

LEAD AGENCY: U.S. Army Corps of Engineers, Los Angeles District.

TITLE OF THE PROPOSED ACTION: Proposed Rio Salado Environmental Restoration.

AFFECTED JURISDICTIONS: Cities of Phoenix and Tempe, Arizona.

REVIEWED AND APPROVED BY: U.S. Army Corps of Engineers, Los Angeles District.

ABSTRACT: This document analyzes the environmental impacts associated with the environmental restoration of two sites along the Salt River in the State of Arizona. The first site, referred to as the Phoenix Reach, consists of a five-mile segment of the Salt River in the City of Phoenix. The second site, referred to as the Tempe Reach, is located in the City of Tempe on portions of the Salt River and Indian Bend Wash (a tributary to the Salt River). Water no longer flows perennially within these segments of the river and the natural condition of the river has been significantly degraded compared to historic conditions. The primary purpose of the project is to restore natural habitat historically associated with the Salt River flood plain. Incidental to this objective is the creation of passive recreational opportunities associated with the restored habitat areas, including the use of maintenance roads as trails for walking and biking, and areas for observing wildlife and learning about the natural history of the river. The project proposes to re-introduce water into the river channel and restore the following habitat types in the channel and along the banks: cottonwood/willow riparian forest, freshwater marsh, aquatic strand, and mesquite bosque. The capacity of the river channel to convey flood flows will be maintained and the river will continue to function as a regional flood control facility.

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

Page

LIST OF TABLES

TABLE OF CONTENTS

Page

LIST OF TABLES (continued)

LIST OF FIGURES

EXECUTIVE SUMMARY

1. INTRODUCTION/OVERVIEW

This Final Environmental Impact Statement (EIS) describes existing environmental conditions along portions of the Salt River in the Cities of Phoenix and Tempe, Arizona, and examines the potential environmental effects associated with a proposal for the restoration of natural habitat within and along the river channel. This environmental restoration project is proposed by the U.S. Army Corps of Engineers (Corps), Los Angeles District, in conjunction with the Cities of Phoenix and Tempe.

This document was prepared by the Corps pursuant to the requirements of the National Environmental Policy Act (NEPA). The purpose of this EIS is to identify the potentially significant environmental impacts which would result from the construction, operation, and maintenance of the proposed habitat areas and the various improvements and facilities associated with the project. As necessary, feasible mitigation measures are identified to avoid or reduce the severity of potentially significant impacts. This EIS also examines alternatives to the proposed action, including a "no action" alternative.

This Draft EIS considered comments made by agencies and the general public during the public scoping period, including comments received at public scoping meetings for the project conducted in Tempe on June 10, 1996, and in Phoenix on June 11, 1996. The Draft EIS was released for a 45-day public comment period that ended on January 28, 1998. Agencies, organizations, and individuals provided their comments on the contents of the Draft EIS document during the public comment period. This Final EIS includes responses to these comments (Appendix H) and incorporates various minor textual revisions prompted by the comments.

2. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

The Corps, in conjunction with the Cities of Phoenix and Tempe, proposes to undertake the environmental restoration of two sites along the Salt River in the State of Arizona (see Figures 2-1 and 2-2). The first site, referred to herein as the "Phoenix Reach," consists of an 8-kilometer (km) (5-mile) portion of the Salt River in the City of Phoenix. The second site, referred to as the "Tempe Reach," is located in the City of Tempe and includes portions of the Salt River and Indian Bend Wash (a tributary to the Salt River). The specific locations of the two sites are shown in Figures 2-3 and 2-4.

The primary purpose of the project is to restore natural habitat historically associated with the Salt River flood plain. Incidental to this objective is the creation of passive recreational opportunities associated with the restored habitat areas, including the use of maintenance roads as trails for walking and biking, and the creation of areas for observing wildlife and learning about the natural history of the river.

Phoenix Reach

The proposed restoration of the Phoenix Reach would involve the construction of a 60-meter (200-foot) wide low-flow channel in the bed of the river, and the establishment of marsh, riparian forest, and mesquite habitat on the benches, banks, and overbanks of the river channel. The project would also include the construction of maintenance roads along the river channel which would also serve as recreational trails. Three gateway areas are planned for construction on the overbanks of the channel to serve as public access points to the river.

Restoration of the Phoenix Reach includes the creation of a series of shallow pools in the low-flow channel connected by a perennially flowing stream. In total, there would be four pools with a combined surface area of about 9 acres. This connected system of streams and pools would be located in the low-flow channel starting upstream of a grade control structure located about 360 meters (1,200 feet) east of 16th Street and ending at another grade control structure located west of 7th Avenue — a total length of about 4 km (2.5 miles).

A total of 22.03 million liters per day [5.82 million gallons of water per day (mgd)] of water would be required to support the habitat areas, irrigate vegetation, and supply the perennial stream/pool system. The acreages of habitats and other areas planned for the Phoenix Reach are displayed in Table ES-1.

Tempe Reach

The Tempe Reach consists of portions of the Salt River and Indian Bend Wash immediately adjacent to Town Lake (see Figure 2-4). Town Lake is an artificial body of water being constructed by the City of Tempe within the Salt River channel at the confluence of the Salt River and Indian Bend Wash. When completed, the lake will be approximately 200 acres in size and will contain about 3,500 acre-feet of water.

The Tempe Reach includes three areas which would be restored. The first area is located in Indian Bend Wash between the McKellips Road bridge and the confluence with the Salt River. A municipal golf course now occupies the land in the wash between McKellips and Curry Roads and, therefore, the restoration will be limited to the low-flow channel in this section of the wash. Between Curry Road and the Salt River, restoration efforts will include the entire area between the banks which define the wash, including both the low-flow channel and the benches on either side of the channel. The second area included in the Tempe Reach, referred to as *upstream* Salt River, is a 550-meter (1,800-foot) length of the Salt River between the upstream dam of Town Lake and a grade control structure located about 60 meters (200 feet) west of the McClintock Road bridge. The third area, referred to as *downstream* Salt River, is about a 600-meter (2,000-foot) segment of the Salt River immediately below the downstream dam of Town Lake.

In the Tempe Reach, there are a total of approximately 150 acres to be restored. This includes about 50 acres in the low-flow channel of the Indian Bend Wash, 30 acres in the bench of the wash (south of Curry Road), 35 acres in the Salt River bottom upstream of Town Lake, and 35 acres in the Salt River bottom downstream of Town Lake. The acreages of habitats and other areas planned for the Tempe Reach are displayed below in Table ES-2. A total of about 5.7 million liters per day (1.53 mgd) of water would be required to support the proposed restoration of the Tempe Reach.

2.2 ALTERNATIVES

Phoenix Reach

The alternatives for the Phoenix Reach include different treatment of the perennial stream in the low-flow channel, and differing mixes of mesquite, riparian forest, and marsh vegetation. In addition, two of the alternatives include the restoration of three gravel pits along the edges of the river channel. The land area involved in the restoration project differs under these alternatives compared to the Proposed Action due to the incorporation of the gravel pits. Water use varies depending on the amount of wetland vegetation included in each alternative and the amount of water needed to support the different perennial stream options.

Alternative P9: Gravel Pit Restoration, Five-Mile Perennial Stream. This Phoenix Reach alternative places a greater emphasis on wetland habitat than the Proposed Action and, therefore, contains more habitat area devoted to freshwater marsh and cottonwood/willow riparian forest. In addition, this alternative incorporates a perennial stream flowing within the low-flow channel for the entire 8-km (5-mile) length of the Phoenix Reach, although no pools would be located in the low-flow channel. One of the major differences between this alternative and the Proposed Action is the incorporation of three gravel pits along the river's edge into the restoration project. To incorporate the gravel pits, the levees which separate the gravel pits from the river channel would be lowered and the slope angles along the banks of the pits would be reduced. Because the gravel pits have been excavated below the ground water level, the bottoms of the pits are now filled with standing water. Riparian forest habitat would be established along the water's edge in each of the pits. It is estimated that 45.9 million liters per day (12.13 mgd) of water would be required to support this alternative. Similar to the Proposed Action, this alternative includes three public gateways to the river, as well as maintenance roads on the benches, banks, and overbanks of the river which would also serve as recreational trails. Trails would also be constructed along the edges of the restored gravel pits.

Alternative P6: Gravel Pit Restoration, No Perennial Stream. This Phoenix Reach alternative includes restoration of three gravel pits along the river's edge, but does not include a stream or pools within the low-flow channel. This alternative includes a mix of mesquite habitat, freshwater marsh, and cottonwood/willow riparian forest; however, the amount of acreage devoted to each of these habitat types would be less than under the Proposed Action. Due to the lack of streams and pools in the low-flow channel and the slightly smaller habitat sizes, this alternative would require less water than the Proposed Action. It is estimated that 7.34 million liters per day (1.94 mgd) of water would be required to support this alternative. Similar to the Proposed Action, this alternative would include three public gateways to the river, and maintenance roads on the benches, banks, and overbanks of the river which would also serve as recreational trails. Unlike the Proposed Action but similar to Phoenix Reach Alternative P9 described above, this alternative incorporates three gravel pits along the river's edge into the restoration project.

Alternative P2: No Perennial Stream, No Gravel Pit Restoration. This alternative for the Phoenix Reach does not include either a perennial stream in the low-flow channel nor the restoration of the gravel pits along the river's edge. The sizes of the various habitat types are altered under this alternative in order to reduce the amount of water required to support the restoration of the river channel. Therefore, this alternative includes more mesquite habitat and less of the water-consumptive marsh and riparian forest habitat than the Proposed Action. Due to emphasis on mesquite habitat and the lack of a perennial stream in the low-flow channel, this alternative would require less water than the Proposed Action. It is estimated that 7.38 million liters per day (1.95 mgd) of water would be required to support this alternative. This alternative would still include a 60-meter (200-foot) wide low-flow channel, three public gateways to the river, and maintenance roads which would also serve as recreational trails.

Alternative P5: Five-Mile Perennial Stream, No Gravel Pit Restoration. This Phoenix Reach alternative places a greater emphasis on wetland habitat than the Proposed Action and, therefore, contains more habitat area devoted to freshwater marsh and cottonwood/willow riparian forest. This alternative incorporates a perennial stream flowing within the low-flow channel for the entire 8-km (5-mile) length of the Phoenix Reach; however, no pools would be located in the low-flow channel. Because of the length of the perennial stream, this alternative contains more aquatic strand habitat within the low-flow channel than the Proposed Action. Due to the perennial stream and emphasis on marsh and riparian forest habitat, this is considered a high water consumption alternative. It is estimated that 44.3 million liters per day (11.71 mgd) of water would be required to support this alternative. Like the Proposed Action, this alternative includes three public gateways to the river, as well as maintenance roads on the benches, banks, and overbanks of the river which would also serve as recreational trails. It does not include the restoration of the gravel pits located along the edges of the river channel.

Table ES-1 Phoenix Reach: Proposed Action and Alternatives

	Water Use (mgd)	Perennial Stream	Gravel Pit Restoration	Habitat Acreages			
				Mesquite	Cottonwood/ Willow	Freshwater Marsh	Aquatic Strand
Proposed Action	Medium (5.82)	Streams/pools 4 km (2.5 miles) long	No	130	99	58	51
No Action (P1)	None	None	No	-	-	-	-
Alternative P9	High (12.13)	Stream 8 km (5 miles) long	Yes	60	230	100	130
Alternative P6	Low (1.94)	None	Yes	95	90	40	0
Alternative P2	Low (1.95)	None	No	50	80	40	0
Alternative P5	High (11.71)	Stream 8 km (5 miles) long	No	10	185	100	130

Tempe Reach

The alternatives for the Tempe Reach include the restoration of different combinations of each of the Reach's three areas (Indian Bend Wash, upstream Salt River, and downstream Salt River) with restoration plans incorporating differing mixes of riparian and marsh habitat. The restoration plans that emphasize wetland habitat (marsh and cottonwood/willow riparian forest) are considered "high-water use" alternatives due the greater amounts of water needed to support these habitats compared to the "low-water use" alternatives that emphasize mesquite habitat.

Alternative T3: Indian Bend Wash, Upstream Salt River, and Downstream Salt River (Low-Water Use). This alternative includes the restoration of all three segments of the Tempe Reach (Indian Bend Wash, upstream Salt River, and downstream Salt River). Mesquite would be the predominant habitat type in this alternative. Because mesquite requires less water than wetland habitats, this alternative would be less water consumptive than the Proposed Action. It is estimated that 0.87 million liters per day (0.23 mgd) of water would be required to support this alternative.

Alternative T4: Indian Bend Wash and Downstream Salt River (High-Water Use). This alternative includes the restoration of Indian Bend Wash and the Salt River channel immediately downstream of Town Lake. For this alternative, water from the Indian Bend Wash portion of the area would be piped by gravity flow along the north bank of Town Lake and discharged immediately below the downstream dam of Town Lake. The third segment of the Tempe Reach (Salt River upstream of Town Lake) would remain in its present condition. Similar to the Proposed Action, this alternative emphasizes wetland habitat and, therefore, is considered a high water consumption alternative. It is estimated that 9.46 million liters per day (2.5 mgd) of water would be required to support this alternative.

Alternative T2: Indian Bend Wash only (Low-Water Use). This alternative includes only the restoration of Indian Bend Wash. The Salt River segments of the Tempe Reach (upstream and downstream of Town Lake) would remain in their present condition. This alternative emphasizes mesquite habitat and, therefore, would be less water consumptive than the Proposed Action. It is estimated that 0.57 million liters per day (0.15 mgd) of water would be required to support this alternative.

Alternative T6: Downstream Salt River only (High-Water Use). This alternative includes only the restoration of the Salt River segment downstream of Town Lake. The water source would be comprised of overflow from Town Lake, supplemented by other sources to be identified by the City of Tempe. The other two segments of the Tempe Reach (Indian Bend Wash and Salt River upstream of Town Lake) would remain in their present condition. Similar to the Proposed Action, this alternative emphasizes wetland habitat and, therefore, is considered a high water consumption alternative. It is estimated that 1.29 million liters per day (0.34 mgd) of water would be required to support this alternative.

Table ES-2 Tempe Reach: Proposed Action and Alternatives

	Water Use (mgd)	Salt River		Indian Bend Wash	Habitat Acreages			
		Upstream	Downstream		Mesquite	Cottonwood/ Willow	Freshwater Marsh	Aquatic Strand
Proposed Action	High (1.53)	Yes	Yes	Yes	30	20	16	50
No Action (T1)	None	No	No	No	-	-	-	-
Alternative T3	Low (0.23)	Yes	Yes	Yes	30	0	0	0
Alternative T4	High (2.5)	No	Yes	Yes	20	10	8	50
Alternative T2	Low (0.15)	No	No	Yes	20	0	0	0
Alternative T6	High (0.34)	No	Yes	No	0	10	8	0

3. ENVIRONMENTAL CONSEQUENCES AND MITIGATION COMMITMENTS

Table ES-3 provides a summary of the environmental effects and commitments (mitigation measures) for the Proposed Action. The table is organized by issue area and identifies impacts according to following classifications:

- Significant but which can be reduced to a level of insignificance through the implementation of environmental commitments **(Class II)**
- Not significant and, therefore, do not require environmental commitments **(Class III)**
- Beneficial **(Class IV)**.

The Proposed Action does not involve any impacts which are significant and unavoidable **(Class I)**.

Table ES-3 Summary of Environmental Impacts and Commitments

Environmental Effects	Commitments	Implementing Responsibility
Geology and Geomorphology (see Section 4.2)		
Class II		
Some grading of the banks of the river channel is anticipated in order to implement the proposed restoration plan. Measures should be implemented to avoid slope failures which might affect properties along the overbanks of the river channel.	G-1 A soils investigation shall be performed for the project by a professional engineer. The soils investigation shall investigate soil conditions in those portions of the channel where grading is planned and in any areas where structural foundations will be constructed. The soils investigation shall include recommendations for slope stabilization, as necessary, and these recommendations shall be incorporated into construction plans. G-2 A detailed grading plan shall be prepared for the project delineating existing and final grade elevations and incorporating measures, as necessary, for stabilizing slopes.	U.S. Army Corps of Engineers
Because some construction activities could take place during periods of precipitation and/or strong winds, some erosion is likely to occur.	G-3 A comprehensive Erosion Control Plan shall be prepared for project construction. The Plan shall identify measures to be implemented to minimize the erosion effects of grading and excavation. Erosion control methods to be described in the Plan and implemented shall include, but not be limited to, the following: • Avoiding soil disturbance during periods of heavy precipitation or high winds • Keeping disturbed areas to the minimum necessary for construction • Reducing surface water flows across graded or exposed areas • Use of straw bales, soil mats, or silt fences to stabilize disturbed areas, where appropriate • Use of culverts, ditches, water bars, and sediment traps to control runoff and sedimentation.	U.S. Army Corps of Engineers
Class III		
The area's low level of seismic activity precludes any significant seismic hazards, including ground shaking, surface rupture, and liquefaction.	None required (not significant).	Not applicable.
Landform alteration would be necessary to implement the proposed project, primarily excavation and grading to form the low-flow channel and adjacent benches.	None required (not significant).	Not applicable.
Class IV		
The establishment of native plant materials on the banks and benches of the river may help reduce erosion from surface runoff.	None required (beneficial).	Not applicable.

Environmental Effects	Commitments	Implementing Responsibility
Air Quality (see Section 4.3)		
Class II		
None.		
Class III		
On-site air pollutant emissions during construction would principally consist of exhaust emissions from heavy duty construction equipment, as well as fugitive particulate matter from soil disturbed during grading and trenching operations (it is assumed that the construction site would be watered twice daily). Off-site exhaust emissions would result from workers commuting to and from the job site, as well as from trucks transporting material (e.g., soil, broken concrete) to local landfills.	None required (not significant).	Not applicable.
Construction activities may need to be reinitiated in order to repair damage caused to habitat areas by heavy storms flows. More routine maintenance activities related to the habitat areas, recreation facilities, and flood control facilities would be a minor source of air pollutant emissions.	None required (not significant).	Not applicable.
Hydrology and Water Quality (see Section 4.4)		
Class II		
None.		
Class III		
The additional water flow introduced into the river to supply the habitat areas should cause no adverse impact due to the substantial capacity of the channel. The capacity of the river channel to convey flood flows will not be reduced.	None required (not significant).	Not applicable.
The relatively small amount of water introduced into the channel is not expected to cause ground water levels to rise appreciably, therefore, the potential for leaching of hazardous substances due to the introduction of water is not considered a significant impact.	None required (not significant).	Not applicable.
The water required to support the restoration project will not result in a shortage of supplies needed to meet domestic needs.	None required (not significant).	Not applicable.
Habitats/facilities will be designed with the expectation of periodic flooding and will either be designed to withstand inundation and heavy flows or will be repaired as necessary after damaging flood events.	None required (not significant).	Not applicable.
Class IV		
The pumping and treatment of contaminated ground water to supply the habitats may help improve the quality of this water, and may also help prevent the migration of the contaminated ground water.	None required (beneficial).	Not applicable.

Environmental Effects	Commitments	Implementing Responsibility
Biological Resources (see Section 4.5)		
Class II		
The spread of tamarisk from established riparian areas could have a significant adverse on the integrity of the restored habitats	B-1 All tamarisk shall be removed from the existing riparian area and the project site B-2 Tamarisk eradication in this riparian community shall not occur during the months of February through August when birds, mammals and some amphibians may be using the area for breeding. B-3 Prior to any activity in the riparian area, a consultation with U.S. Fish and Wildlife Service and Arizona Game and Fish Department will be held to determine the potential for occurrence of any sensitive amphibian species (such as lowland leopard frog). If determined to be present or have potential to occur, the schedule for tamarisk eradication shall be revised to avoid fall breeding of the species.	U.S. Army Corps of Engineers, Cities of Phoenix and Tempe
Fugitive dust from construction and habitat repair activities could settle on adjacent vegetation to such a degree that photosynthesis is diminished, thereby resulting in lower metabolic activity of the vegetation and eventually affecting the overall health of the community.	B-4 During all construction phases, water trucks, no-toxic dust suppressing chemicals or soil binders will be used to dampen haul roads, staging areas, and construction sites.	U.S. Army Corps of Engineers
Soil preparation for planting of the habitat areas (such as grading and the adding of top soil or soil amendments) may create conditions suitable for the early establishment of weedy species.	B-5 Only weed-free clean top soil shall be added to the restoration sites. B-6 A weeding regime will be implemented during the early stages of the restoration to insure weeds do not establish in the restoration areas. B-7 If used for erosion control during construction, only sterile weed-free hay bales will be used.	U.S. Army Corps of Engineers, Cities of Phoenix and Tempe
An increase in standing water may result in an increase of mosquitoes. Mosquito fish or pesticides introduced to control mosquito populations could have an adverse effect on native fish species.	B-8 In order to minimize the use of chemical pesticides within the habitat area, native predators should be introduced or attracted to the area to help control mosquitoes. Native predators include waterstriders, gaint water bugs, common backswimmers, dragonflies, water boatman, barn swallows, black phoebes, song sparrows, bats, and native fish. Although the use of native fish species (e.g., Gila topminnow) would be preferable, the introduction of mosquitofish to help control mosquito populations shall not be prohibited.	U.S. Army Corps of Engineers, Cities of Phoenix and Tempe
An increase in abandoned cats, dogs, and amphibians could prey on native species that the restoration efforts are meant to attract.	B-9 Signs shall be posted prohibiting the dumping of pets or the use of the areas by unrestrained pets. B-10 Feral or free-ranging cats and dogs pets shall be reported to the local office of animal control.	Cities of Phoenix and Tempe.
Class III		
The removal of existing native shrubs and trees would be adverse but not significant because the species present are common and will be replanted.	None required (not significant).	Not applicable.

Environmental Effects	Commitments	Implementing Responsibility
The clearing of the disturbed desert scrub community will result in the displacement of the small mammals, reptiles, and a suite of bird species presently using the area. The temporary loss of common wildlife species in this area constitutes an adverse but not significant impact.	None required (not significant).	Not applicable.
Class IV		
The replacement of non-native vegetation with native vegetation would be a beneficial impact because it would serve to restore some of the native habitat that once naturally occurred in the area. The introduction of water and the increase of native vegetation will provide better, more protective habitat for existing wildlife species and will attract new wildlife species to the area.	None required (beneficial).	Not applicable.
Loss of the non-native arboreal and herbaceous species would be considered beneficial because removal of such species would decrease the likelihood of these weedy species spreading to other restored areas.	None required (beneficial).	Not applicable.
Increased standing water in the habitat areas may become suitable habitat for the introduction of native fish species	None required (beneficial).	Not applicable.
Land Use and Recreation (see Section 4.6)		
Class II		
None.		
Class III		
Construction activities may temporarily disrupt recreational use of the existing trail along the bank of Indian Bend Wash.	None required (not significant).	Not applicable.
Class IV		
The project would improve the land use character of the area, provide new public recreational opportunities, and further the planning goals of both Phoenix and Tempe.	None required (beneficial).	Not applicable.
Cultural Resources (see Section 4.7)		
Class II		
Although the river channel and banks have been highly disturbed, it is possible that intact cultural resources exist within the project area. Subsurface materials may exist in the undisturbed portions of the area.	C-1 A survey of the project site shall be performed by a qualified archaeologist prior to project construction. If the survey identifies any cultural resource sites within the project site, measures to mitigate the project's impact on such sites shall be formulated by a qualified archaeologist and implemented prior to the initiation of any construction activity in the vicinity of the site(s). C-2 If evidence of subsurface cultural resources is found during construction, excavation and other construction activity in the area shall cease, and a qualified archaeologist shall evaluate the findings in accordance with standard practice and applicable regulations.	U.S. Army Corps of Engineers

Environmental Effects	Commitments	Implementing Responsibility
Class III		
None.		
Hazardous, Toxic, and Radioactive Waste (see Section 4.8)		
Class II		
During project construction, an accidental spill or release of hazardous substances (fuel, hydraulic fluid, lubricants) would contaminate the soil and could potentially migrate to surface waters and the ground water table.	H-1 In the event of a spill or release of hazardous substances at the construction site, the contaminated soil shall be immediately excavated and treated per Federal and State regulations.	U.S. Army Corps of Engineers, Cities of Phoenix and Tempe
It is possible that debris removal, grading, and excavation activities associated with project construction could disturb areas of previously undetected contamination, potentially exposing workers to unsafe levels of hazardous substances.	H-2 Prior of construction, a Phase I environmental site assessment of the project site shall be conducted to identify areas potentially containing hazardous substances. The Phase I site assessment should include a review of existing information on known sites of contamination, and a survey of the entire project site for the purpose of identifying suspected areas of uncontrolled chemical releases (e.g., discolored soils, unusual odors, vegetation stress). Based on the results, recommendations shall be made for testing suspected areas and determining the nature and extent of possible contamination. If testing indicates that contamination does exist, the area shall be cleaned up in accordance with applicable State regulations. H-3 During construction, should an area of suspected contamination be encountered, construction activity in the area shall be stopped and soil sampling shall be conducted to determine the nature and extent of the potential contamination. If testing indicates that contamination does exist, the area shall be cleaned up in accordance with applicable State and federal regulations.	U.S. Army Corps of Engineers, Cities of Phoenix and Tempe
Class III		
None.		
Aesthetics (see Section 4.9)		
Class II		
None.		
Class III		
None.		
Class IV		
Implementation of the Proposed Action would improve visual conditions by removing trash and debris and introducing native vegetation into the currently barren river channel.	None required (beneficial).	Not applicable.

Environmental Effects	Commitments	Implementing Responsibility
Noise (see Section 4.10)		
Class II		
None.		
Class III		
On-site noise would be generated during construction from heavy-duty construction equipment. Because the closest noise receptors are approximately 200 to 300 feet from the noise source, and that the noise within the channel would be partially shielded by the overbank, noise levels would be adverse, but not significant.	The following measures are *recommended* to reduce construction noise: N-1 Conduct all construction activities involving motorized equipment between the hours of 7 a.m. and 7 p.m., Monday through Saturday, or for a shorter period if so stipulated in the applicable noise ordinance. Incorporate these restrictions in all construction plans prior to construction. N-2 Maintain proper mufflers on all internal combustion and vehicle engines used in construction to reduce noise to the maximum feasible extent.	U.S. Army Corps of Engineers, Cities of Phoenix and Tempe
Off-site construction noise sources would include trucks delivering material (e.g., cement) and equipment, as well as from vehicles used by workers commuting to and from the proposed job site. Noise levels from these off-site sources are generally low and would not affect any ambient noise levels.	None required (not significant).	Not applicable.
On a periodic basis, minor noise levels would result from temporary construction activities that would be required to repair damaged habitat areas caused heavy storm flows, from well pumps and water treatment equipment, and from maintenance vehicles traveling within the subject channel.	None required (not significant).	Not applicable.
Transportation (see Section 4.11)		
Class II		
None.		
Class III		
The volume of truck and vehicle trips will not be large enough to affect levels of service (LOS) on local roadways; however, it is possible that concentrations of construction vehicles entering and exiting the project site at specific access points could cause localized disruptions of traffic. This could present a potential traffic safety issue and could also inconvenience some motorists.	The following measure is *recommended*: T-1 Flagmen shall direct vehicle traffic on affected roadways when a lane would be blocked, or large equipment or trucks would enter or exit the project site. Although a large volume of construction traffic is not anticipated, a traffic control plan may be needed for construction operations. As needed, the traffic control plan would identify access points to the site for construction vehicles, limit times of truck ingress/egress, provide direction for the deployment of construction sign and barricades, establish detour routes or other traffic routing plans, and provide for the use of flag men or other temporary traffic control measures.	Cities of Phoenix and Tempe.

Environmental Effects	Commitments	Implementing Responsibility
During construction, encroachment upon local roadways would occur during preparations for and the pouring of concrete and asphaltic concrete. Some damage could be caused to roadways by heavy construction vehicles.	The following measure is *recommended*: T-2 Within 30 days of completion of construction activities, any damage to local roadways related to project construction activities and vehicles shall be repaired to pre-construction conditions.	Cities of Phoenix and Tempe
Visitors to the recreational facilities planned for the river corridor are expected to arrive primarily by automobile, creating a demand for parking. Parking facilities planned along the overbanks should provide an adequate amount of parking.	None required (not significant).	Not applicable.
Class IV		
After construction, the project will be beneficial to pedestrian and bicycle circulation in that it will provide new hiking/biking trails within the river corridor.	None required (beneficial).	Not applicable.

SECTION 1. PURPOSE, NEED, AND SCOPE

1.1 PURPOSE AND NEED

The Salt River (*Rio Salado* in Spanish) is a significant tributary to the Gila River in the State of Arizona. The river originates in the White Mountains in eastern Arizona and flows westward through the Phoenix metropolitan area to its confluence with the Gila River about 24 kilometers (15 miles) west of downtown Phoenix. Historically, the Salt River was a perennial stream fed by snowmelt from the mountains to the east and the highlands to the northwest. Beginning in the early 1900s, the historical conditions of the river were radically altered by man-made constructions, including the U.S. Bureau of Reclamation's Salt River Project, which resulted in the construction of a series of dams in the Salt and Verde River watersheds, and the Indian Bend Wash flood control project completed in the early 1980s. Other human activities which have altered the river include sand and gravel mining adjacent to the river channel and landfills along the river banks.

Due to dams and diversions, perennial flows in the Salt River have ceased and the natural condition of the River has been drastically degraded compared to historic conditions. The elimination of natural base flows has caused the ground water table beneath the river to drop and the resulting lack of moisture in the river bed has caused the natural riparian ecosystem to die out. Today, most areas of the Salt River are barren or contain mainly non-native species, such as salt cedar, which have relatively little habitat value. Within Phoenix and Tempe, the dense riparian vegetation and abundant wildlife which historically characterized the Salt River are almost non-existent.

The purpose of the proposed project is to restore some of the native plant communities and natural wildlife habitat which historically existed along the Salt River before flows were diverted. The project proposes to re-introduce water into the river and restore mesquite bosque, cottonwood/willow riparian forest, freshwater marsh, and aquatic strand habitats in the channel and along the banks of the river. *Mesquite bosque* is a riparian habitat dominated by honey mesquite trees that is normally found on the upper terraces of the flood plain, above the active flood channel. *Cottonwood/willow riparian forest* habitat is dominated by a combination of cottonwood and willow trees. This plant community is typically found along the edge of active stream beds and can extend outward to the edge of the two-year flood boundary. *Freshwater marsh* habitat consists primarily of cattails, bulrushes, and water cress. This habitat is found along active watercourses, backwater areas, shallow ponds, and in areas of heavily saturated soils. *Aquatic strand* is a general term referring to a mix of riparian strand and riparian scrubland habitat. Riparian strand habitat is found within the flood channels of rivers and streams and contains short-lived, successional plant species adapted to periodic flooding, scouring, and soil deposition. Riparian scrubland is also located along the drainages of rivers and streams, but in areas less frequently subject to flooding. These areas are more densely vegetated than riparian strands, consisting primarily of low to medium height trees and shrubs in scrub form. All of these habitats are associated with Sonoran Desert riparian corridors and each historically existed in the Salt River flood plain.

For the purposes of this project, the term *open edges* refers to areas within the river channel where no active restoration is planned. Instead, these areas will develop naturally and will serve as buffers between habitats and non-habitat areas. They are expected to be used by some wildlife species on an opportunistic basis, such as for hunting and foraging. Open edge areas will be most valuable when they are interspersed with habitat types providing cover.

1.2 STUDY AUTHORITY

Under the authority of Public Law 761, Seventy-fifth Congress, known as Section 6 of the Flood Control Act of 1938, the U.S. Army Corps of Engineers (Corps), Los Angeles District, has conducted a General Investigations study to investigate water resource problems and opportunities along the Salt River (referred to in Public Law 761 as "Gila River and tributaries"). Congress added renewed commitment for this undertaking through the adoption of House Resolution 2425 (HR2425) in May 1994 which requested the Corps to review prior reports pertaining to flooding and environmental restoration in the State of Arizona. HR2425 states that "the Secretary of the Army is requested to review the reports of the Chief of Engineers on the State of Arizona .... in the interest of flood damage reduction, environmental protection and restoration, and related purposes." Funds for the General Investigations study were appropriated under the Senate Energy and Water Development Appropriations Bill, 1994, wherein Congress directed the "Corps of Engineers to conduct a reconnaissance study to investigate flooding and water quality problems in the Rio Salado area of the Salt River in Tempe and Phoenix. The study should consider water quality, recreation, and restoration of riparian habitat benefits as well as benefits traditionally displayed."

The Los Angeles District of the Corps completed the first phase of the two-phase General Investigations study in March 1995. The results of the first phase, referred to as the reconnaissance study, were presented in the *Rio Salado, Salt River, Arizona, Reconnaissance Report* (USACE, 1995). This report concluded that there was a Federal interest in proceeding to the second phase of the General Investigations, referred to as the feasibility study. The Corps Headquarters certified the Reconnaissance Report in June 1995, giving the Los Angeles District authority to move into the feasibility study phase of the General Investigations.

The Corps completed an interim feasibility study for the proposed restoration project in May 1997. The efforts of the feasibility study were directed toward establishing the feasibility of environmental restoration with incidental recreation along the Salt River in Phoenix and Tempe, Arizona. To accommodate local interest in long-term restoration of the entire 53-kilometer (33-mile) reach of the Salt River, the Corps divided the feasibility study effort into two phases — an interim feasibility report and a final feasibility report. The interim feasibility report focuses on two immediate opportunities for restoration and the final feasibility report, to be completed some time in the future, will address the remaining areas along the reach of the river.

In accordance with the Federal government's "Economic and Environmental Principles and Guidelines for Water and Related Land Resource Implementation Studies," all water resource projects undertaken by the Corps must "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." National economic development (NED) can be measured in terms of both monetary and non-monetary outputs. Environmental restoration is an example of a water resource project whose benefits would primarily be measured in terms of non-monetary outputs.

1.3 STUDY OBJECTIVES

One of the purposes of the feasibility study phase of the General Investigations is to determine if environmental restoration with incidental recreation along the Salt River in Phoenix and Tempe meets the Federal objective for national economic development (i.e., an increase in net value to NED). In addition to the overall NED objective, a number of specific objectives were identified through the planning and public involvement processes for the project. The specific objectives identified for the environmental restoration project are to:

- Restore riparian habitat
- Restore the study area to a more natural condition through the installation of plant species that are native to, and occurred historically, in riparian streams and washes in the region
- Identify water supplies which will sustain riparian habitat in the areas restored
- Increase passive recreation opportunities incidental to the restoration
- Contribute to other qualitative environmental quality objectives.

1.4 AGENCY USE OF THIS DOCUMENT

This Environmental Impact Statement (EIS) has been prepared in compliance with the National Environmental Policy Act (NEPA) to meet the needs of Federal, State, and local permitting agencies in considering the proposed restoration of two reaches of the Salt River in Tempe and Phoenix. The Lead Agency responsible for preparing this EIS for the Proposed Action is the U.S. Army Corps of Engineers (Corps), Los Angeles District. The Cities of Tempe and Phoenix are the non-federal sponsors for the project. The Lead Agency is responsible for ensuring that this EIS has been prepared in compliance with the provisions of NEPA. The Corps will determine the adequacy and completeness of the Final EIS prior to rendering any decisions on the Proposed Action. The Corps will issue a decision for the Proposed Action in the form of a Record of Decision. The Corps will rely upon this EIS when considering whether to move forward with any of the restoration projects described in the Proposed Action. This EIS will also be utilized by other Federal and State agencies to evaluate the project for their permit decisions.

This EIS does not make recommendations regarding the approval or denial of the project; it is purely informational in content.

1.5 PUBLIC CONCERNS AND INVOLVEMENT

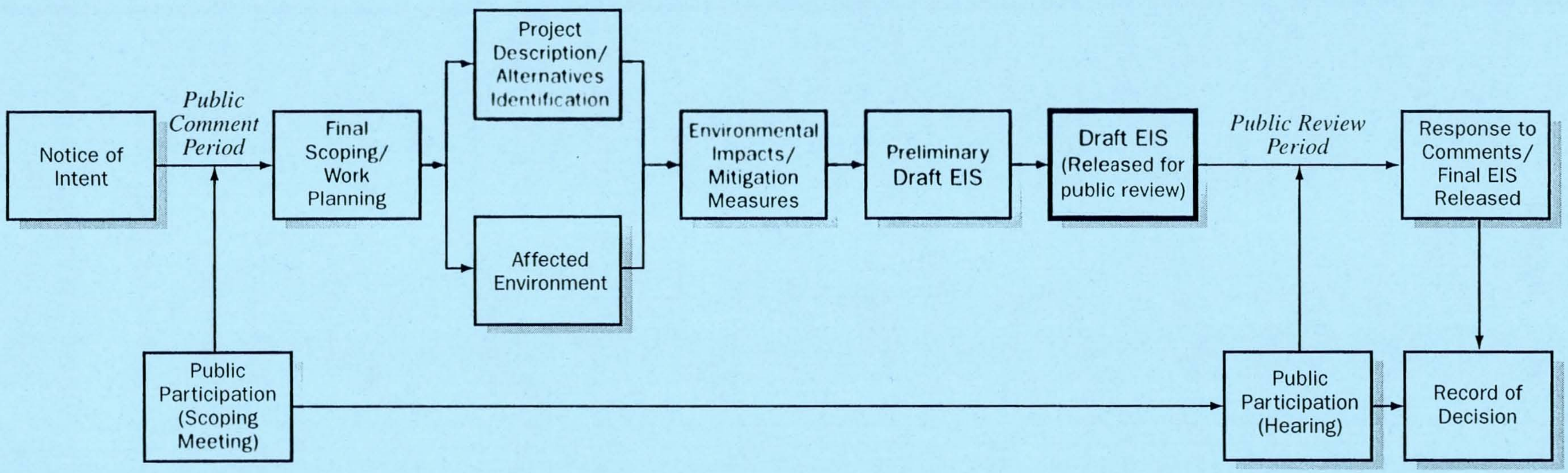
Figure 1-1 presents the Federal environmental decision-making process. In accordance with Federal requirements, a Notice of Intent (NOI) to prepare a Draft EIS was published in the Federal Register. Public Scoping Meetings for the Draft EIS were conducted in Tempe and Phoenix in June, 1996, to solicit comments from government agencies and the public, and to determine the focus and content of the EIS. Notice of the Public Scoping Meeting conducted in Tempe on June 10, 1996, was mailed to approximately 200 agencies, land owners, news media, and other interested parties, and was also published in the *Mesa Tribune*, a local newspaper serving Tempe and the surrounding area. An announcement of the Public Scoping Meeting held in Phoenix on June 11, 1996, was also mailed to approximately 200 agencies, land owners, news media, and other interested parties, and was published in the *Arizona Republic*, a local newspaper serving the Phoenix area.

Verbal comments received from the public and agency representatives at the Scoping Meetings were recorded, and those in attendance were invited to fill out a questionnaire and submit additional comments in writing. Both the verbal and written comments were addressed in the Draft EIS.

The Draft EIS was available for public review in December 1997. The public review period ended on January 28, 1998. During the public review period, the Corps conducted two public hearings and received oral and written testimony from interested parties on the proposed project and the Draft EIS. The first public hearing was conducted on January 7, 1998, in Tempe and the second public hearing was conducted on January 8, 1998, in Phoenix.

Copies of this Final EIS may be obtained from Mike Ternak, Corps Study Manager (602/640-2003), or Alex Watt, Corps Environmental Coordinator (213/452-3860), and are available for review at: U.S. Army Corps of Engineers, Water Resources Branch, Planning Section C, 3636 N. Central Avenue, Suite 740, Phoenix, AZ 85012-1936.

This Final EIS includes responses to comments received on the Draft EIS. A Notice of Availability of the Final EIS has been published in the Federal Register and copies are being provided to all who commented on the Draft EIS and to those requesting a copy. Although the Corps is not soliciting comments on the Final EIS, interested parties may submit comments to Alex Watt at the address indicated above.



Rio Salado Environmental Restoration EIS

Figure 1-1

EIS Task Flow

Prepared by
Aspen Environmental Group

1.6 SCOPE OF ANALYSIS AND DOCUMENTATION

This EIS provides an analysis of the potential environmental and socioeconomic impacts of the proposed restoration project in accordance with the requirements of NEPA. The analysis of each environmental issue begins with an examination of the existing physical or baseline setting wherein the Proposed Action would be placed (see Section 3, Affected Environment). The regulatory setting, which includes applicable government rules, regulations, plans, and policies, is also presented in the baseline setting. For the purposes of this document, and pursuant to guidelines for implementing NEPA, the baseline used for the impact analysis reflects the actual conditions at the time of preparation of the report.

The potential environmental and socioeconomic impacts associated with the Proposed Action are addressed for each issue area and are presented in Section 4 (Environmental and Socioeconomic Consequences). This analysis was conducted by an interdisciplinary team of engineers, biologists, archaeologists, hydrologists, geographers, and other experts who analyzed the Proposed Action against existing baseline conditions described in Section 3 (Affected Environment) and identified the relevant impacts, both adverse and beneficial. For each issue area, potential impacts were identified and compared with pre-determined significance criteria. Environmental Commitments (also known as mitigation measures) that would avoid or reduce impacts were identified and assessed for their effectiveness. Each impact was then classified based on the applicable significance criteria and mitigation commitment effectiveness, as follows:

Class I: Significant; cannot be mitigated to a level that is not significant.
Class II: Significant; can be mitigated to a level that is not significant.
Class III: Adverse, but not significant.
Class IV: Beneficial.

The analysis presented in Section 4 discusses the impacts of the Proposed Action, as well as the impacts of alternatives to the Proposed Action and cumulative projects. The same methodology was applied systematically to each alternative to the Proposed Action, including the No Action Alternative. The focus of the cumulative impact analysis was to identify those project impacts that might not be significant when considered alone, but contribute to a significant impact when viewed in conjunction with future planned projects (listed in Section 4.12).

The proposed restoration project is located within a growing urban environment. As a result, previous studies have been prepared for other proposed projects in the area. In accordance with the Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act, Section 1502.21, the relevant information contained in these previous studies is incorporated by reference and summarized within various sections of this EIS as denoted in the subject sections. The documents incorporated by reference are also available for review at the U.S. Army Corps of Engineers, Water Resources Branch, 3636 N. Central Avenue, Suite 740, Phoenix, Arizona, 85012-1936.

1.7 References

USACE (U.S. Army Corps of Engineers). 1997. Los Angeles District, South Pacific Division, *Rio Salado, Salt River, Arizona, General Investigations, F3 Package*. January.

_____. 1997b. Los Angeles District, South Pacific Division, *Rio Salado, Salt River, Arizona, General Investigations, F4 Package*. May.

_____. 1995. Water Resources Support Center, Institute for Water Resources, *Draft Planning Manual, IWR Report 95-R-15*, October.

_____. 1995. Los Angeles District, South Pacific Division. *Rio Salado, Salt River, Arizona, Reconnaissance Report*. March.

SECTION 2. ALTERNATIVES CONSIDERED, INCLUDING PROPOSED ACTION

Section 2 of this Environmental Impact Statement (EIS) provides a description of alternatives considered for the environmental restoration of portions of the Salt River in the Cities of Phoenix and Tempe, Arizona. These alternatives were formulated by the U.S. Army Corps of Engineers (Corps) in conjunction with two non-federal sponsors -- the City of Phoenix and the City of Tempe. The alternatives presented in this section are described and evaluated in detail in the *Rio Salado Feasibility Report* (USACE, 1997c) prepared for the project. The analysis presented in the *Rio Salado Feasibility Report* resulted in the selection of a preferred alternative for the restoration of the Phoenix portion of the Salt River and a preferred alternative for the restoration of the Tempe portion of the River. For the purposes of this EIS, the selected alternatives for Phoenix and Tempe are considered together as a single combined alternative. This preferred alternative is referred to as the Proposed Action (see Section 2.1). Based on the requirements of the National Environmental Policy Act (NEPA), this EIS evaluates the environmental effects of the Proposed Action and a range of reasonable alternatives to the Proposed Action (see Sections 2.3 and 2.4), including the No Action Alternative (see Section 2.2). A comparison of the alternatives to the Proposed Action is presented in Section 2.6 (see Table 2-9).

Please refer to Section 1 of this EIS for descriptions of the purpose and need for the Proposed Action, agency use of this document, and public concerns and involvement.

2.1 PROPOSED ACTION

2.1.1 Overview of the Proposed Action

The Corps in conjunction with two non-federal sponsors, the Cities of Phoenix and Tempe, proposes to undertake the environmental restoration of two sites along the Salt River in the State of Arizona (see Figures 2-1 and 2-2). The first site, hereafter referred to as the "Phoenix Reach," consists of an 8-kilometer (km) (5-mile) portion of the Salt River in the City of Phoenix. The second site, referred to as the "Tempe Reach," is located in the City of Tempe and includes portions of the Salt River and Indian Bend Wash (a tributary to the Salt River). The specific locations of the two sites are shown in Figures 2-3 and 2-4.

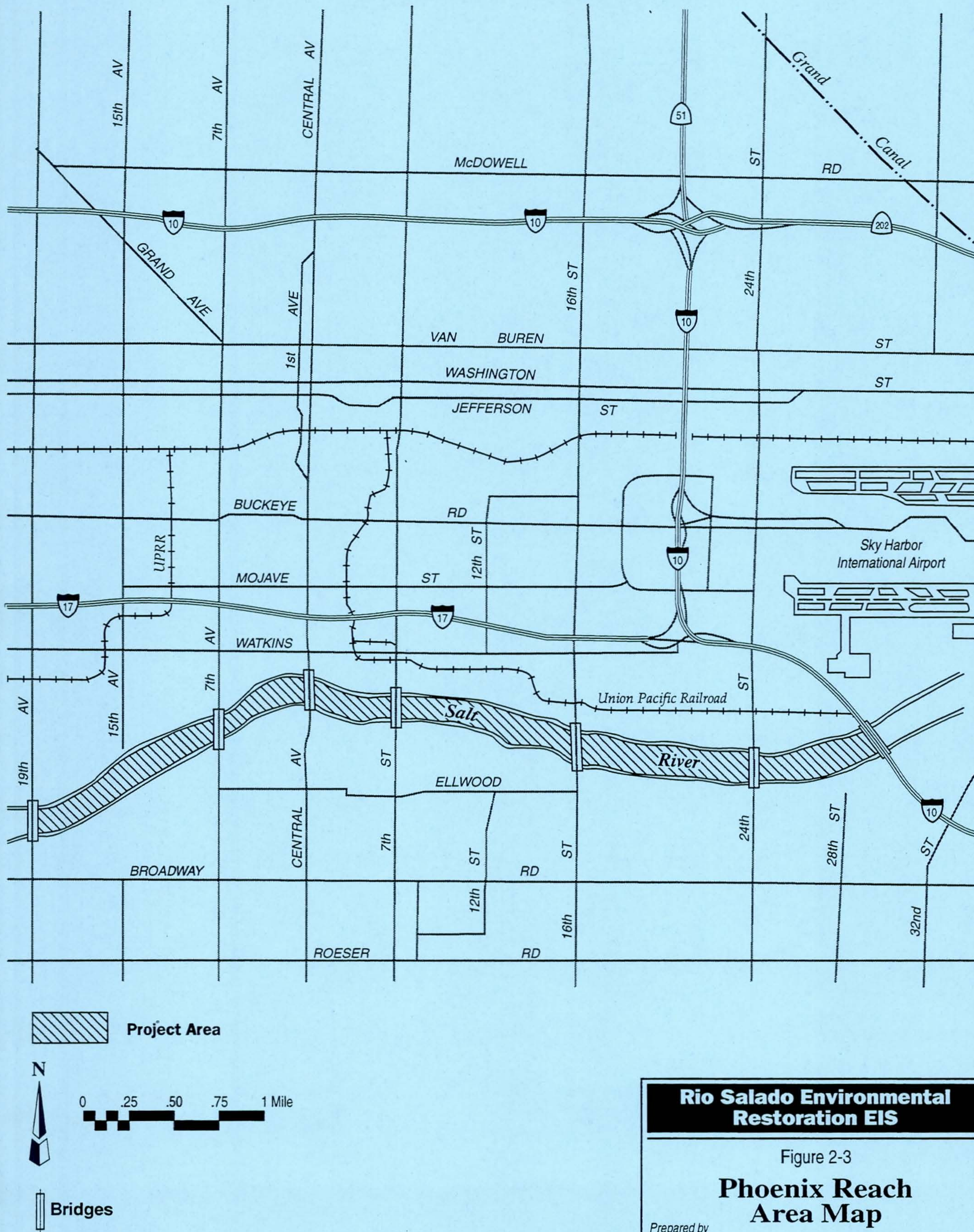
In the context of this project, environmental restoration refers to the re-introduction of water flows in the river channel and the restoration of natural habitats historically associated with the Salt River flood plain. The habitat types proposed to be established in the river channel are described in Sections 1.1 and 2.1.2. The proposed environmental restoration project involves various areas in the river bed and along the sides of the river, and terms describing these various components of the river channel are used throughout this document. The term *low-flow channel* refers to an incised channel in the river bottom designed to convey low-level water flows, and *benches* refer to the portions of the river bed on either side of the low-flow channel. The river *banks* are the sloping sides of the river channel and the *overbanks* are the areas above the banks on each side of the river. A typical cross-section of the river channel is shown in Figure 2-5.

Rio Salado Environmental Restoration EIS

Figure 2-1

Regional Location Map

Prepared by
Aspen Environmental Group



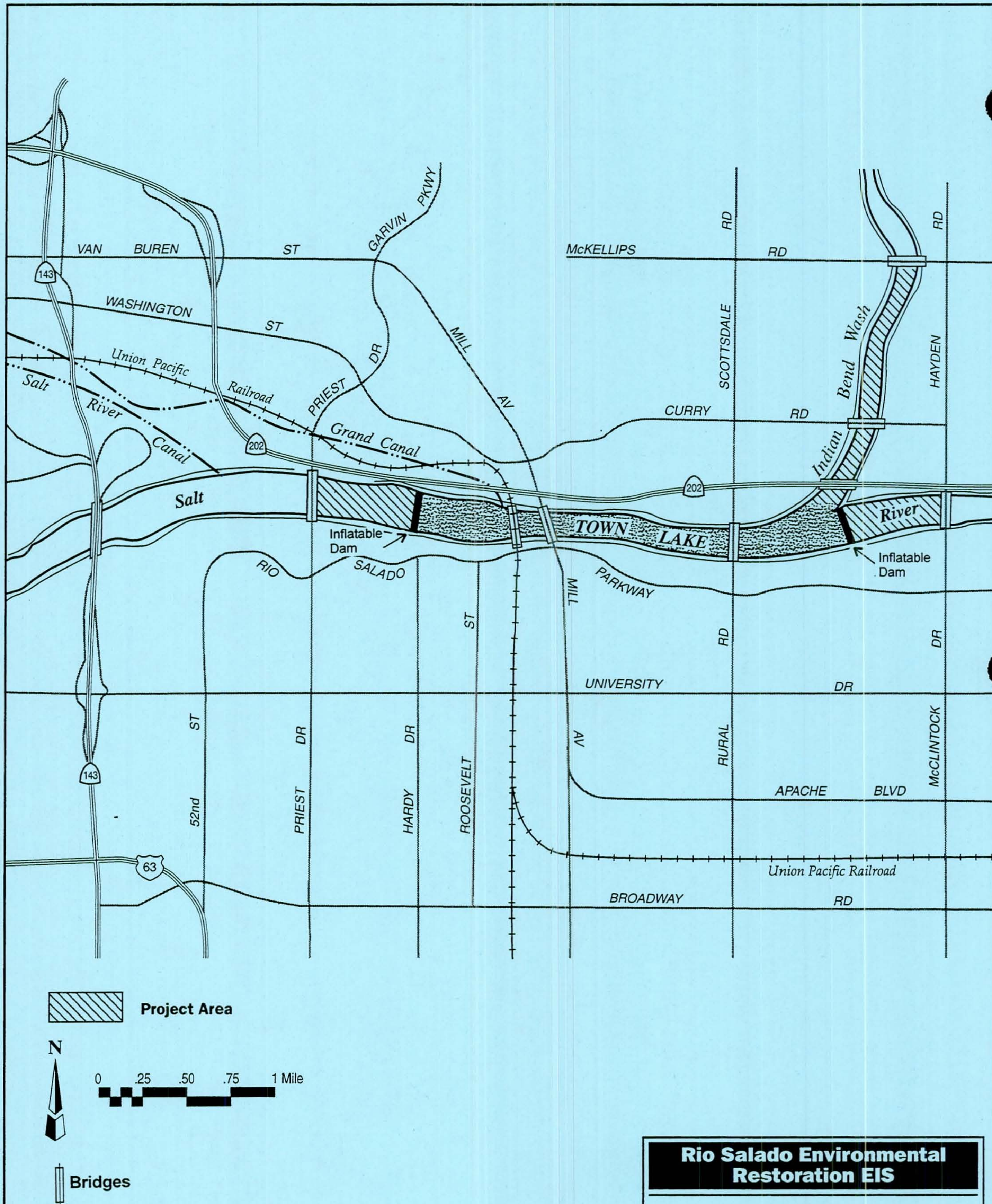
Rio Salado Environmental Restoration EIS

Figure 2-3

Phoenix Reach Area Map

Prepared by

Aspen Environmental Group



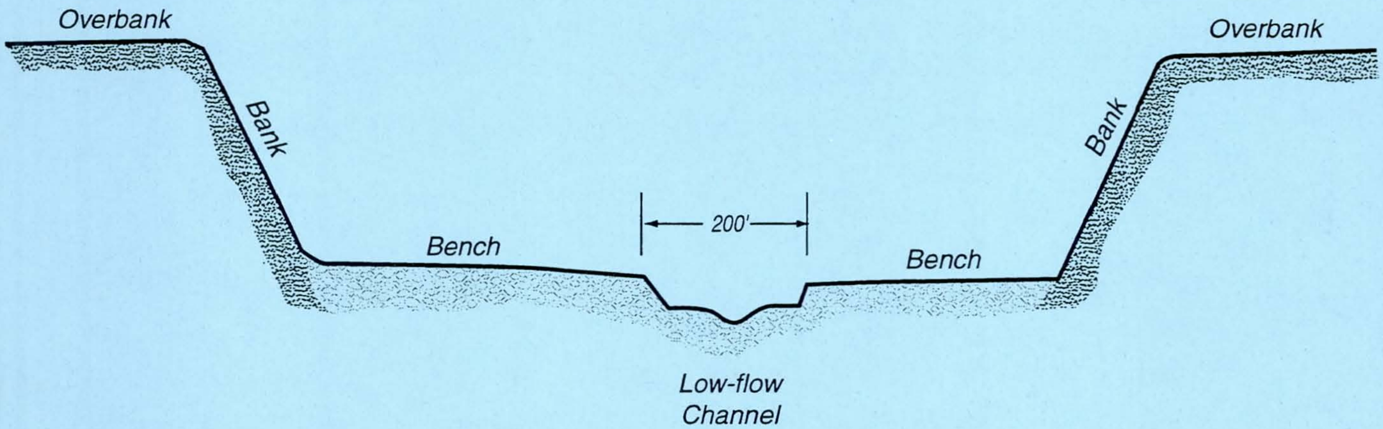
Rio Salado Environmental Restoration EIS

Figure 2-4

Tempe Reach Area Map

Prepared by

Aspen Environmental Group



Rio Salado Environmental Restoration EIS

Figure 2-5

Typical River Channel Cross Section

Prepared by

Aspen Environmental Group

Phoenix Reach

The Phoenix Reach is an 8-km (5-mile) portion of the Salt River which runs through the City of Phoenix. The upstream limit of the Phoenix Reach is a grade control structure at the Interstate 10 bridge and the downstream limit is the 19th Avenue bridge (see Figure 2-3). Currently, the Phoenix Reach consists largely of a barren river channel with active sand/gravel mining operations and former landfills along the banks of the river. Except during periods of flooding, the only water in this reach of the river consists of outflows from storm drains.

The proposed restoration of the Phoenix Reach would involve the construction of a 60-meter (200-foot) wide low-flow channel in the river bed, the establishment of marsh, riparian forest, and mesquite habitat on the benches, banks, and overbanks of the river channel. The project would include the construction of maintenance roads on the benches, banks, and overbanks of the river which would also serve as public recreational trails. Three gateway areas are planned for construction on the overbanks of the channel to serve as public access points to the river. The plan for restoration of the Phoenix Reach is shown in Figure 2-6.

Restoration of the Phoenix Reach includes the creation of a series of shallow pools in the low-flow channel connected by a perennially flowing stream. In total, there would be four pools with a combined surface area of about 9 acres. The streams connecting the pools would be about 3-6 meters (10-20 feet) wide and would flow at an average rate of about 5 cubic feet per second (cfs). The streams would total about 2.4 km (1.5 miles) in length. This connected system of streams and pools would be located in the low-flow channel starting upstream of a grade control structure about 360 meters (1,200 feet) east of 16th Street and ending at another grade control structure west of 7th Avenue — a total length of about 4 km (2.5 miles). A total of 22.03 million liters per day [5.82 million gallons of water per day (mgd)] of water would be required to support the habitat areas, irrigate vegetation, and supply the perennial stream/pool system.

The Phoenix Reach includes the restoration of a total of approximately 550 acres. This includes about 440 acres in the Salt River channel and 110 acres along the overbanks of the channel. The acreages of habitats and other areas planned for the Phoenix Reach are displayed in Table 2-1, below.

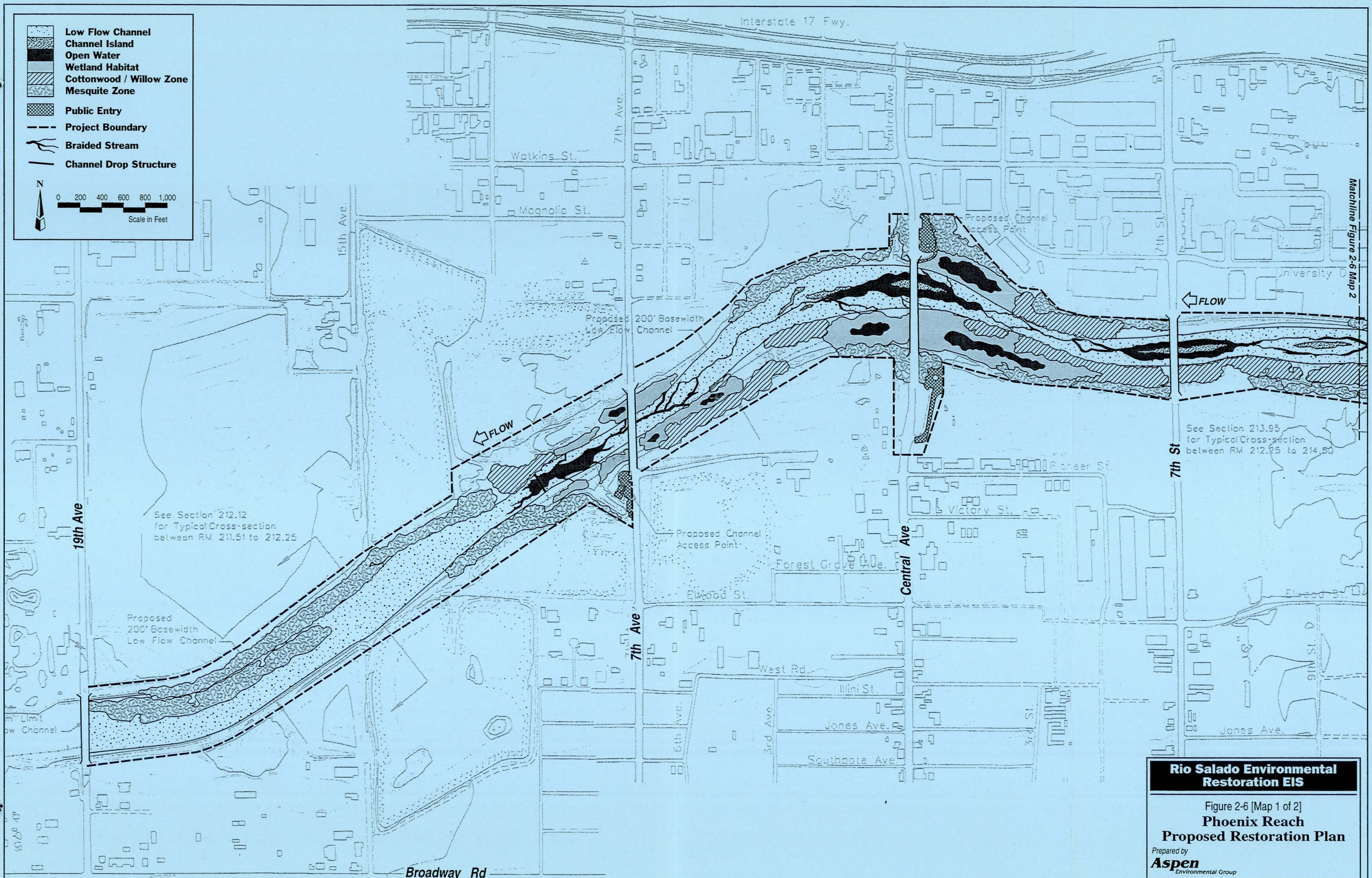
Table 2-1 Proposed Action: Phoenix Reach

Area	Acreage						Total Acres
	Mesquite	Cottonwood Willow	Freshwater Marsh*	Aquatic Strand	Open Edges	Other	
Low-Flow Channel	-	-	9	51	70	-	130
Bench/Bank	110	79	49	-	57	15	310
Overbank	20	20	-	-	10	10	60
Gateway Areas	-	-	-	-	50	-	50
Totals	**130**	**99**	**58**	**51**	**187**	**25**	**550**

* Includes areas of open water.

Note: See Section 1.1 for descriptions of the habitat types.

This page left blank on purpose.

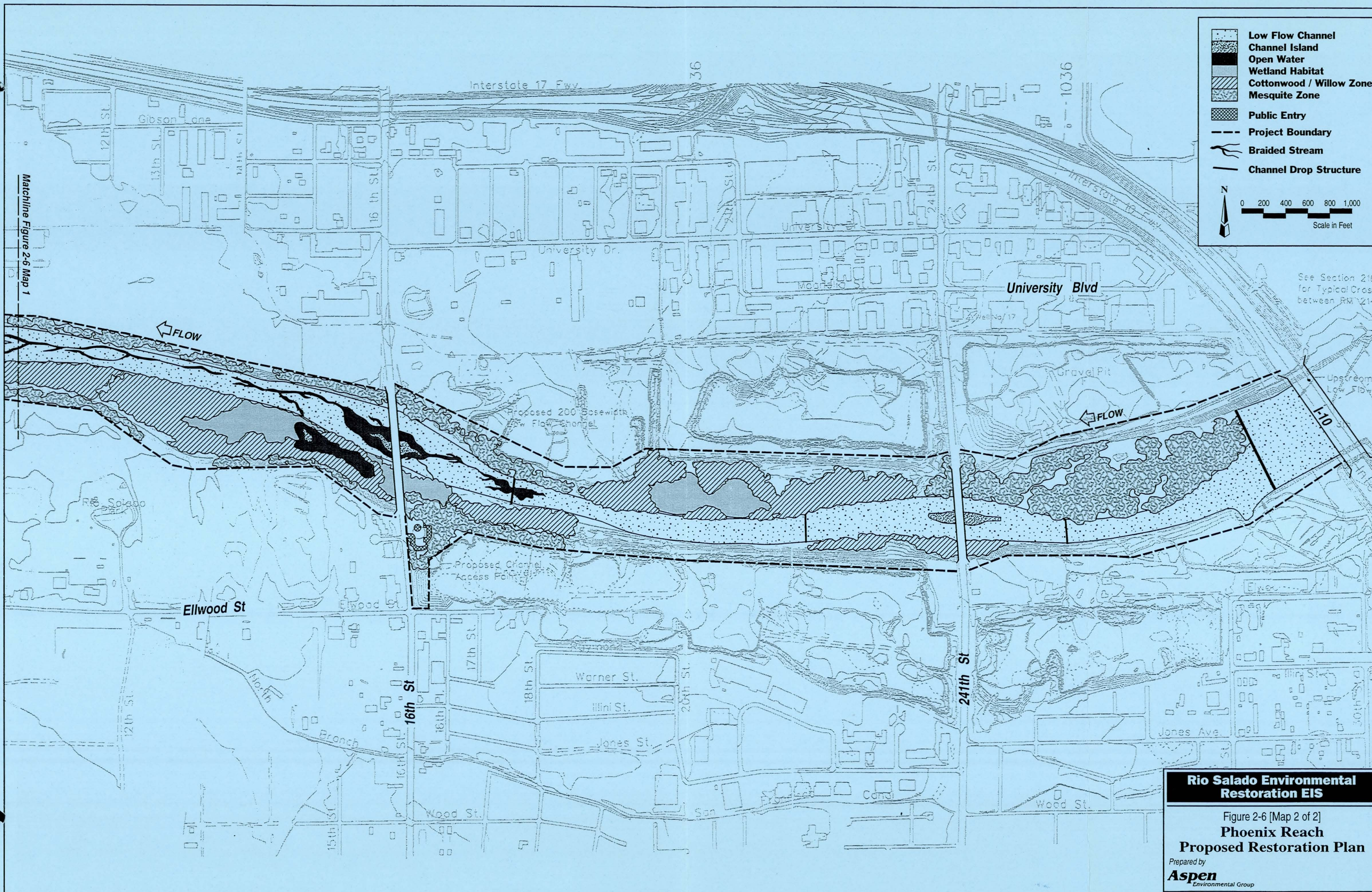


Rio Salado Environmental Restoration EIS

Figure 2-6 [Map 1 of 2]

Phoenix Reach Proposed Restoration Plan

Prepared by Aspen Environmental Group



Rio Salado Environmental Restoration EIS

Figure 2-6 [Map 2 of 2]
Phoenix Reach Proposed Restoration Plan

Prepared by
Aspen Environmental Group

Tempe Reach

The Tempe Reach consists of portions of the Salt River and Indian Bend Wash immediately adjacent to Town Lake (see Figure 2-4). Town Lake is an artificial body of water which the City of Tempe is constructing within the Salt River channel at the confluence of the Salt River and Indian Bend Wash. The lake will be constructed by installing inflatable dams across the river and filling the area between the dams with water. When completed, the water surface of the lake will be approximately 200 acres in size and the lake will contain about 3,500 acre-feet of water. Construction on Town Lake began in August 1997.

The Tempe Reach includes three areas which would be restored. The first area is located in Indian Bend Wash between the McKellips Road bridge and the confluence with the Salt River, a distance of about 2 km (1.3 miles). A municipal golf course now occupies the land in the wash between McKellips and Curry Roads and, therefore, the restoration will be limited to the low-flow channel in this section of the wash. Between Curry Road and the Salt River, restoration efforts will include the entire area between the banks which define the wash, including both the low-flow channel and the benches on either side of the channel. The second area included in the Tempe Reach, referred to as *upstream* Salt River, is a 550-meter (1,800-foot) length of the Salt River between the upstream dam of Town Lake and the grade control structure located 60 meters (200 feet) downstream from the McClintock Road bridge. The third area, referred to as *downstream* Salt River, is approximately a 600-meter (2,000-foot) segment of the Salt River immediately below the downstream dam of Town Lake. The plan for restoration of the Tempe Reach is shown in Figure 2-7. A total of 5.7 million liters per day (1.53 mgd) of water would be required to support the proposed restoration of the Tempe Reach.

In the Tempe Reach, there are a total of approximately 150 acres to be restored. This includes about 50 acres in the low-flow channel of the Indian Bend Wash, 30 acres in the bench of the wash, 35 acres in the Salt River upstream of Town Lake, and 35 acres in the Salt River downstream of Town Lake. The Proposed Action includes 5 acres in the downstream Salt River portion and 5 acres in the upstream Salt River portion which are not included in the other alternatives. The acreages of habitats and other areas planned for the Tempe Reach are displayed below in Table 2-2.

Table 2-2 Proposed Action: Tempe Reach

Area	Acreage						Total Acres
	Mesquite	Cottonwood Willow	Freshwater Marsh*	Aquatic Strand	Open Edges	Other	
Indian Bend Wash	20	-	-	50	10	-	80
Upstream Salt River	5	10	8	-	12	-	35
Downstream Salt River	5	10	8	-	12	-	35
Totals	**30**	**20**	**16**	**50**	**34**	**0**	**150**

* Includes areas of open water.
Note: See Section 1.1 for descriptions of the habitat types.

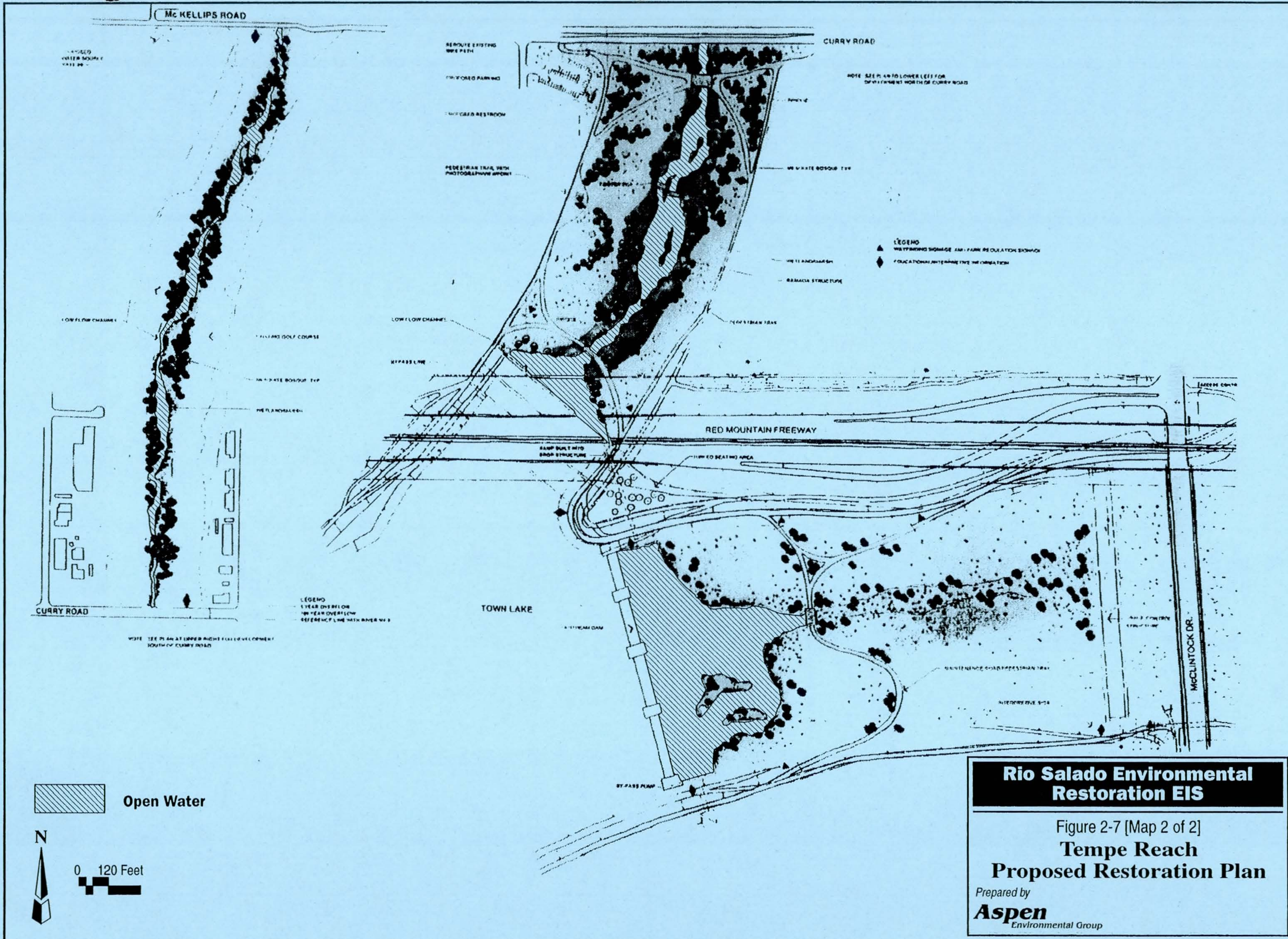
Rio Salado Environmental Restoration EIS

Figure 2-7 [Map 1 of 2]

Tempe Reach Proposed Restoration Plan

Prepared by

Aspen *Environmental Group*



Rio Salado Environmental Restoration EIS

Figure 2-7 [Map 2 of 2]

Tempe Reach Proposed Restoration Plan

Prepared by

Aspen Environmental Group

2.1.2 Components of the Proposed Action

The primary purpose of the Rio Salado environmental restoration project is to restore natural habitat within portions of the Salt River and Indian Bend Wash in the Cities of Phoenix and Tempe. Incidental to this objective is the creation of passive recreational opportunities associated with the restored habitat areas, including the use of maintenance roads as recreational trails for walking and biking, and the creation of areas for observing wildlife and learning about the natural history of the river. Critical to both the environmental restoration and recreation components of the project is the availability of adequate water supplies to support the restored habitat areas. In addition, the river channel must continue to function as a regional flood control facility.

Habitat Restoration

The Proposed Action would include the establishment of several types of wetland and riparian habitat within both the Phoenix and Tempe Reaches, including mesquite bosque, cottonwood/willow riparian forest, freshwater marsh, and aquatic strand. Each of these habitats are associated with Sonoran Desert riparian corridors and each historically existed in the Salt River flood plain (see Section 1.1 for a description of these habitats).

The Phoenix Reach would contain a range of habitats associated with various components of the river environment, including freshwater marsh habitat adjacent to areas of open water, riparian forest in areas of moist soil near water courses and water bodies, and mesquite bosques in upper terrace areas which are subject to periodic flooding. Under the Proposed Action, a series of ponds would be created on the benches on either side of the low-flow channel between 24th Street and 11th Avenue. Freshwater marsh habitat, consisting of cattails, bulrushes, and other native wetland species, would be established along the shallow edges of these ponds. Riparian forest habitat, containing cottonwoods, willows, and associated species, would be planted at the periphery of the freshwater marsh areas and along the small streams feeding and connecting the ponds. Most of the remainder of the bench areas and portions of the river banks would be planted with honey mesquite trees.

Because of concerns associated with bird strikes at nearby Sky Harbor International Airport, no streams or open water would be established at the upstream end of the Phoenix Reach, between Interstate 10 and 24th Street, in order to avoid attracting water fowl to this area. In addition, no open water areas would be created at the downstream end of the Phoenix Reach, between 11th and 19th Avenues, in order to avoid the potential for water seepage in the vicinity of the 19th Avenue Superfund site. As a result, both the upstream and downstream ends of the Phoenix Reach would contain only mesquite habitat.

The overbank areas along the Phoenix Reach will be a mix of mesquite and cottonwood/willow riparian forest. The areas along the ditches which will convey water from wells to the habitat areas in the river will be lined with cottonwood/willow riparian habitat. Because mesquite typically dominates the upper terraces of the flood plain under natural conditions, mesquite habitat will be established in the other areas of the overbank. Gateway areas will serve as public access points to the river and will include parking, interpretive displays, ramadas (shade structures), and other features to accommodate access and use of the restored river channel by the public.

The low-flow channel along the Phoenix Reach will not be planted to create habitat; however, it is expected to naturally attain habitat value as riparian plant species establish themselves along the edges of the streams and pools which will be created in a portion of the channel. This habitat, referred to as "aquatic strand" in the restoration plans, is expected to consist of a mix of riparian strand and scrubland habitat.

In the Tempe Reach, Indian Bend Wash would contain a mix of mesquite and aquatic strand habitat. Between McKellips and Curry Roads, the water which will be introduced into the low-flow channel of the Wash is expected to support aquatic strand habitat, which may include occasional riparian trees along the edge of the channel as it flows through the golf course. South of Curry Road, a mesquite bosque will be planted on the benches of the Wash and aquatic strand species are expected to establish themselves in the low-flow channel.

In the upstream Salt River portion of the Tempe Reach, freshwater marsh and cottonwood/willow riparian forest will be created adjacent to the open water which will be impounded on the upstream side of the Town Lake dam. This open water will be fed by flows from Indian Bend Wash which will be directed by pipe to the area above the dam. Similarly, the downstream Salt River area will also consist of a mix of freshwater marsh and cottonwood/willow riparian forest habitat located at the edges of the ponded water formed by overspill from the Town Lake dam and overflow from the upstream Salt River habitat area. Mesquite will be established at various locations on the banks and overbanks of the Salt River segments of the Tempe Reach. The Tempe Reach also include some areas referred to as "open edges" which are not proposed to be planted, but instead will develop naturally. These areas will serve as buffers between habitats and non-habitat areas, and are expected to used by some wildlife species on an opportunistic basis, such as for foraging.

Water Supply

Water is an essential element to the restoration of both the Phoenix and Tempe Reaches. Because of the emphasis on wetland habitat, a relatively large amount of water would be required to support the proposed restoration project. For the Phoenix Reach, it is estimated that 22.03 million liters per day (5.82 mgd) of water would be needed to support the planned habitats and maintain a perennial stream in the low-flow channel. It is estimated that 10.8 million liters per day (1.53 mgd) of water would be needed to support the proposed restoration of the Tempe Reach.

The Cities of Phoenix and Tempe will each be responsible for the provision of the water needed to support the habitats within their respective portions of the river. Both cities have indicated that water from underground aquifers is their preferred source of water for the project.

For the Phoenix Reach, a series of wells would be drilled on the overbanks of the river to draw water from near-surface aquifers. Because of contamination from industrial uses, agriculture and waste disposal, it is assumed for the purposes of this study that water from these wells would need to be treated before being released into the environmental restoration areas. However, if water from the production wells meets appropriate water quality standards, treatment will not be necessary. For the Tempe Reach, one or two new wells would be drilled to supply water to the project. The most probable location for these wells would be somewhere in the vicinity of Curry Road and Indian Bend Wash. The new wells would be dedicated to supply only the proposed project.

Recreation

In order to provide recreational opportunities for the public, maintenance roads constructed for the project will serve as a system of trails within the river corridor. These service roads will provide maintenance access to the habitats and facilities within the river corridor and will also serve as recreational paths for pedestrians and bicyclists. It is anticipated that these roads will be 3-4 meters (10-12 feet) wide and paved with asphaltic concrete. In addition, a system of unpaved trails for equestrian use is planned. The roads and trails will be located on the benches in the river channel and on the banks and overbanks of the river. Interpretive signs will be installed along the trail system for visitors wishing to learn about the habitats and natural history associated with the river channel.

Along the Phoenix Reach, public access points will be constructed at three locations — the south side of the river at 16th Street, the north side of the river at Central Avenue, and the south side of the river at 7th Avenue. These public access points will include parking areas, interpretive displays, gathering/staging areas, and ramadas (shade structures), and will also provide access to the trail system.

Flood Control

Flows in the Salt River are controlled by six major upstream dams which impound water for hydroelectric power generation, water supply, and flood control purposes. During most years, all upstream flows are blocked by these dams and diverted for domestic and agricultural use, preventing these flows from reaching the project area. On average, it is estimated that water will spill over the Granite Reef Dam [a minor agricultural water diversion structure 23 km (14 miles) east of Tempe — not one of the six major dams discussed above] once every three years, resulting in sustained flow through the project area during some portions of those years. Depending on the size and duration of flows, sustained flood flows through the project area could damage the restored habitat in the river channel. While the scouring effects of large volume flows could displace much of the restored vegetation in the river channel, smaller flood events could damage or destroy habitat by submerging vegetation for extended periods of time. It is estimated that cottonwoods can survive inundation for periods of up to 30 days without effecting the long-term health of the trees. Willows and mesquite trees can survive inundation for longer periods.

Along the Phoenix Reach, a low-flow channel will be constructed in the river bottom to convey low-level flows and thereby minimize potential damage to the restored habitat areas. The low-flow channel will be 60 meters (200 feet) wide and approximately 3-4 meters (10 feet) in depth. The sides of channel will be sloped and reinforced with soil cement. The design capacity of the low-flow channel is 12,200 cubic feet per second (cfs). A channel of this size will not prevent periodic inundation of the habitat areas, but should have sufficient capacity to substantially reduce the likelihood that restored river habitats will be flooded for durations of more than 30 days.

Along the Tempe Reach, a low-flow channel currently exists in the middle of Indian Bend Wash. This channel will be maintained at its current width of 46 meters (150 feet). Low-flow channels will not be constructed in the Salt River segments of the Tempe Reach.

Currently, the flows from a 100-year flood event would be contained within the existing river channel (with some overflow into adjacent gravel pits). Corps regulations require that the ability of the river to convey flood flows must not be compromised by restoration projects. Therefore, the flood capacity of the river will be maintained with the proposed project.

2.1.3 Project Construction

Construction of the proposed restoration project would proceed in distinct stages. The first stage of construction would involve grading of the river bed and banks to create the planned configuration of channels, benches, and banks within the river channel. For the Phoenix Reach, this would include the excavation of a low-flow channel in the river bottom, the creation of benches on either side of the low-flow channel, and various re-configurations of the river banks. Minimal grading of the river bed and banks would be required within the Tempe Reach. Exotic vegetation in the river channel (such as salt cedar) would also be removed during this initial stage of construction. Regular watering of disturbed areas will be required during this stage of construction in order to reduce the amount of fugitive dust generated by grading and excavation activities.

Following grading and landform modification, various improvements associated with habitat restoration and flood control would be constructed or installed. In the Phoenix Reach, the sides of the low-flow channel would be lined with soil cement in order to stabilize the channel banks. Other improvements would include the installation of wells and water treatment equipment, and the construction of conveyance systems to bring water from the overbanks to the habitat areas in the river bottom.

The wells to supply the Phoenix Reach would be located along the sides of the river channel, probably at three locations on each side of the river. After any necessary treatment, the well water would be conveyed along the overbanks of the river through a combination of pipes and open ditches or canals. The ditches or canals will probably be lined with clay or some other impermeable soil layer. The water would then flow down the river banks onto the benches of the river channel and then be conveyed by ditches to the wetland areas to be constructed on the benches in the river channel. After flowing through one or more wetland areas, this water would be released into the low-flow channel to feed the streams and pools planned for a portion of the channel.

To supply the Tempe Reach, well water would be released into the low-flow channel of Indian Bend Wash south of the McKellips Road bridge. It would then flow downstream to where Indian Bend Wash meets Town Lake. The flows will not be allowed to enter Town Lake and instead will be collected and carried by gravity flow through a pipe to the upstream segment of Salt River. These flows will be released into the Salt River channel at a point on the north side of the river just above Town Lake's upstream dam. The accumulated flow will support a wetland area adjacent to the dam. As the flows trapped upstream of the dam become excessive, a pumping system will remove the overflows, which will be conveyed by a pipe along the south side of the river channel to the downstream segment of the Salt River. This water will flow through the downstream segment of the Salt River, eventually seeping down into the cobbles of the river channel in the vicinity of Priest Drive.

The next stage of construction would involve soil preparation and planting to create habitat areas on the benches and banks of the river channel. The bottoms of the planned freshwater marsh areas will be covered with an impermeable soil liner to prevent water in the wetlands from seeping into the loose gravel and cobbles of the river bed. Soil may also be imported and spread over the other habitat areas to provide more suitable conditions for establishment of plants. Following soil preparation, the various habitat areas will be planted with native vegetation. Irrigation systems will be installed to provide water to the plantings until they are adequately established.

In order to create each of the planned habitat types, the dominant plant species characteristic of each habitat will be planted. To create the mesquite habitat, mesquite trees (*Prosopis* sp.) will be planted at a density of 100 plantings per acre. Understory plants that may be planted in the mesquite include elderberry (*Sambucus mexicana*), greythorn (*Zizyphus obtusifolia* var. *canescens*), and wolfberry (*Lyceum fremontii*). For the cottonwood/willow riparian habitat, Fremont cottonwood trees (*Populus fremontii*) will be planted at a density of 50 plantings/acre and Goodding willow trees (*Salix gooddingii*) will be planted at a density of 50 plantings/acre. Other plants that may be planted in the cottonwood/willow habitat include desert broom (*Baccharis sarothroides*) and elderberry (*Sambucus mexicana*). The freshwater marsh habitat would consist of plantings of cattail (*Typha* sp.) and giant bulrush (*Scirpus californicus*). Riparian strand and scrubland habitats will not be planted, but are expected to become established on their own in the low-flow channel through seeds and rooting plant material transported by natural mechanisms (e.g., water flows, wind, animals). Various other native species will also become established on their own where conditions are favorable. The selected planting densities assume that a small percentage (perhaps 10%) of the original plantings will not survive.

2.1.4 Operation and Maintenance

Various operation and maintenance activities will be required after the initial construction of the planned habitat areas, as well as on an ongoing and recurring basis. It is estimated that it will take only a few seasons for the freshwater marsh areas to become established, several years for the cottonwood/willow riparian areas, and slightly longer for the mesquite areas. Until each habitat area is fully established, maintenance activities will include irrigation of the new plantings, replacement of dead or diseased plants, removal of invasive exotic plants, and, perhaps, some pruning of the plantings. Until various types of plants grow to sufficient size, some form of protection from herbivore (plant-eating) animals may be required.

Ongoing maintenance activities will include removal of invasive plants, and debris removal and habitat repair after storm flows. Periodically, large storm flows will wash away riparian vegetation (especially aquatic strand/scrub in the low-flow channel) and inundate the various habitat areas within the river channel. It is estimated that plants in the cottonwood/willow habitat will be able to survive inundations of up to 30 days, and that mesquite will be able to survive longer periods of inundation. Especially large floods could cause substantial damage to the habitats in the river. After periods of heavy flows and inundation within the river channel, plants will need to be replaced and a period of habitat re-establishment will ensue. The amount of replacement required will depend on the velocity of the flows through the river and period of inundation for the various habitat areas. Therefore, a recurring cycle of habitat repair and re-establishment is anticipated throughout the life of the project. In addition to habitat repair, accumulated sediment in the pools in the low-flow channel will probably have to be removed about every 3 years.

2.2 NO ACTION ALTERNATIVE

One of the most important aspects of the environmental review process is the identification and assessment of reasonable alternatives that have the potential for avoiding or minimizing the impacts of a proposed project. In addition to mandating consideration of the No Action or No Project Alternative, NEPA Regulations (Section 1502.14) emphasize the selection of a reasonable range of technically feasible alternatives and adequate assessment of these alternatives to allow for a comparative analysis for consideration by decision makers. Further, NEPA regulations [Section 1502.14(c)] provide for the inclusion of reasonable alternatives not within the jurisdiction of the lead agency. This section discusses the No Action Alternative and Sections 2.3 and 2.4 describe other alternatives to the Proposed Action.

The **No Action Alternative** required for consideration under NEPA regulations would mean that existing conditions within the Tempe and Phoenix Reaches of the Salt River would continue into the future. The 400 acres of the Salt River bed in Phoenix from the Interstate 10 bridge to 19th Avenue would remain primarily barren cobbles. The bank and overbank areas would also remain in their current condition. Similarly, Indian Bend Wash in the Tempe Reach between Curry Road and the confluence with the Salt River would remain as bare earth and cobbles and the low-flow channel between McKellips and Curry Roads would remain its present condition with bermuda grasses invading from the adjacent golf course. The upstream Salt River portion of the Tempe Reach would remain as barren cobbles. Except for riparian habitat associated with overspill from Town Lake, the downstream portion of the Salt River would also remain as barren cobbles. An evaluation of the impacts of the No Action Alternative is provided within each environmental issue area in Sections 4.1 through 4.12 of this EIS. A comparison of this alternative to the Proposed Action is provided in Section 2.6. In the *Rio Salado Feasibility Report* (USACE, 1997c), the No Action alternatives for the Phoenix and Tempe Reaches are referred to as Alternatives P1 and T1, respectively.

2.3 PHOENIX REACH ALTERNATIVES

A wide range of alternatives for the restoration of the Phoenix Reach of the Salt River were evaluated in the initial stages of the feasibility study completed by the Corps. After further analysis, the Corps eliminated a substantial number of alternatives from further consideration and selected a preferred plan (the Proposed Action) for the restoration of the Phoenix Reach (see Section 2.5 for a description of the alternatives which were considered and rejected). The alternatives to the Proposed Action for the Phoenix Reach are described below. The alternatives include different treatments of the perennial stream in the low-flow channel, and differing mixes of marsh and riparian vegetation. In addition, two of the alternatives include the restoration of three gravel pits along the edges of the river channel. The land area involved in the restoration project differs under these alternatives compared to the Proposed Action due to the incorporation of the gravel pits. Water use varies depending on the amount of marsh and riparian vegetation included in each alternative and the amount of water needed to support the different perennial stream options.

The numbering system for the Phoenix Reach alternatives (P9, P6, P2, and P5) corresponds to the numbering system utilized in the *Rio Salado Feasibility Report* (USACE, 1997c). A full sequence of numbered alternatives (i.e., P1 through P9) is not included because several alternatives had previously been eliminated from further consideration during the course of the planning process.

2.3.1 Alternative P9: Gravel Pit Restoration, Five-Mile Perennial Stream

This Phoenix Reach alternative places a greater emphasis on wetland habitat than the Proposed Action and, therefore, contains more habitat area devoted to freshwater marsh and cottonwood/willow riparian forest. In addition, this alternative incorporates a perennial stream flowing within the low-flow channel for the entire 8-km (5-mile) length of the Phoenix Reach, although no pools would be located in the low-flow channel. Because of the five-mile length of the perennial stream, this alternative has more aquatic strand habitat within the low-flow channel than the Proposed Action. One of the major differences between this alternative and the Proposed Action is the inclusion of three gravel pits, along the river's edge, in the restoration project. To incorporate the gravel pits, the levees which separate the gravel pits from the river channel would be lowered and the slope angles along the banks of the pits would be reduced. Because the gravel pits have been excavated below the ground water level, the bottoms of the pits are now filled with standing water. Marsh and riparian habitat would be established along the water's edge in each of the pits. Due to the emphasis on wetland habitat, and the incorporation of a perennial stream along the entire length of the Phoenix Reach, substantially more water would be required to support this alternative than would be required for the Proposed Action. It is estimated that 45.9 million liters per day (12.13 mgd) of water would be required to support this alternative. Similar to the Proposed Action, this alternative includes three public gateways to the river, as well as maintenance roads on the benches, banks, and overbanks of the river channel which would also serve as recreational trails. Trails would also be constructed along the edges of the restored gravel pits. The habitat acreages associated with this alternative are shown in Table 2-3.

Table 2-3 Alternative P9: Gravel Pit Restoration, Five-Mile Perennial Stream

Area	Acreage						Total Acres
	Mesquite	Cottonwood Willow	Freshwater Marsh	Aquatic Strand	Open Edges	Other	
Low-Flow Channel	-	-	-	130	-	-	130
Bench	30	160	100	-	-	10	300
Bank	5	40	-	-	-	5	50
Overbank	25	20	-	-	25	40	110
Gateway Areas	-	-	-	-	50	-	50
Gravel Pits	-	10	-	-	-	230	240
Totals	**60**	**230**	**100**	**130**	**75**	**285**	**880**

2.3.2 Alternative P6: Gravel Pit Restoration, No Perennial Stream

This Phoenix Reach alternative includes restoration of three gravel pits along the river's edge, but does not include a stream or pools within the low-flow channel. This alternative includes a mix of mesquite habitat, freshwater marsh, and cottonwood/willow riparian forest; however, the amount of acreage devoted to each of these habitat types would be less than under the Proposed Action. Due to the lack of streams and pools in the low-flow channel and the slightly smaller habitat sizes, this alternative would require less water than the Proposed Action. It is estimated that 7.34 millions liters per day (1.94 mgd) of water would be required to support this alternative. Similar to the Proposed Action, this alternative would include three public gateways to the river, and maintenance roads on the benches, banks, and overbanks of the river channel which would also serve as recreational trails. Unlike the Proposed Action but similar to Alternative P9 described above, this alternative incorporates three gravel pits along the river's edge into the restoration project. The habitat acreages associated with this alternative are shown in Table 2-4.

Table 2-4 Alternative P6: Gravel Pit Restoration, No Perennial Stream

Area	Acreage						Total Acres
	Mesquite	Cottonwood Willow	Freshwater Marsh	Aquatic Strand	Open Edges	Other	
Low-Flow Channel	-	-	-	-	130	-	130
Bench	50	80	40	-	120	10	300
Bank	-	-	-	-	45	5	50
Overbank	45	-	-	-	35	30	110
Gateway Areas	-	-	-	-	50	-	50
Gravel Pits	-	10	-	-	-	230	240
Totals	**95**	**90**	**40**	**0**	**380**	**275**	**880**

2.3.3 Alternative P2: No Perennial Stream, No Gravel Pit Restoration

This alternative for the Phoenix Reach does not include either a perennial stream in the low-flow channel nor the restoration of the gravel pits along the river's edge. Similar to the Proposed Action, the total area to be restored within the Phoenix Reach under this alternative is 550 acres. The sizes of the various habitat types are altered under this alternative in order to reduce the amount of water required to support the restoration of the river channel. Therefore, this alternative includes more mesquite habitat and less of the water-consumptive marsh and riparian forest habitat than the Proposed Action. Due to emphasis on mesquite habitat and the lack of a perennial stream in the low-flow channel, this alternative would require less water than the Proposed Action. It is estimated that 7.38 million liters per day (1.95 mgd) of water would be required to support this alternative. This alternative would still include a 60-meter (200-foot) wide low-flow channel, three public gateways to the river, and maintenance roads which would also serve as recreational trails. The habitat acreages associated with this alternative are shown in Table 2-5.

Table 2-5 Alternative P2: No Gravel Pit Restoration, No Perennial Stream

Area	Acreage						Total Acres
	Mesquite	Cottonwood Willow	Freshwater Marsh	Aquatic Strand	Open Edges	Other	
Low-Flow Channel	-	-	-	-	130	-	130
Bench	20	80	40	-	120	10	270
Bank	-	-	-	-	35	5	40
Overbank	30	-	-	-	20	10	60
Gateway Areas	-	-	-	-	50	-	50
Gravel Pits	-	-	-	-	-	-	0
Totals	**50**	**80**	**40**	**0**	**355**	**25**	**550**

2.3.4 Alternative P5: Five-Mile Perennial Stream, No Gravel Pit Restoration

This Phoenix Reach alternative places a greater emphasis on wetland habitat than the Proposed Action and, therefore, contains more habitat area devoted to freshwater marsh and cottonwood/willow riparian forest. Similar to the Proposed Action, the total area to be restored within the Phoenix Reach under this alternative is 550 acres. This alternative incorporates a perennial stream flowing within the low-flow channel for the entire 8-km (5-mile) length of the Phoenix Reach; however, no pools would be located in the low-flow channel. Because of the length of the perennial stream, this alternative contains more aquatic strand habitat within the low-flow channel than the Proposed Action. Due to the perennial stream and emphasis on wetland habitat, this is considered a high water consumption alternative. It is estimated that 44.3 million liters per day (11.71 mgd) of water would be required to support this alternative. Like the Proposed Action, this alternative includes three public gateways to the river, as well as maintenance roads on the benches, banks, and overbanks of the river channel which would also serve as recreational trails. It does not include the restoration of the gravel pits located along the edges of the river channel. The habitat acreages associated with this alternative are shown in Table 2-6.

Table 2-6 Alternative P5: Five-Mile Perennial Stream, No Gravel Pit Restoration

Area	Acreage						Total Acres
	Mesquite	Cottonwood Willow	Freshwater Marsh	Aquatic Strand	Open Edges	Other	
Low-Flow Channel	-	-	-	130	-	-	130
Bench	-	160	100	-	-	10	270
Bank	-	5	-	-	30	5	40
Overbank	10	20	-	-	10	20	60
Gateway Areas	-	-	-	-	50	-	50
Gravel Pits	-	-	-	-	-	-	0
Totals	**10**	**185**	**100**	**130**	**90**	**35**	**550**

2.4 TEMPE REACH ALTERNATIVES

As with the Phoenix Reach, a range of alternatives for the environmental restoration of the Tempe Reach were evaluated in the initial stages of the feasibility study completed by the Corps. After further analysis, the Corps eliminated a substantial number of alternatives from further consideration and selected a preferred plan (the Proposed Action) for the restoration of the Tempe Reach (see Section 2.5 for a description of the alternatives which were considered and rejected). The alternatives to the Proposed Action for the Tempe Reach are described below. The alternatives for the Tempe Reach include the restoration of different combinations of each of the Reach's three areas (Indian Bend Wash, upstream Salt River, and downstream Salt River) with restoration plans incorporating differing mixes of marsh and riparian habitat. The restoration plans that emphasize wetland habitat (freshwater marsh and cottonwood/willow riparian forest) are considered "high-water use" alternatives due to the greater amounts of water needed to support these habitats compared to the "low-water use" alternatives that emphasize mesquite habitat.

The numbering system for the Tempe Reach alternatives (T3, T4, T2, and T6) corresponds to the numbering system utilized in the *Rio Salado Feasibility Report* (USACE, 1997c). A full sequence of numbered alternatives (i.e., T1 through T6) is not included because several alternatives had previously been eliminated from further consideration during the course of the planning process.

2.4.1 Alternative T3: Indian Bend Wash, Upstream Salt River, and Downstream Salt River (Low-Water Use)

This alternative includes the restoration of all three segments of the Tempe Reach (Indian Bend Wash, upstream Salt River, and downstream Salt River). Mesquite would be the predominant habitat type in this alternative. Because mesquite requires less water than wetland habitats, this alternative would be less water consumptive than the Proposed Action. It is estimated that 0.87 million liters per day (0.23 mgd) of water would be required to support this alternative. The habitat acreages associated with this alternative are shown in Table 2-7.

Table 2-7 Alternative T3: Indian Bend Wash, Upstream Salt River, and Downstream Salt River (Low-Water Use)

Area	Acreage						Total Acres
	Mesquite	Cottonwood Willow	Freshwater Marsh	Aquatic Strand	Open Edges	Other	
Indian Bend Wash	20	-	-	-	10	50	80
Upstream Salt River	5	-	-	-	25	-	30
Downstream Salt River	5	-	-	-	25	-	30
Totals	**30**	**0**	**0**	**0**	**60**	**50**	**140**

2.4.2 Alternative T4: Indian Bend Wash and Downstream Salt River (High-Water Use)

This alternative includes the restoration of Indian Bend Wash and the Salt River channel immediately downstream of Town Lake. For this alternative, water from the Indian Bend Wash portion of the area would be piped by gravity flow along the north bank of Town Lake and discharged immediately below the downstream dam of Town Lake. The third segment of the Tempe Reach (Salt River upstream of Town Lake) would remain in its present condition. Similar to the Proposed Action, this alternative emphasizes wetland habitat and, therefore, is considered a high water consumption alternative. It is estimated that 9.46 million liters per day (2.5 mgd) of water would be required to support this alternative. The habitat acreages associated with this alternative are shown in Table 2-8.

Table 2-8 Alternative T4: Indian Bend Wash and Downstream Salt River (High-Water Use)

Area	Acreage						Total Acres
	Mesquite	Cottonwood Willow	Freshwater Marsh	Aquatic Strand	Open Edges	Other	
Indian Bend Wash	20	-	-	50	10	-	80
Upstream Salt River	-	-	-	-	-	30	30
Downstream Salt River		10	8	-	12	30	30
Totals	**20**	**10**	**8**	**50**	**22**	**60**	**140**

2.4.3 Alternative T2: Indian Bend Wash only (Low-Water Use)

This alternative includes only the restoration of Indian Bend Wash. The Salt River segments of the Tempe Reach (upstream and downstream of Town Lake) would remain in their present condition. This alternative emphasizes mesquite habitat and, therefore, would be less water consumptive than the Proposed Action. It is estimated that 0.57 million liters per day (0.15 mgd) of water would be required to support this alternative. The habitat acreages associated with this alternative are shown in Table 2-9.

Table 2-9 Alternative T2: Indian Bend Wash only (Low-Water Use)

Area	Acreage						Total Acres
	Mesquite	Cottonwood Willow	Freshwater Marsh	Aquatic Strand	Open Edges	Other	
Indian Bend Wash	20	-	-	-	10	50	80
Upstream Salt River	-	-	-	-	-	30	30
Downstream Salt River	-	-	-	-	-	30	30
Totals	**20**	**0**	**0**	**0**	**10**	**110**	**140**

2.4.4 Alternative T6: Downstream Salt River only (High-Water Use)

This alternative includes only the restoration of the Salt River segment downstream of Town Lake. The water source would be comprised of overflow from Town Lake, supplemented by other sources to be identified by the City of Tempe. The other two segments of the Tempe Reach (Indian Bend Wash and Salt River upstream of Town Lake) would remain in their present condition. Similar to the Proposed Action, this alternative emphasizes wetland habitat and, therefore, is considered a high water consumption alternative. It is estimated that 1.29 million liters per day (0.34 mgd) of water would be required to support this alternative. The habitat acreages associated with this alternative are shown in Table 2-10.

Table 2-10 Alternative T6: Downstream Salt River only (High-Water Use)

Area	Acreage						Total Acres
	Mesquite	Cottonwood Willow	Freshwater Marsh	Aquatic Strand	Open Edges	Other	
Indian Bend Wash	-	-	-	-	-	80	80
Upstream Salt River	-	-	-	-	-	30	30
Downstream Salt River	0	10	8	-	12	-	30
Totals	**0**	**10**	**8**	**0**	**12**	**110**	**140**

2.5 ALTERNATIVES CONSIDERED AND REJECTED

A wide range of alternatives for the environmental restoration of both the Phoenix and Tempe Reaches of the Salt River were presented in the interim feasibility study completed by the Corps, entitled *Rio Salado, Salt River, Arizona, General Investigations, F3 Package* (January, 1997). After further evaluation, the range of alternatives was substantially reduced, and a more limited number of alternatives was analyzed in the *Rio Salado, Salt River, Arizona, General Investigations, F4 Package* (May, 1997). As a result of the analysis provided in the F4 Package, a preferred alternative has been formulated (the Proposed Action). Most of the alternatives presented in the initial stages of the feasibility study have been eliminated from further consideration by the Corps and, therefore, are not considered viable alternatives for the purposes of this EIS.

For the Phoenix Reach, alternatives were eliminated which either did not include a low-flow channel in the river bottom or included a low-flow channel greater than 60 meters (200 feet) in width. The alternatives which did not include a low-flow channel were eliminated because hydraulic analysis indicated that the restored habitats in the river bottom would be subject to frequent damage unless a channel was constructed to contain low-level flows. Although they would be able to convey larger flows, the wider channel configurations were eliminated as alternatives because these larger channels would consume a significant portion of the area available in the river bottom for the creation of habitat. Also, because it was determined that a 60-meter (200-foot) wide channel would be sufficient to reduce the risks of prolonged inundation of the restored habitat areas, the wider channel configurations were considered unnecessary.

Due to the expense associated with supplying water to support the restored habitat areas, a number of alternatives for the Phoenix Reach were eliminated due to their high water requirements. These alternatives incorporated large areas of wetland habitat which require substantial amounts of water. For similar reasons, most of the alternatives which included a perennial stream along the entire length of the Phoenix Reach were also eliminated from further consideration.

Originally, concepts for the restoration of the Phoenix Reach included restoration of six gravel pits adjacent to the river channel. The number of gravel pits incorporated into the restoration alternatives was subsequently reduced to three. Although several of the project alternatives brought forward still incorporate gravel pits in the restoration project, further investigation has indicated that acquisition of the gravel pits may not be feasible at this time. Therefore, the Proposed Action does not include restoration of any of the gravel pits. The possibility remains for restoration of the gravels pits at some future date.

For the Tempe Reach, the alternatives originally under consideration included restoration of only Indian Bend Wash and the segment of the Salt River upstream of Town Lake. During the F4 stage of the Corps' feasibility study for the project, restoration of the portion of the Salt River downstream of Town Lake was added to the project. A high-water alternative which included restoration of only Indian Bend Wash was eliminated because of the difficulties involved in removing the flows which would accumulate adjacent to Town Lake at the downstream end of Indian Bend Wash (a high-water alternative which includes a Salt River segment would allow accumulated Indian Bend Wash flows to be diverted to the Salt River).

2.6 COMPARISON OF ALTERNATIVES

Tables 2-11 and 2-12 provide a summary comparison of the Proposed Action and alternatives for the Phoenix and Tempe Reaches, respectively. These alternatives are fully described in Sections 2.1, 2.3, and 2.4, and their impacts are presented by issue area in Sections 4.1 through 4.11.

Table 2-11 Alternatives Comparison: Phoenix Reach

	Water Use (mgd)	Perennial Stream	Gravel Pit Restoration	Habitat Acreages			
				Mesquite	Cottonwood/ Willow	Freshwater Marsh	Aquatic Strand
Proposed Action	Medium (5.82)	Streams/pools 4 km (2.5 miles) long	No	130	99	58	51
No Action (P1)	None	None	No	-	-	-	-
Alternative P9	High (12.13)	Stream 8 km (5 miles) long	Yes	60	230	100	130
Alternative P6	Low (1.94)	None	Yes	95	90	40	0
Alternative P2	Low (1.95)	None	No	50	80	40	0
Alternative P5	High (11.71)	Stream 8 km (5 miles) long	No	10	185	100	130

Table 2-12 Alternatives Comparison: Tempe Reach

	Water Use (mgd)	Salt River		Indian Bend Wash	Habitat Acreages			
		Upstream	Downstream		Mesquite	Cottonwood/ Willow	Freshwater Marsh	Aquatic Strand
Proposed Action	High (1.53)	Yes	Yes	Yes	30	20	16	50
No Action (T1)	None	No	No	No	-	-	-	-
Alternative T3	Low (0.23)	Yes	Yes	Yes	30	0	0	0
Alternative T4	High (2.5)	No	Yes	Yes	20	10	8	50
Alternative T2	Low (0.15)	No	No	Yes	20	0	0	0
Alternative T6	High (0.34)	No	Yes	No	0	10	8	0

2.7 REFERENCES

USACE (U.S. Army Corps of Engineers). 1997. Los Angeles District, South Pacific Division, *Rio Salado, Salt River, Arizona, General Investigations, F3 Package*. January.

_____. 1997b. Los Angeles District, South Pacific Division, *Rio Salado, Salt River, Arizona, General Investigations, F4 Package*. May.

_____. 1997c. Los Angeles District, South Pacific Division, *Rio Salado Feasibility Report, Salt River, Arizona*. November.

SECTION 3. AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This section of the EIS (Section 3, Affected Environment) provides a description of baseline (existing) conditions in both the Phoenix and Tempe Reaches. Information on existing conditions is presented for each environmental issue. The regulatory setting, which includes applicable government rules, regulations, plans, and policies related to each issue, is also presented. For the purposes of this document, and pursuant to guidelines for implementing NEPA, the baseline used for the impact analysis reflects the actual conditions at the time of preparation of this report.

3.2 GEOLOGY AND GEOMORPHOLOGY

This section describes the existing geologic and geomorphic setting as it relates to the construction and maintenance of the Rio Salado Environmental Restoration Project in Tempe and Phoenix. *Geology* refers to the structure of the earth's crust, including the formation of surface and subterranean land forms, and *geomorphology* describes the physical geographic features of the study area. Technical terms used in this section are defined in Section 8 (Acronyms and Glossary of Terms). Previous studies have been prepared for this area and are hereby incorporated by reference; these studies are summarized below and are listed at the rear of this section. The documents incorporated by reference are also available for review at the location cited in Section 1.5.

3.2.1 ENVIRONMENTAL BASELINE

Regional Geology

The project area is located in the Phoenix Basin of the Salt River Valley. The area is located within a region referred to in physical geography as the Gila Lowland Section of the Sonoran Desert Subprovince, a part of the Southern Basin and Range Physiographic Province. This province is characterized by broad, gently sloping, connected alluvial valleys (basins) bounded by rugged, moderately high mountains (ranges) which trend in a northwest-southeast direction. The most common type of geologic structure in this province is block faulting, which has produced isolated, almost parallel mountain ranges separated by low-lying desert plains. The mountain ranges were extensively dissected and uplifted during late Miocene time by fault activity. The basins are now very thick alluvial areas which cover portions of these mountain ranges. Numerous low-lying isolated hills, called inselbergs, project above the valley surfaces, representing peaks of former mountain ranges that are now almost completely covered by alluvial material in the Salt River Valley.

The mountains in the vicinity of the project area consist mostly of Tertiary-aged sedimentary and volcanic rocks that lie upon an ancient Precambrian igneous and metamorphic basement complex. The complex is composed predominantly of igneous granite and diorite, metamorphosed schist, gneiss, and volcanics. The Tertiary rocks which make up the mountains are composed of volcanic basalt, andesite and rhyolite, and sedimentary sandstone, siltstone, and conglomerate.

The valley fill in the basins consists of Quaternary and upper Tertiary sediments, mostly poorly to well consolidated and unconsolidated gravel, sand, silt, and clay representing several environments and ages of deposition. The total thickness of the alluvial materials in the basins ranges from nearly zero meters along the mountain fronts to 3,000 meters (9,840 feet) at the valley interior. The valley fill materials tend to be more coarse near the mountain fronts and more fine in the interior of the valley. Near the Salt River, the valley fills have been eroded as the river formed terraces during its evolution.

The Lower Salt River is associated with three pediment-inselberg complexes in the surrounding terrain -- the Spook, Papago, and Bush Pediments. A pediment is an erosional ramp-like feature commonly found in the semi-arid regions of the world. Pediments form at the base of mountains or extend outward from the base of an inselberg. Pediments are characterized by (1) a well-defined break in slope, or severe gradient change, between the pediment surface and the inselberg slope and (2) a bedrock surface, in some cases covered with a relatively thin layer of alluvium. These pediment slopes supply the river directly with small amounts of sediment.

Local Geology and Topography

The Salt River flows west into the Phoenix Basin from the Superstition and Goldfield mountain ranges. The historic flood plain of the Salt River spreads out across the gentle slopes of the Basin to a width of about 1.5 kilometers (km) (0.9 miles), but is restricted to a width of less than 0.5 km (0.3 mile) near the Tempe Butte inselberg.

The predominant surface materials in the area consist of Quaternary-aged alluvium deposited by river and sheet wash, and slope-deposited colluvium. Thick layers of alluvium have accumulated within the major streams, tributaries, and flood plains of the Salt River. Mixed among streambed alluvium are thinner layers of alluvium and colluvium which have been deposited by wind and sheet flows. The deeper Quaternary sediments [75-100 meters (250-330 feet) below the surface] consist of sand, gravel, and boulders interbedded with irregular lenses of silt, sand, and gravel. The shallower sediments [down to about 75 meters (250 feet)] consist of loose to dense silt, sand, clay, and gravel alluvium and calcified to uncalcified colluvium.

Sediments of the Salt River reach their maximum thicknesses east and west of Tempe Butte gap. At the gap itself, sediments average less than 70 meters (230 feet) thick and, in some places, bedrock is exposed. A significant exposure of Precambrian granite occurs at the stream bed surface along a 2.5-km (1.6-mile) length of the river channel just west of the gap.

River terrace deposits greater than 100 meters (330 feet) thick from the upper Tertiary age are located 30-100 meters (100-330 feet) beneath the Quaternary alluvium. These terrace sediments also lie exposed up to 100 meters (330 feet) above the Salt River channel near the perimeters of the flood plain. The terraces consist of thick calcified and uncalcified sand and gravel. The terrace sediments are located above thick Tertiary sedimentary and volcanic rocks beneath the basin. The very thick Precambrian basement complex underlies basin alluvium at depths of 1,000 meters (3,300 feet) or greater.

Faults and Seismicity

Faults in central Arizona are generally short, discontinuous, normal faults -- some of which have been interpreted by geologists to displace Quaternary formations. Most of these faults are located within the Jerome-Wasatch Structural Zone, which is a 75 km (47-mile) wide band which extends from Utah to Mexico. In Utah, the zone is associated with current earthquake activity and displays evidence of abundant

Quaternary faulting. In Arizona, the zone includes the Main Street Fault in the northwest corner of the state and Verde Fault located approximately 90 km (56 miles) north of the Salt River. Both of these faults are considered potentially active.

Within the vicinity of the project area, a zone of exposed, Tertiary-age inactive faults exists just north of the Tempe Butte gap. This fault zone is approximately 400 meters (1,300 feet) wide and trends in a northwest to southeast direction. It is located between 300 and 4,400 meters (980-14,400 feet) north-northwest of the Salt River. At Tempe Butte gap, an east-west trending Tertiary-age fault, approximately 1,750 meters (5,750 feet) in length, lies concealed below the alluvium in the middle of the river.

The project area is located in an region of low seismicity with no large earthquakes recorded in recent times.

Subsidence

Available information suggests that subsidence of the ground surface has not occurred in the project area. Ground failure in the form of subsidence and earth fissures has occurred in other areas of the Phoenix Basin. The closest ground failure occurrences to the project area are near Luke Air Force Base, where 0.3 to 1 meter (1-3 feet) of subsidence has been measured and exhibits the shape of a 3-km diameter bowl-shaped depression.

Earth fissures and subsidence are both produced by groundwater withdrawal, whereby the ground compresses (subsides) because it has lost the support of water within its pores. Earth fissures develop when the soil subsides differentially and pulls apart.

Soils

The interior floor of the Salt River Valley is comprised of thick layers of alluvium. The U.S. Department of Agriculture categorizes the soils in the vicinity of the river channel in a group known as the hyperthermic torrifluvents association, which are well-drained to excessively well-drained soils which exist on nearly level or gently sloping surfaces. These soils are often sandy to gravelly, but may include lenses of finer particles. They are often redistributed by water flows in active channels.

3.2.2 REGULATORY SETTING

Geologic resources and geotechnical hazards are governed primarily by local jurisdictions. The plans and ordinances of local jurisdictions contain policies for the protection of geologic features and avoidance of hazards. Building codes in each jurisdiction establish standards for construction of structures depending on soils conditions and the potential for ground movement and faulting.

3.2.3 REFERENCES

Arizona State University. 1994. *Draft Geomorphic Assessment of the Lower Salt River, Central Arizona*. August.

USACE (U.S. Army Corps of Engineers). 1997. Los Angeles District, South Pacific Division. *Geotechnical Appendix, Rio Salado Feasibility Report, Salt River, Arizona*. August.

3.3 AIR QUALITY

3.3.1 ENVIRONMENTAL BASELINE

Climate and Meteorology

The proposed Rio Salado project is located within the Salt River Valley (Valley) at an elevation of approximately 335 meters (1,100 feet). The Valley is oval shaped and flat, except for scattered precipitous mountains rising a few hundred to as much as 460 meters (1,500 feet) above the Valley floor. The study area is characterized as a desert with hot summers, mild winters, and little annual rainfall. As described in Table 3.3-1, summer mean high and low temperatures (July) in Phoenix are 41°C (106°F) and 27°C (81°F), respectively. Winter mean high and low temperatures (January) are 19°C (66°F) and 5°C (41°F), respectively. Precipitation in the study area is approximately seven inches annually and occurs mostly between late November to early April from active frontal systems, and in the late summer (August) from periodic thunderstorms.

As described in Table 3.3-1, the Valley is characterized by light wind speeds that range from 8.2 kilometers per hour (kph) [5.1 miles per hour (mph)] in December to 11.4 kph (7.1 mph) in July. The prevailing wind direction is from the east, except in July when the wind direction is coming from the west as a result of monsoons that rotate into the subject area. Less frequently, widespread gusty winds occur over all areas of the Valley.

Table 3.3-1 Monthly Temperatures, Precipitation, Wind Speed/Direction in Phoenix

Month	Temperature				Precipitation		Wind		
	Maximum		Minimum				Speed		Prevailing Direction
	°F	°C	°F	°C	inches	cm	mph	kph	
January	65.9	18.8	41.2	5.1	0.67	1.70	5.3	8.5	E
February	70.7	21.5	44.7	7.1	0.68	1.73	5.9	9.5	E
March	75.5	24.2	48.8	9.3	0.88	2.24	6.6	10.6	E
April	84.5	29.2	55.3	12.9	0.22	0.56	6.9	11.1	E
May	93.6	34.2	63.9	17.7	0.12	0.30	7.0	11.3	E
June	103.5	39.7	72.9	22.7	0.13	0.33	6.8	10.9	E
July	105.9	41.1	81.0	27.2	0.83	2.11	7.1	11.4	W
August	103.7	39.8	79.2	26.2	0.96	2.44	6.6	10.6	E
September	98.3	36.8	72.8	22.7	0.86	2.18	6.3	10.1	E
October	88.1	31.2	60.8	16.0	0.65	1.65	5.8	9.3	E
November	74.9	23.8	48.9	9.4	0.66	1.68	5.3	8.5	E
December	66.2	19.0	41.8	5.4	1.00	2.54	5.1	8.2	E

Notes: E= East; W=West
Source: National Climatic Center, 1995. Phoenix Annual Summary of the Local Climatological Data

Existing Air Quality

Criteria Pollutants. The quality of the surface air (air quality) is evaluated by measuring ambient concentrations of pollutants that are known to have deleterious effects. The degree of air quality degradation is then compared to the *ambient air quality standards* (AAQS). The air pollutants that are regulated by these standards are called "criteria pollutants". The current National and State Ambient Air Quality Standards are equivalent are listed in Table 3.3-2.

Table 3.3-2 National and State Ambient Air Quality Standards

Pollutant	Averaging Time	National and State Standards	
		Primary	Secondary
Ozone (O_3)	1-hour	0.12 ppm (235 $\mu g/m^3$)	0.12 ppm (235 $\mu g/m^3$)
Carbon Monoxide (CO)	8-hour 1-hour	9.0 ppm (10 mg/m^3) 35.0 ppm (40 mg/m^3)	9.0 ppm (10 mg/m^3) 35.0 ppm (40 mg/m^3)
Nitrogen Dioxide (NO_2)	Annual Average	0.053 ppm (100 $\mu g/m^3$)	0.053 ppm (100 $\mu g/m^3$)
Sulfur Dioxide (SO_2)	Annual Average 24-hour 3-hour	80 $\mu g/m^3$ (0.03 ppm) 365 $\mu g/m^3$ (0.14 ppm) NS	NS NS 1300 $\mu g/m^3$ (0.5 ppm)
Suspended Particulate Matter (PM_{10})	Annual Arithmetic Mean 24-hour	50 $\mu g/m^3$ 150 $\mu g/m^3$	50 $\mu g/m^3$ 150 $\mu g/m^3$
Lead (Pb)	Calendar Quarter	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$

Notes: NS = no standard; ppm = parts per million; $\mu g/m^3$ = microgram per cubic meter; mg/m^3 = milligrams per cubic meter

A summary of the air quality status in the study area (i.e., the City of Phoenix and Tempe), relative to the AAQS, is provided in Table 3.3-3. Nonattainment is a term used to indicate the violation of a particular AAQS. In the past, air quality in the vicinity of the study area has regularly exceeded the Federal and State AAQS for ozone (O_3), carbon monoxide (CO), and fine particulate matter (PM_{10}). As a result, the U.S. Environmental Protection Agency (USEPA) and the Arizona Department of Environmental Quality (ADEQ) have classified Maricopa County as a non-attainment area for the Federal and State AAQS for O_3, CO, and PM_{10}.

Table 3.3-3 Study Area Attainment Status

Location	O_3		CO		NO_2		SO_2		PM_{10}	
	State	Fed.	State	Fed.	State	Fed.	State	Fed.	State	Fed.
Study Area - City of Phoenix and Tempe	N	N	N	N	A	A	A	A	N	N

Notes: A = Attainment of Standards; N = Non-Attainment

Source: Personal Communication with Ira Domsky at the ADEQ, July 29, 1997

The Arizona Department of Environmental Quality (ADEQ) and Maricopa County Bureau of Air Pollution Control (BAPC) operate a county-wide network of air pollution monitoring stations in the study area. Two monitoring stations near the proposed Rio Salado Project were selected to provide a general profile of the air quality within the study area. Table 3.3-4 lists the monitoring stations and presents the ambient air quality concentrations recorded in 1993 through 1995, as well as the number of days the ambient concentrations exceeded the Federal and State AAQS.

Table 3.3-4 Air Quality Summary

Standards	Monitoring Station 1845 E. Roosevelt, Phoenix			Monitoring Station Broadway & Brooks, Mesa		
	1993	1994	1995	1993	1994	1995
Ozone (1-Hour) Standard						
Max. Concentration (ppm)	0.11	0.11	0.12	0.13	0.12	0.13
Days > NAAQS (0.12 ppm)	0	0	0	1	0	3
NO_2 (Annual) Standard						
Max. Concentration (ug/m^3)	NM	NM	61	NM	NM	NM
Days > CAAQS (100 ug/m^3)	NM	NM	0	NM	NM	NM
PM_{10} (24-Hour) Standard						
Max. Concentration (ug/m^3)	98	92	88	96	73	89
Days > NAAQS (150 ug/m^3)[c]	0	0	0	0	0	0
CO (8-Hour) Standard						
Max. Concentration (ppm)	7.7	9.7	9.0	4.0	5.3	5.7
Days > NAAQS (9.0 ppm)	0	1	0	0	0	0

Notes: ppm=parts per million; ug/m^3=micrograms per cubic meter; NM = not monitored
Source: ADEQ. 1993, 1994, and 1995 Air Quality Data for Arizona

Toxic Air Contaminants. In addition to criteria pollutants, other regulated pollutants include toxic air contaminants (TACs), which are suspected or known to cause cancer, genetic mutations, birth defects, or other serious illnesses in exposed people. TACs are not regulated by the Federal or State AAQS but are addressed by the National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Title III of the 1990 Clean Air Act Amendments.

The concentrations of toxic pollutants are determined by the level of emissions at the source and the meteorological conditions encountered as these pollutants are transported away from the source. Thus, impacts from toxic pollutant emissions tend to be site specific and their intensity is subject to constantly changing meteorological conditions. The worst meteorological conditions that affect short-term impacts (low wind speed, highly stable air mass, and constant wind direction) occur relatively infrequently.

3.3.2 REGULATORY SETTING

Federal, state, and regional agencies have established standards and regulations addressing air pollutant emissions that affect proposed projects. The following federal and state regulatory considerations may apply to the project and to the alternatives.

Federal and State Regulations

- The Federal Clean Air Act of 1970 directs the attainment and maintenance of National AAQS for six "criteria" pollutants (e.g., ozone, carbon monoxide)

- The 1977 Clean Air Act enacted legislation to control seven air toxic pollutants. USEPA adopted the National Emission Standards for Hazardous Air Pollutants (NESHAP), which were designed to control Hazardous Air Pollutants (HAP) emissions to prevent adverse health effects in humans.

- The 1990 Amendments to this Act determine attainment and maintenance of NAAQS (Title I), motor vehicles and reformulation (Title II), hazardous air pollutant (Title III), acid deposition (Title IV), operating permits (Titles V), stratospheric ozone protection (Title VI), and enforcement (Title VII).

- The U.S. Environmental Protection Agency (EPA) implements the New Source Review (NSR) and Prevention of Significant Deterioration (PSD) regulations.

Regional and Local Regulations

The Maricopa County BAPC has jurisdiction within the County of Maricopa. The proposed Rio Salado project would be located within Maricopa County, and therefore, emissions that would result from the construction and maintenance of the Rio Salado project are subject to the rules and regulations of Maricopa County BAPC. Rules and regulations of this agency are designed to achieve defined air quality standards that are protective of public health. To that purpose, they limit the emissions and the permissible impacts of emissions from projects, and specify emission controls and control technologies for each type of emitting source in order to ultimately achieve the air quality standards.

3.3.3 REFERENCES

ADEQ (Arizona Department of Environmental Quality). 1997. Personal Communication with Ira Domsky on July 29, 1997.

_____. 1996. *1995 Air Quality Data for Arizona.*

_____. 1995. *1994 Air Quality Data for Arizona.*

_____. 1994. *1993 Air Quality Data for Arizona.*

National Climatic Center. 1995. *Phoenix Annual Summary of the Local Climatological Data.*

3.4 HYDROLOGY AND WATER QUALITY

This section describes the existing environmental conditions in the project area relating to water resources. Information presented in this section is derived primarily from the *Rio Salado Feasibility Report, Salt River, Arizona* (USACE, 1997) prepared by the U.S. Army Corps of Engineers, Los Angeles District.

3.4.1 ENVIRONMENTAL BASELINE

Surface Water Hydrology

The Salt River is the largest tributary of the Gila River and drains a total area of approximately 34,200 square kilometers (13,200 square miles) within the northern and eastern portions of the State of Arizona. The Salt River originates on the eastern portion of the Mogollon Plateau, in the White Mountains, with peaks as high as 3,500 meters (11,590 feet). Formed by the confluence of two westward flowing streams, the White and Black Rivers, the Salt drains directly into Roosevelt Lake where it is joined by Tonto Creek. The drainage area controlled by the Modified Roosevelt Dam, which forms the lake, is approximately 15,000 square kilometers (5,800 square miles). The Salt River Project (SRP) operates four dams on the Salt River upstream of the Verde River confluence, including the Modified Roosevelt Dam. Total water supply space behind these dams is 1.9 million acre-feet, with an additional 0.56 million acre-foot for flood control.

The Verde River is the principal tributary of the Salt River. The Verde River flows south from the Chino Valley and joins the Salt River upstream of the Cities of Mesa, Tempe, and Phoenix. The Verde River drains approximately 17,350 square kilometers (6,700 square miles) and is partially controlled by two water supply dams operated by the SRP. The two dams provide a water supply space of 310,000 acre-feet.

Approximately three miles below the Verde and Salt River confluence, the SRP operates the Granite Reef Diversion Dam. The purpose of this facility is to divert upstream reservoir releases into water supply canals. The canals criss-cross the Phoenix metropolitan area furnishing water for agricultural and municipal uses. The total water supply space of the SRP system is 2.8 million acre-feet, not including the amount of water that is stored within the canal system.

Due to the large water supply space behind the SRP dams, the Salt River rarely flows through metropolitan Phoenix. The relative frequency of flow downstream of Granite Reef Dam is about once every three years, on average (i.e., sustained flow through the project reach might occur during some portions of those years). To place that in perspective, if the current SRP system was operated under the current operation manual, water would have spilled over Granite Reef dam only 34 times since 1888. Given this infrequency of flow events, Table 3.4-1 gives estimated discharge-frequency values of the Salt River in the two study reaches.

Table 3.4-1 Salt River Discharge-Frequency Values

Return Period	Tempe Reach Peak Discharge		Phoenix Reach Peak Discharge	
	cfs	cms	cfs	cms
500-yr	243,000	6,877	240,000	6,792
200-yr	204,000	5,773	202,000	5,717
100-yr	169,000	4,783	166,000	4,698
50-yr	140,000	3,962	135,000	3,821
20-yr	90,000	2,547	87,000	2,462
10-yr	55,000	1,557	53,000	1,500
5-yr	20,500	580	20,200	572

Due to the SRP system, flows in the Salt River, when they do occur, do not follow a normally expected bell-shaped hydrograph. The flows do not rise to their peak and then fall to normal levels as the flood wave passes. Rather, when a release is made, the flow in the river is sustained at a certain level for many days. Only after the proper storage level in the SRP system is reached do the releases stop, and flow in the Salt River ceases. As such, inundation duration in the Salt River is of prime concern to maintaining habitat within the river. Table 3.4-2 depicts an expected inundation duration for various discharge frequencies.

Table 3.4-2 Salt River Duration-Frequency Values (cfs)

Freq.	Peak		1-day		3-day		5-day		10-day		30-day		60-day	
	cfs	cms	cfs	cms	cfs	cms	cfs	cms	cfs	cms	cfs	cms	cfs	cms
500-yr	240,000	6,792	190,000	5,377	100,000	2,830	70,000	1,981	46,000	1,302	25,000	708	14,000	396
200-yr	202,000	5,717	145,000	4,104	75,000	2,123	55,000	1,557	33,000	934	19,000	538	9,000	255
100-yr	166,000	4,698	100,000	2,830	60,000	1,698	40,000	1,132	25,000	708	15,000	425	7,000	198
50-yr	135,000	3,821	70,000	1,981	40,000	1,132	29,000	821	18,000	509	10,000	283	5,000	142
20-yr	87,000	2,462	40,000	1,132	22,000	623	15,000	425	10,000	283	5,300	150	2,800	79
10-yr	53,000	1,500	21,000	594	11,000	311	7,000	198	5,200	147	2,700	76	1,400	40
5-yr	20,200	572	8,000	226	3,500	99	2,100	59	1,500	42	800	23	0	0

Note: The above values display the discharge exceeded for specified duration. For the 5-yr frequency, a flow rate of 200 cfs is exceeded for 53 days.

Indian Bend Wash (IBW) drains approximately 230 square kilometers (90 square miles). The watershed is mostly urbanized and includes portions of Scottsdale, Phoenix, and Tempe. The outlet of IBW is the Salt River about midway between McClintock Road on the east and Rural Road on the west. The improved channel was designed to convey a 100-year discharge of 850 cubic meters per second (cms) [30,000 cubic feet per second (cfs)]. The improved channel also includes a low-flow channel which was designed to convey a 5-year discharge of 110 cms (4,000 cfs).

Although there is sparse record available, there are no instances during which runoff from IBW did much more than wet the Salt River bed downstream of the confluence. Under most circumstances, water from the IBW does not have sufficient volume, nor flow for a long enough duration, to fill the Salt River channel and flow downstream. However, estimates have been performed which describe how the runoff from the 10-year and 5-year events from IBW affects the Salt River. The results are displayed in Table 3.4-3 below. As shown, the impacts are minimal.

Table 3.4-3 Impact from IBW Runoff to the Salt River

Location	Approx 5-yr Peak Discharge		Approx 10-yr Peak Discharge	
	cfs	cms	cfs	cms
IBW-Salt River Confluence	4,800	136	9,000	255
Salt River at Mill Avenue	370	10	1,500	42
Salt River at Central Avenue	0	0	140	4.0

Two significant side drains to the Salt River mainstem are the Old Cross Cut Canal and the Tempe Drain. The Old Cross Cut Canal was originally a part of the SRP canal system. Today it serves to drain flood waters to the Salt River just upstream of the Phoenix Reach. The confluence is approximately 0.4 km (¼ mile) west of 48th Street on the north side of the Salt River. The drainage area is approximately 44 square kilometers (17 square miles). The discharge capacity of this side drain is approximately 140 cms (5,000 cfs). The Tempe Drain serves to drain storm water from within the urbanized portion of Tempe. The Tempe Drain also conveys effluent from the City of Tempe's Kirene Road wastewater treatment facility located south of the Salt River. It enters the Salt River from the south, along the west-bound lanes of Interstate 10 bridge. The drainage area of the Tempe Drain is approximately 36 square kilometers (14 square miles). The capacity of the Tempe Drain is approximately 31 cms (1,100 cfs).

Similar to Indian Bend Wash, the impacts from runoff from the Old Cross Cut Canal and Tempe Drain to the Salt River are expected to be minimal. The disparity in size (IBW drains about 5 times as much area) as well as the larger Salt River cross section, eliminates anticipated problems from drainage resulting from these two side drains.

There are numerous local side/storm drains which discharge into the Salt River and IBW. In the Tempe Reach, there are 17 side drains varying in size from 90 centimeters (36 inches) to 5.5 meters (18 feet) in diameter. The contributing drainage areas range in size from 0.08 to 7.43 square kilometers (0.03 to 2.87 square miles). The peak 100-year discharge from any drain in the Tempe Reach ranges from 0.7 to 90 cms (25 to 3,200 cfs), while the average annual volume is expected to range from 1.7 to 210 acre-feet. All drains discharging into IBW appear to produce insignificant flows.

In the Phoenix Reach, there are 34 storm drains varying in size from 38 centimeters (15 inches) to 6.4 meters (21 feet) in diameter. The contributing drainage areas range in size from 0.13 to 35.9 square kilometers (0.05 to 13.87 square miles). The peak 100-year discharge from any side drain in the Phoenix Reach is anticipated to range from 1 to 106 cms (37 to 3,730 cfs). The anticipated average annual volume ranges from 2.5 to 900 acre-feet.

Surface Water Quality

The Environmental Protection Agency and the Arizona Department of Environmental Quality have set quality standards for surface waters in the Tempe and Phoenix Reaches. These standards vary depending on the designated use of the waterway. The current designated uses for the Indian Bend Wash portion of the Tempe Reach are "Aquatic and Wildlife (warm water fishery)" "Partial Body Contact," and "Fish Consumption." For the Salt River portion of the Tempe Reach, the designated uses are "Aquatic and Wildlife (ephemeral)," and "Partial Body Contact." The current designated uses in the Salt River in the Phoenix Reach are "Aquatic and Wildlife (warm water fishery)" and "Partial Body Contact." The various water quality standards for the study reaches are given below in Tables 3.4-4, 3.4-5, and 3.4-6.

Table 3.4-4 Surface Water Quality Standards for the IBW Portion of Tempe Reach

	Fish Consumption	Partial Body Contact	Aquatic and Wildlife (warm water fishery) Acute/Chronic
Fecal Coliform (cfu/100ml)	-	4,000/1,000	4,000/1,000
Arsenic (ppb)	3.1 T	2,800 T	360 D/190 D
Mercury (ppb)	0.6 T	42 T	2.4 d/0.01 D
TCE (ppb)	78	-	20,000/1,300
PCE (ppb)	11	4,000	6,500/680
TCA (ppb)	160,000	13,000	2,600/1,600
Benzene (ppb)	120	470	2,700/180
Chloroform (ppb)	590	1,400	14,000/900

Note: Standards for Cadmium, Copper, Lead, Silver, and Zinc not shown. No standards for TSS, TDS, Chloride, Fluoride, Nitrate, or DBCP.

Table 3.4-5 Surface Water Quality Standards for the Salt River Portion of Tempe Reach

	Partial Body Contact	Aquatic and Wildlife (ephem.) Acute/Chronic
Fecal Coliform (cfu/100ml)	4,000/1,000	-
Arsenic (ppb)	2,800 T	440 D/230 D
Mercury (ppb)	42 T	5 D/2.7 D
TCE (ppb)	-	20,000/1,300
PCE (ppb)	4,000	15,000/1,600
TCA (ppb)	13,000	2,600/1,600
Benzene (ppb)	470	-
Chloroform (ppb)	1,400	-

Note: Standards for Cadmium, Copper, Lead, Silver, and Zinc not shown. No standards for TSS, TDS, Chloride, Fluoride, Nitrate, or DBCP.

Table 3.4-6 Surface Water Quality Standards for the Salt River in the Phoenix Reach

	Partial Body Contact	Aquatic and Wildlife (warm water fishery) Acute/Chronic
Fecal Coliform (cfu/100ml)	4,000/1,000	4,000/1,000
Arsenic (ppb)	2,800 T	360 D/190 D
Mercury (ppb)	42 T	2.4 d/0.01 D
TCE (ppb)	-	20,000/1,300
PCE (ppb)	4,000	6,500/680
TCA (ppb)	13,000	2,600/1,600
Benzene (ppb)	470	2,700/180
Chloroform (ppb)	1,400	14,000/900

Note: Standards for Cadmium, Copper, Lead, Silver, and Zinc not shown. No standards for TSS, TDS, Chloride, Fluoride, Nitrate, or DBCP.

Flows in the Salt River originating upstream of the Phoenix metropolitan area are generally of good quality. Salt River flows maintain high amounts of mineral content and total dissolved solids (TDS). When flood flows do occur, however, they commonly violate quality standards for fecal coliform bacteria. The Salt River water contains a sodium chloride character both above and below the SRP system dams due to salt springs upstream of the lakes. Verde River water has a lower amount of total dissolved solids (TDS) than found in the Salt River water. The Verde water tends to lower the overall TDS content in flows downstream of their confluence. The quality of water would be sufficient to support native fish species; however, elimination of the base flows does not allow it.

Storm runoff in the two study reaches is intermittent and highly variable. Generally, the observed surface water quality from storm drains is of poor quality. Concentrations of bacteria, metals, turbidity, petroleum products, and pesticides have been observed. Fecal coliform commonly exceeds water quality standards.

Ground Water Hydrology

Prior to development of the Phoenix metropolitan area and construction of upstream reservoirs, the Salt River was a perennial stream. The river was a significant source of ground water recharge in some areas and a recipient of ground water discharge in other areas. As the area began to be settled, irrigation to support crops was obtained by diverting the stream flow into canals. By the 1900s, much of the Salt River Valley was waterlogged due to recharge from canal seepage and deep percolation combined with a lack of ground water pumping. Beginning in the 1920s, substantial ground water pumping began for irrigation and to control shallow ground water levels. Following World War II, advances in drilling and pump technology allowed extensive pumping from deep aquifers to occur. The result of the ground water pumping practices was extensive overdraft.

The ground water supply beneath the study reaches is regulated by the Arizona Department of Water Resources (ADWR). To aid in monitoring, ADWR differentiates between ground water basins. The subsurface geologic conditions in the two study reaches are within the Phoenix Active Management Area (AMA) of ADWR.

The Phoenix AMA is comprised of portions of two distinct but interconnected alluvial groundwater basins, the West Salt River Valley (WSRV) and the East Salt River Valley (ESRV). These two basins are divided by subsurface geologic outcroppings located near Priest Road in Tempe. The Tempe Reach lies in the ESRV basin while the Phoenix Reach lies in the WSRV basin. In general, ground water in these two basins is moving laterally toward extensive and deep depressions in some of the main aquifer systems. In the ESRV, major ground water depressions are centered in the Scottsdale-Paradise Valley area, in east Mesa and north of the Santan Mountains. In the WSRV, a major depression is centered near Luke Air Force Base.

Within the two ground water basins, there are three hydrogeologic units: the lower alluvial unit (LAU), the Middle Alluvial Unit (MAU), and the Upper Alluvial Unit (UAU). There is also a Red Unit which forms the base of the aquifer beneath part of the area north of the Salt River. The LAU overlies the Red Unit and consists mainly of conglomerate and gravel. The LAU is tapped by many city wells, and it is estimated that approximately 25 percent of the pumpage originates from this unit. The MAU overlies the LAU and consists mainly of clay, silt, mudstone and some sand and gravel. The unit ranges in thickness from 30 meters (100 feet) to over 490 meters (1,600 feet) in the deeper parts of the basin. The MAU is now the primary source of ground water in the Phoenix metropolitan area. ADWR estimates that 50 percent of the total pumpage in the valley is from the MAU.

The UAU overlies the MAU and consists primarily of gravel, sand and silt. The amount of coarse-grained deposits is highest near the Salt and Gila Rivers. The thickness of the UAU is relatively uniform and ranges from 60 to 90 meters (200 to 300 feet) thick in ESRV and between 90 to 120 meters (300 and 400 feet) thick in the WSRV. In the past, the UAU was the primary source of ground water in the valley, but because of dewatering and large areas of poor quality water, only about 25 percent of ground water pumped in the valley is from the UAU.

In the Phoenix Reach, the current ground water level is estimated to be at 313 to 318 meters (1028 to 1042 feet) above mean sea level. Fluctuations in ground water levels occur in response to river flow events.

Ground Water Quality

When ground water pumping was initiated in the Phoenix metropolitan area in the 1920s, the ground water quality, although high in minerals, was considered to be of very good quality. Today, there are a number of ground water problems in the Salt River Valley. The problems associated with inorganic chemical constituents include high levels of chloride, TDS, nitrates and salinity. The problems associated with trace organic constituents include the pesticide DBCP and volatile halocarbons. Most of the regional problems are currently limited to ground water in the UAU. At this time, little data exists with respect to the salinity levels of the water in the near surface aquifers.

Numerous incidents of volatile halocarbon contamination have been detected in the Phoenix metropolitan area. Volatile organic compounds are located in shallow ground water beneath several landfills along the Salt River, near industrial facilities, and beneath large sections of land formerly used for agricultural purposes. In some cases, the contamination is limited to plumes in specific areas and can be associated with specific waste disposal practices or industrial activities. The extent of contamination near the 19th Avenue Landfill and at numerous other facilities and areas is not well defined. A large areas of volatile halocarbon contamination has been delineated in the UAU. This area is located approximately 1.6 to 2.4 km (1 to 1.5 miles) north of the river bed, parallel to the Salt River, and extends from the Motorola/52nd Street Superfund Site through downtown Phoenix and the West Van Buren area. Multiple sources of contamination exist throughout this area.

Because of high organic and volatile halocarbon concentrations and decreases in the use of land for agriculture, use of the ground water in the UAU for public consumption has dropped significantly. New water supply wells tap the higher quality ground water stored in the MAU or LAU have been replacing the shallow wells for several decades. Much of the shallow ground water is now only suitable for industrial or agricultural purposes. The deeper water is generally unaffected by agricultural and industrial practices and has lower salinity and nitrate concentrations.

3.4.2 REGULATORY SETTING

Executive Order 11990, Protection of Wetlands. Requires governmental agencies, in carrying out their duties, to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands.

Executive Order 11988, Floodplain Management. Requires that governmental agencies, in carrying out their responsibilities, provide leadership and take action to restore and preserve the natural and beneficial values served by floodplains.

Clean Water Act of 1977 (33 U.S.C. 1251 et seq.). Provides for the restoration and maintenance of the physical, chemical, and biological integrity of the nation's waters. Section 404(b) of the Act prohibits the discharge of dredged or fill materials into the waters of the United States, including wetlands, except as permitted under separate regulations by the U.S. Army Corps of Engineers and the Environmental Protection Agency. Section 401 of the Clean Water Act requires federal agencies to obtain state water quality certification for any federal project, or federally permitted project, potentially affecting water quality. Section 402 establishes conditions and permitting for point-source discharges of pollutants under the National Pollution Discharge Elimination System (NPDES). Pursuant to NPDES requirements, a General Construction Activity Storm Water Permit will be required for project construction and a standard NPDES permit will be required for the direct discharges of groundwater into the river channel.

3.4.3 REFERENCES

USACE (U.S. Army Corps of Engineers). 1997. Los Angeles District, South Pacific Division, *Rio Salado Feasibility Report, Salt River, Arizona*. August.

3.5 BIOLOGICAL RESOURCES

3.5.1 ENVIRONMENTAL BASELINE

The following discussion characterizes the biological resources within the proposed project site. The information presented is derived from the Biological Technical Report in Appendix A. In addition, a habitat valuation analysis was prepared for each of the restoration alternatives by the U.S. Army Corps of Engineers, Los Angeles District. The habitat valuation analysis is presented in Appendix C.

3.5.1.1 Historic Conditions within the Project Site

Salt River and Indian Bend Wash. Table 1 in the Biological Technical Report (Appendix A) lists the species known to occur within the proposed project site prior to development (USACE, 1995). Prior to dam construction in the early 1900s, the Salt River was a perennial stream fed by snowmelt from the New River and Hieroglyphic Mountains and highlands in the northeast. The river supported a dense riparian community dominated by Fremont cottonwoods (*Populus fremontii*), Goodding's willows (*Salix gooddingii*), arroyo willow (*S. lasiolepis*), coyote willow (*S. exigua*), and Arizona alder (*Alnus oblongifolia*) on the banks of the river, with desert scrub communities comprised of screwbean and honey mesquites (*Prosopis pubescens* and *P. juliflora*), grease-wood (*Sarcobatus vermiculatus*), little leaf and blue palo verde (*Cercidium microphyllum* and *C. floridum*), sagebrush (*Artemisia* sp.), creosote bush (*Larrea tridentata*), and saltbush (*Atriplex* sps.) on the lower terraces. Dense mesquite bosques occurred within the river flood plain on higher alluvial terraces than the stream-side terraces supporting cottonwood-willow riparian communities. Mesquite bosques consisted of open to fairly dense, drought-deciduous stream-side forests dominated by honey or screwbean mesquite, with an understory of elderberry (*Sambucus mexicana*), greythorn (*Zizyphus obtusifolia* var. *canescens*), wolfberry (*Lyceum fremontii*), and annual and perennial grasses. Characteristic species included burro-weed (*Ambrosia dumosa*), saltbush (*Atriplex canescens*, *A. polycarpa*, and *A. lentiformis*), Palmer's coldenia (*Coldenia palmeri*), and iodine weed (*Suaeda torreyana*). The bosques had open interiors that were maintained by frequent flooding and/or fire (Holland, 1986).

The plant communities and perennial water flow supported a variety of wildlife characteristic of Sonoran Desert riparian communities. Fish species such as desert and Sonoran sucker (*Catostomus clarki* and *C. insignis*), roundtail chub (*Gila robusta*), and long-finned dace (*Agosia chrysogaster*) occupied the waters of the Salt River (USACE, 1995). A variety of reptile and amphibian species occupied the waters and alluvial terraces including western spadefoot toad (*Scaphiopus hammondii*), Colorado River toad (*Bufo alvarius*), desert tortoise (*Gopherus agassizii*), Gila monster (*Heloderma suspectum*), chuckwalla (*Sauromalus obesus*), side-blotch lizard (*Uta stansburiana*), desert horned lizard (*Phrynosoma platyrhinos*), coachwhips (*Masticophis flagellum*), gopher snake (*Pituophis catenifer*), western diamond-backed rattlesnake (*Crotalus atrox*), and sidewinder (*Crotalus cerastes*) (USACE, 1995).

A wide variety of resident and migratory bird species typical of the Sonoran Desert occupied the area prior to the clearing of the riparian vegetation and the alteration of the stream flow. The vegetation once present provided shade, protection from predators, and foraging, nesting and breeding habitat for resident and migratory birds. Species utilizing the habitat included raptors such as Cooper's hawk (*Accipiter cooperii*), peregrine falcon (*Falco peregrinus*), and prairie falcon (*Falco mexicanus*). Also present were species of quail, dove, flickers, flycatchers, wrens, warblers, sparrows, humming birds, waterfowl, and towhees. A more complete list of species is provided in Table 1 of the Biological Technical Report (Appendix A).

Mammals known to occur in the proposed area prior to development include beaver (*Castor canadensis*), big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), desert pocket mouse (*Perognathus pencillatus)*, raccoon (*Procyon lotor*), and larger mammals such as coyote (*Canus latrans*), and jaguar (*Felis onca*).

Sensitive species (species either listed as endangered, threatened, or rare by the Federal or State government) that may have been present prior to development include Maricopa tiger beetle (*Cicindela oregona maricopa*), roundtail chub, razorback sucker (*Xyraunchen teanus*), Colorado squawfish (*Ptycheilus lucius*), spike dace (*Meda fulgida*), woundfin (*Plagopterus argentissimus*), loach minnow (*Rhinichthys cobitis*), Gila topminnow (*Pociliposis occidentalis*), desert tortoise, southwestern willow flycatcher (*Empidonax traillii extimus*), Yuma clapper rail (*Rallus longirostris yumanensis*), bald eagle (*Haliaeetus leucocephalus*), American peregrine falcon (*Falco peregrinus anatum*), cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*), buff-breasted flycatcher (*Empidonax fulvifrons pygmaeus*), lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), and greater mastiff-bat (*Eumops perotis californicus*) (USACE, 1995).

In the early 1900s, the U.S. Bureau of Reclamation constructed a series of dams in the Salt and Verde River watersheds that eliminated the perennial water flow within the Salt River. Water flow was limited to summer or fall rains and related flood events which diminished the native vegetation and created open disturbed habitat suitable for the invasive, non-native tamarisk (*Tamarix* sp.) as early as the 1920s. From its introduction into the southwest, tamarisk (a Eurasian native tree species) spread throughout the southwestern river systems at a rate of almost 24 km (15 miles) per year. By the 1940s, tamarisk dominated the channel in dense extensive communities, to the exclusion of most native riparian species. Post-dam riparian vegetation along the Salt River diminished further as vegetation removal programs started in the early 1950s and ground pumping (which reduced the ground water table) were implemented. Historic photographs indicate that vegetation removal during this period included the removal of both non-native and native species. Non-native vegetation within the channel continued to increase until vegetation clearing programs were enacted in the 1980s. The further depletion of ground water from pumping within the Indian Bend Wash and Tempe portion of the Salt River reduced the ground water level below the critical depth required to support even tamarisk [between 4.5 to 9.0 meters (15 to 30 feet)] limiting the species to areas with surface water from effluent or in selected areas where the ground water is closer to the surface.

It should be noted here that 30 miles upstream of the study area a relatively undisturbed riparian corridor exists on the Salt River (above the Verde River) in the Tonto National Forest. The closest riparian corridor to the study area is the riparian vegetative community sustained by effluent discharge from the 91st Avenue Wastewater Treatement Plant about 15 miles downstream.

3.5.1.2 Present Conditions within the Project Site

At present, only disturbed desert scrub, a small cottonwood/willow riparian woodland, tamarisk stands, and ruderal communities are present in the Phoenix Reach and Tempe Reach.

Phoenix Reach

Currently, the Salt River is characterized as an effluent-dominated water course where highly disturbed marginal riparian habitat only occurs at locations where wastewater effluent and nuisance water run off are discharged into the channel. The remainder of the habitat is so disturbed that most of the channel is devoid of vegetation and consists of a barren cobbly wash. A small body of water occurs at the westernmost end of this reach from Central Avenue to about 7th Avenue. The remainder of the reach contains only unconnected scattered puddles of water.

Vegetation. The majority of the habitat within the Phoenix Reach can be characterized as highly disturbed, sparsely vegetated cobbly wash with banks that are either devoid of vegetation or thinly vegetated with ruderal herbs and non-native grasses. The most vegetation within the reach occurs on the south bank from the east side of 7th Street west to 7th Avenue. Disturbed desert scrub occupies the lower stream-side terraces. Species present include creosote bush, brittlebush (*Encelia farinosa*), buckwheat (*Eriogonum* sp.), desert sage (*Salvia carnosa*), mesquite, palo verde, tamarisk, and non-native grasses including fountain grass (*Pennisetum setaceum*), crabgrass (*Digitaria sanguinalis*), and fescue (*Festuca myuros*). The area is highly disturbed by the presence of concrete and asphalt rubble, trash, and construction waste dumping.

On the south bank of the river just west of the Interstate 10 bridge, a disturbed cottonwood-willow community is established. Fremont cottonwood, tamarisk, mulefat (*Baccharis salicifolia*)and a several willow species (*Salix* sps.), some exceeding 6 meters (20 feet) in height, occupy an area of less than two acres. The margins of this riparian community are occupied by a community of rushes and sedges.

The remainder of the channel within the Phoenix Reach is only sparsely and sporadically vegetated by tamarisk, desert broom (*Baccharis sarothroides*), and rabbitbrush (*Chrysothamnus nauseosus*).

Fish and Wildlife. Wildlife within the river channel wash consists of mostly avian and small mammal species that frequent those portions of the channel with vegetation and/or water with only a few reptile and aquatic species noted. Birds visiting the wash and channel area consist of urban and desert avian species including hawks (*Accipiter* sps.), greater roadrunner (*Geococcyx californianus*), great blue heron (*Ardea herodias*), common dove (*Columbina passerina*), mourning dove (*Zenaida macroura*), Inca dove (*Columbina inca*), grackle (*Quiscalus quiscula*), house sparrow (*Passer domesticus*), verdin (*Auriparus flaviceps*), black-chinned hummingbird (*Archilochus alexandri*), Gambel's quail (*Callipepla gambelii*), house finch (*Carpodacus mexicanus*), northern mockingbird (*Mimus polygottos*), European starling (*Sturnus vulgaris*), goldfinch (*Carduelis psaltria*), and killdeer (*Charadrius vociferus*) (Howard et. al, 1990). Mammals are limited to cottontail rabbit (*Sylvilagus audubonii*), domestic cat (*Felis cattus*), and domestic dog (*Canis domesticus*). Herpetofauna present are limited to coachwhip (*Masticophis flagellum*), gopher snake (*Pituophis melanoleucus*), and unidentified toads and lizards (Howard et. al, 1990). No fish species are present within the channel due to the lack of any permanent water source. Fish may be transported into the channel during floods but soon expire when water dries up (Howard et al, 1990). During flow periods, a variety of aquatic organisms inhabit the channel but because flows are often brief and drought conditions usually prevail, few organisms are capable of surviving the long periods of dessication. Species that could realistically survive the harsh conditions within the channel and the wash include flatworms, nematodes, isopods, crayfish, eliminthid beetles, and small crustaceans (Howard et. al, 1990). Aquatic insects present in areas with captured effluent water include damsel flies, dragon flies, and skimmers.

Sensitive Species and Potential Habitat for Sensitive Species. Because of the lack of any permanent water and vegetation in and near the channel and due to the high level of disturbance of those few areas with even temporary water and disturbed vegetation, no suitable habitat for sensitive plant or wildlife species occurs within the Phoenix Reach to date.

Adjacent Habitat. Much of the adjacent area on either side of the channel has been developed and is occupied by commercial and industrial buildings, sand and gravel mining operations, or has been cleared of vegetation and lays vacant. Further out from the channel, the area is occupied by urban and suburban development with no natural habitat in the immediate vicinity of this reach of the river.

Tempe Reach

The Tempe Reach is almost completely without vegetation within the channel and consists mostly of barren cobbly wash with rock rip rap reinforced banks or banks sparsely vegetated by small ruderal species. No surface water is present in this reach.

Vegetation. The Indian Bend Wash portion of the Tempe Reach is unvegetated except for the northernmost portion that contains a golf course upstream of Curry Road which is planted with turf grass, eucalyptus trees, and other ornamental non-native tree and shrub species. The center of the golf course contains a shallow, narrow stream [approximately 0.6 to 1.2 meters (2 to 4 feet) wide] which drains out before reaching the southern portion of Indian Bend Wash. The remainder of the wash is largely barren except for a few scattered mesquite trees. The Salt River portion of the reach is essentially unvegetated except for a very sparse scattering of small rabbitbrush and small desert broom.

Fish and Wildlife. Wildlife within the river channel consists of mostly avian and small mammal species that frequent those portions of the channel with vegetation, such as the golf course. The species expected to visit this area is mostly limited to urban wildlife species as those identified in the Phoenix Reach.

Sensitive Species and Potential Habitat for Sensitive Species. Due to the lack of vegetation and the development adjacent to the reach, little or no potential for sensitive species exists within the Tempe Reach in its present state.

Adjacent Habitat. Most of the area immediately adjacent to the wash consists of commercial and residential development. A public park exists exists in Indian Bend Wash north of McKellips Road which includes a small lake (McKellips Lake). This lake would likely support migratory birds, waterfowl and small mammals. The park is vegetated with ornamental tree and shrub species and lawn grasses with a permanent lake for recreational purposes. Karsten Golf Course occupies the area just south of the upstream Salt River portion of the Tempe Reach and may also serve as marginal foraging habitat for visiting birds and small mammals. Several parks are located near the downstream portion of the Salt River, including Moeur Park, Papago Park, and Tempe Beach Park.

3.5.2 REGULATORY SETTING

Federal

National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4341 et seq.). NEPA was established to ensure that the environmental consequences of Federal actions were identified and considered in the decision making process. NEPA requires an Environmental Impact Statement (EIS) for actions that would have a significant effect on the environment. Regulations implementing NEPA are set forth in the Council on Environmental Quality Regulations (next paragraph).

Council on Environmental Quality (CEQ) Regulations Implementing the National Environmental Policy Act (40 CFR Parts 1500-1508). CEQ Regulations implementing NEPA establish the requirements of an EIS and the process by which Federal agencies fulfill their obligations under NEPA. The Regulations also define such key terms as "cumulative impact," "mitigation," and "significantly" to ensure consistent application of these terms in environmental documents.

Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.). The endangered Species Act (ESA) protects threatened and endangered species, as listed by the U.S. Fish and Wildlife Service (USFWS), from unauthorized take, and directs Federal agencies to ensure that their actions do not jeopardize the continued existence of such species. Section 7 of the Act defines Federal agency responsibilities for consultation with the USFWS. A Planning Aid Letter (PAL -- see Appendix F) indicates that no endangered species are likely to occur in the study area and a concurrence letter (see Appendix F) received indicates that the project is in compliance with the Act. A formal request for a list of threatened and endangered species likely to occur has been made of the USFWS per ESA regulations.

Executive Orders 11988 and 11990, Floodplain Management and Protection of Wetlands, respectively. These Executive Orders require Federal agencies to provide leadership to protect the natural and beneficial values served by floodplains and wetlands. Federal agencies are directed to avoid development in floodplains where possible, and to minimize the destruction or degradation of wetlands.

Clean Water Act of 1977 (33 U.S.C. 1251 et seq.). Provides for the restoration and maintenance of the physical, chemical, and biological integrity of the nation's waters. Section 404 of the Act prohibits the discharge of dredged or fill materials into waters of the U.S., including wetlands, except as permitted under separate regulations by the U.S. Army Corps of Engineers and Environmental Protection Agency.

Fish and Wildlife Coordination Act (16 U.S.C. 661). Requires federal agencies to coordinate with the USFWS and local state agencies when any stream or body of water is proposed to be modified. The intent is to give fish and wildlife conservation equal consideration with other purposes of water resources development projects. Coordination under the Fish and Wildlife Coordination Act is ongoing and a PAL from the USFWS appears in Appendix F.

3.5.3 References

Arizona Native Plant Society. 1993. *Desert Grasses*. Arizona Native Plant Society Urban Landscape Committee, Tucson, AZ.

_____. 1991. *Desert Ground Cover and Vines*. Arizona Native Plant Society Urban Landscape Committee, Tucson, AZ.

_____. 1990. *Desert Shrubs*. Arizona Native Plant Society Urban Landscape Committee, Tucson, AZ.

_____. 1990. *Desert Trees*. Arizona Native Plant Society Urban Landscape Committee, Tucson, AZ.

Bowers, J.E. 1993. *Shrubs and Trees of the Southwest Deserts*. Southwest Parks and Monuments Association, Tucson, AZ.

_____. 1989. *100 Desert Wildflowers of the Southwest*. Southwest Parks and Monuments Association, Tucson, AZ.

_____. 1987. *100 Roadside Wildflowers of the Southwest*. Southwest Parks and Monuments Association, Tucson, AZ.

Brown, D.E. 1994. *Biotic Communities, Southwestern United States and Northwestern Mexico*. University of Utah Press, Salt Lake City, UT.

Burt, W.H. and R.P. Grossenheider. 1980. *Peterson Field Guide to Mammals of North America and Mexico*. Houghton Mifflin Company, New York, NY.

Cunningham, R.L. 1990. *50 Common Birds of the Southwest*. Southwest Parks and Monuments Association, Tucson, AZ.

Davis, B. 1997. *A Field Guide to Birds of the Desert Southwest*. Gulf Publishing Company, Houston, TX.

Department of Transportation Federal Aviation Administration. 1993. *Final Environmental Impact Statement Sky Harbor International Airport Master Plan Update Improvements, Phoenix, Maricopa County, AZ.*

Dodge, N.N. 1985. *Flowers of the Southwest Deserts*. Southwest Parks and Monuments Association, Tucson, AZ.

Elmore, F.H. 1976. *Shrubs and Trees of the Southwest Uplands*. Southwest Parks and Monuments Association, Tucson, AZ.

Epple, A.O. 1995. *A Field Guide to the Plants of Arizona*. LewAnn Publishing Company, Mesa, AZ

Gould, F.W. 1988. *Grasses of the Southwestern United States*. University of Arizona Press, Tucson, AZ.

Holland, R.F. 1986. *Preliminary Descriptions of the Terrestrial Natural Communities of California*. California Department of Fish and Game, Sacramento, CA.

Howard, Needles, Tammen and Bergendoff. 1990. *Final Tempe Rio Salado Wildlife Habitat Master Plan, Tempe AZ.*

Kearney, T.H. and R.H. Peebles. 1951. *Arizona Flora*. University of California Press, Berkeley, CA.

Page, L.M. and B.M. Brooks. 1991. *Peterson Field Guide Freshwater Fishes*. Houghton Company, New York, NY.

Parker, K.F. 1990. *An Illustrated Guide to Arizona Weeds*. University of Arizona Press, Tucson, AZ.

Powell, J.A. and C.L. Hogue. 1979. *California Insects*. University of California Press, Berkeley, CA.

Scott, S.L. (editor). 1994. *National Geographic Society Field Guide to the Birds of North America, 2nd Edition*. The National Geographic Society, Washington, D.C.

Stebbins, R.C. 1985. *A Field Guide to Western Reptiles and Amphibians*. Houghton Mifflin Company, Boston, MA.

USACE (U.S. Army Corps of Engineers). 1997. Phoenix, AZ. *Rio Salado, Salt River, Arizona General Investigations F3 Package.*

_____. 1995. Los Angeles CA. *Rio Salado, Salt River, Arizona Reconnaissance Report.*

3.6 LAND USE AND RECREATION

3.6.1 ENVIRONMENTAL BASELINE

This section presents information on existing land use patterns, including recreational uses, in the vicinity of the Proposed Action and summarizes the land use regulatory environment. The study area for the evaluation of potential Proposed Action impacts on land use includes the Phoenix and Tempe reaches of the Salt River channel and land uses immediately adjacent to the channel. The study area is located in a urbanized setting and is generally characterized by a mixture of land uses including recreational, industrial, commercial, and residential. Table 3.6-1 (below) lists examples of common land uses categorized according to general land use classifications.

Table 3.6-1 Land Use Classifications

Classification	Examples of Land Uses
Agricultural	Farm Field; Ranch; Orchard; Wholesale Nursery
Commercial	Store; Business Park; Shopping Center; Retail Plant Nursery; Professional Office
Industrial	Oil Well; Oil Refinery; Tank Farm; Substation; Gravel Pit; Concrete Plant; Landfill; Sewer Plant; Transmission Line; Pipeline; Utilities
Institutional	Governmental, public and quasi-public and community-owned facilities; Public and private schools from kindergarten to college/university levels and their support facilities; Post Offices; Libraries; Museums; Places of worship; Day care centers; Police Stations; Government Buildings; Non-profit Housing
Open Space	Significant Ecological Area; Environmentally Sensitive Habitat; Wildlife Refuge/Preserve; River, Stream or Floodplain; Coastal Bluffs or Non-Recreational Area; Vacant Urban Land
Recreational	State, County, City Park; State, County Beach or Vista Point; Recreation Facility; Cultural Center, Museum; Campground; Fairgrounds; RV Park Near Recreation Site; Zoo; Golf Course; Drive-In Theater/Nature Conservancy
Residential	Hillside Management Area; Single or Multi-Family Residential; Condominium or Apartment; Townhouse; RV Park away from Recreation Site; Motel; Mobile Home Park
Transportation	Freeways; Highways; Rail Transit

Phoenix Reach

The Phoenix Reach is located within the City of Phoenix and extends west to east from 19th Avenue to where the Interstate 10 bridge crosses the Salt River channel. This reach is a 8-kilometer (km) (5-mile) portion of the Salt River. According to the City of Phoenix Land Use Plan, the land use designation for the Salt River channel is "Parks/Open Space" (Phoenix, 1995).

The predominant land use types adjacent to the Phoenix Reach are heavy and light industrial, and commercial uses consisting of industrial warehouses and showrooms, sand and gravel mining operations, landfills, and professional offices. Mining activities are ongoing throughout the Phoenix Reach, with material extraction taking place outside of the river channel on the adjacent overbanks (USACE, 1997). Also within this reach are 11 inactive landfills, one of which (the 19th Avenue Landfill) is listed as a Superfund Site by the U.S. EPA. Cleanup activities at the 19th Avenue Landfill are basically complete (USACE, 1997). There are also two active landfill operations which are used for disposal of construction debris. There are up to 880 acres under consideration for improvement in the Phoenix Reach with eight potentially affected land owners (USACE, 1997). Primary land owners include two sand and gravel mining operators (CalMat and United Metro), the City of Phoenix, and the Arizona Department of Transportation. In addition, four private parties own 141.5 acres.

Recreational activities in this area are highly dependent upon the availability of surface water and riparian habitat, both of which are dependent upon the supply and availability of ground water (USACE, 1997). As a result, virtually no recreational activities take place along the Phoenix Reach. Rio Salado Park, located at 12th Street and Elwood Streets on the south side of the River, is the only recreational area adjacent to the Salt River in the Phoenix Reach. The park encompasses approximately 14 acres and contains picnic facilities, and racquetball and basketball courts. Most of the park users are employees of industrial businesses located in the area. According to the City of Phoenix Parks Department, fewer than 200 people visit the park on a weekly basis. There are currently no plans for expansion of the park, and visitation is not expected to increase in the absence of improvements to the Salt River.

Tempe Reach

The Tempe Reach is located within the City of Tempe and consists of three areas: a 2.1-km (1.3-mile) portion of Indian Bend Wash and two segments of the Salt River located immediately upstream and downstream of the City of Tempe's Town Lake. See Figure 2-4 for the location of the Tempe Reach. The Indian Bend Wash portion of the Tempe Reach extends north to south from McKellips Road to the Salt River confluence. The Rio Salado Golf Course is within the Indian Bend Wash channel between McKellips and Curry Roads. The two Salt River portions of the Tempe Reach extend from Priest Drive to the downstream dam of Town Lake, and from the upstream dam of Town Lake to McClintock Road. The 3.2-km (2-mile) portion of the river channel separating the upstream and downstream Salt River segments of the Tempe Reach is to be occupied by Town Lake, which is not part of the Proposed Action. According to the City of Tempe's Rio Salado Plan, the land use designation for both portions of the river channel in the Tempe Reach is "Recreational/Educational" (Tempe, 1996).

There are a mixture of land uses adjacent to both portions of the Tempe Reach. These include commercial and light industrial uses, with recreational uses being the predominant activity. The Tempe Reach offers a number of recreational opportunities. A biking/walking path lies on the west bank of Indian Bend Wash. The Rio Salado Golf Course lies within Indian Bend Wash. Recreational facilities near the Tempe Reach include: Indian Bend Park, Arizona State University's (ASU) Karsten Golf Course, ASU's Sun Devil and Packard Stadiums, B.B. Moeur Park, Tempe Beach Park, the North and South Bank Linear Parks, and a wetlands wildlife habitat area. Activities experienced at these facilities include golfing, picnicking, bicycling, spectator sports, jogging, walking, photography, and birdwatching.

It is expected that recreational activities along the Tempe Reach will increase significantly as a result of the City of Tempe's Town Lake Project, which includes the dedication of over 1,000 acres of land for recreational development and open space. Activities would include picnicking, hiking, bicycling, horseback riding, softball/baseball, volleyball, golfing, water slides, and play areas (Tempe, 1996).

Land Use Types

Table 3.6-2 (below) presents the types and approximate locations of land uses within and along the Phoenix and Tempe Reaches of the Salt River.

Table 3.6-2 Land Use Types Occurring Within and Along the Salt River Channel

Location	Agriculture	Commercial	Industrial	Institutional	Open Space*	Recreation	Residential
Phoenix Reach							
19th Ave. to 7th Ave.			●		●		●
7th Ave. to 16th St.		●	●	●	●	●	●
16th Ave. to Interstate 10 overcrossing			●	●	●		
Tempe Reach							
McKellips Rd. to Curry Rd.		●	●		●	●	●
Curry Rd. to river confluence			●		●	●	●
McClintock Dr. to Town Lake upstream dam					●	●	
Town Lake downstream dam to Priest Drive		●			●	●	

*Refers to the river channel itself.

3.6.2 Regulatory Setting

Land use and recreation regulations, plans, and policies which are applicable to the Proposed Action are described below.

Phoenix General Plan

- Natural resources should be conserved
- The lifestyle of the citizens of Phoenix should be enriched by enhancing and maintaining wildlife and vegetation resources in the community
- Support the development of distinctive features to give neighborhoods a distinctive character and identity
- Provide, preserve, and maintain parks and open space
- Utilize land clearance or redevelopment opportunities to acquire open space in developed areas
- Encourage open space and recreation oriented development of the Rio Salado Development Area
- Work with the Salt River Project to assure the availability of canal banks for trail usage.

City of Tempe, Rio Salado Plan

- Encourage the optimum development of land along the Salt River
- Promote outdoor recreation facilities
- Provide the best features of flood control
- Utilize sensitive environmental planning
- Improve the quality of life in the region.

3.6.3 References

Phoenix, City of. 1995. *General Plan for Phoenix, 1985-2000: General Plan Summary and Land Use Map*. Prepared by the City of Phoenix Planning Department. February (Revised).

Tempe, City of. 1996. *Rio Salado Plan*. Prepared by the City of Tempe Community Development Department.

USACE (U.S. Army Corps of Engineers). 1997. *Rio Salado Feasibility Report, Salt River, Arizona.* Prepared by the U.S. Army Corps of Engineers. August.

3.7 CULTURAL RESOURCES

3.7.1 ENVIRONMENTAL BASELINE

The Salt River Valley (Rio Salado Valley) has been witness to human activity for several thousand years. The prehistoric people who populated the Salt River Valley are called the Hohokam by archaeologists. The Hohokam were an agricultural people, and cotton and corn became important crops circa 500 A.D. By around 900 A.D., the Hohokam people were living in permanent villages, comprised of shallow pithouses arranged in groups around courtyards. It was about this time that they began building ball courts. The Hohokam culture was at its height circa 1200 A.D. and during this time platform mounds and village compounds were numerous and widespread. The Hohokam constructed over 800 km (500 miles) of prehistoric irrigation canals in the Salt River Valley. Due to changes in rainfall patterns and other factors, the Hohokam culture collapsed around 1450 A.D. Several Spanish expeditions visited the Salt River Valley after the first Spanish contact by Coronado in 1540 A.D. The City of Phoenix, however, was not established until 1870.

A records and literature search was conducted by Corps archaeologists at the regional archaeological clearinghouse (State Historic Preservation Office, Phoenix), the Office of Cultural Resource Management at Arizona State University, and the Archaeologist for the City of Phoenix. The results of the records search indicate that no resources listed in, or eligible for, the National Register of Historic Places are recorded within the area of potential effects (APE) for the project.

The Tempe portion of the project has been studied as part of the Indian Bend Wash project in the 1970s. Archaeological surveys identified one archaeological site (AZ U:9:45) near Indian Bend Wash. The site was tested by the Arizona State Museum in 1974, and does not qualify for the National Register of Historic Places. In addition, the Arizona Department of Transportation sponsored studies as part of the Red Mountain Freeway project. Again, no significant cultural resources were encountered. Archaeological site AZ U:9:78 was, when originally recorded, on the bank of the river in the vicinity of the APE. An intensive survey by Corps archaeologists in September 1997 revealed that a majority of the south side of the river has since moved (via fill deposition) approximately 200-400 meters (1/8-1/4 mile) north. Archaeological site AZ U:9:78 will be avoided by the proposed project. Therefore, the Tempe portion of the project does not contain known resources eligible for, or listed in, the National Register of Historic Places.

The Phoenix portion of the APE was surveyed by archaeologists from the Corps in September 1997. Both banks (north and south) of the Salt River were walked systematically. Gravel mining and the deposition of landfill waste has destroyed much of the river bank areas. Based on the records search, one archaeological site was recorded within the APE. Archaeological site S-54, 18PG could not be relocated. An intensive survey of the alleged site location yielded evidence of extensive disturbance by landfill and business park construction. An intensive pedestrian survey of both banks of the river located two possible historic landfills, in addition to several recent waste landfills. Refuse dating from the 1940s was observed eroding from two locations along the Phoenix portion of the river. The historic refuse is in a very disturbed context. The placement of refuse along the river may have served for flood control, as well as convenience. Given the disturbance, and the absence of important information (potential or otherwise), the historic landfills are not eligible for listing in the National Register of Historic Places. The entire environmental setting has been severely impacted by erosion. There are very few areas that exhibit relatively intact, natural landforms. Archaeological surveys were more intensive in these few areas.

In summary, the Phoenix portion of the project does not contain resources eligible for, or listed in, the National Register of Historic Places.

3.7.2 REGULATORY SETTING

The Federal government has developed laws and regulations designed to protect cultural resources that may be affected by actions undertaken, regulated, or funded by Federal agencies. Most of these are based on the National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA).

The Proposed Action must comply with NEPA and the NHPA. The NHPA provides a detailed process by which the assessment of impacts on archaeological and historical resources, as required by the Act, is implemented. According to NHPA, three steps are required for compliance: 1) identification of significant resources that may be affected by an undertaking; 2) assessment of project impacts on those resources; and 3) development and implementation of mitigation measures to offset or eliminate adverse impacts. The National Historic Preservation Act is summarized below.

The National Historic Preservation Act of 1966 establishes the National Register of Historic Places (or "National Register") and defines the Section 106 process requiring Federal agencies to consider the effects of an action on cultural resources in or eligible for listing in the National Register. Criteria for determining eligibility of cultural resources for listing in the National Register are provided in the Code of Federal Regulations (36 CFR Part 800). The Section 106 review process is administered by the Advisory Council on Historic Preservation and is further defined in 36 Code of Federal Regulation 800 (36 CFR 800). As part of this process, a letter of project of effect regarding the proposed Rio Salado Project has been sent by the Corps to the Arizona State Historic Preservation Officer (see Appendix E). SHPO has concurred with the Corps' determination of no project effect (see Appendix E), and the project therefore is in compliance with the Act.

3.8 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

This section describes the existing environmental conditions in the project area relating to hazardous, toxic, and radioactive waste. Information presented in this section is derived primarily from the *Rio Salado, Salt River, Arizona, General Investigations, F4 Package* (USACE, 1997) prepared by the U.S. Army Corps of Engineers, Los Angeles District.

3.8.1 ENVIRONMENTAL BASELINE

Soils within the river bed are very gravelly sands to the very fine sandy loam typical of alluvial deposits. The soils are potentially subject to contamination from several sources: toxic materials in discharge from storm water collector systems carrying metals, grease, and oils of minimal toxicity, and from overland flows transmitting sediment and fertilizers. However, as of 1989, municipal testing at storm water discharge points has not indicated contaminants in sufficient quantities to discount use of soils from the river channel for certain types of projects. There are no known sources of persistent pesticides in the study area and only two minor petroleum spills have been recorded within the western end of the Tempe Reach.

Twenty-four official landfill sites occur along the Salt River's edge within the greater Phoenix-Tempe metropolitan area. These landfills present numerous constraints for development. At several of these sites, testing revealed excesses of common cations and anions. The most dangerous substance was a potential carcinogen, vinyl chloride. The ground water is unsuitable for domestic use without prior treatment. Other landfill sites have not been tested and many of them are considered to have some potential for contamination. Ground water monitoring is being conducted at the two former municipal landfills that are present along the Phoenix Reach (19th Avenue and Del Rio landfills).

The North Indian Bend Wash Superfund site is located northeast of the Indian Bend Wash portion of the project. The site is bounded by Scottsdale Road on the west, Chaparral Road on the north, Pima Road on the east, and McKellips Road on the south.

Industrial chemicals were found in wells operated by the Cities of Scottsdale, Tempe and Phoenix in 1981, and in 1983 the U.S. Environmental Protection Agency designated North Indian Bend Wash as a Federal Superfund site due to the solvent trichloroethylene (TCE), which is present in the ground water below the site. In addition, the South Indian Bend Wash Superfund site is located east of the project area, and due to the location and content can be considered to be combined with the North Indian Bend Wash site to create one larger site.

A treatment facility has been constructed on the east edge of Pima Park to remove the contaminants from the water by an air-stripping process. Water is pumped from the aquifer, and treated prior to being introduced to the public water supply. The water is tested daily, and test results are used to determine compliance with Federal and State drinking water standards and other legal requirements. The pumping of the groundwater has two beneficial results in that it both slows the movement of the underground plume and cleans up the aquifer by removing the contamination.

Eleven inactive and two active landfills are located within the Phoenix Reach of the study area (see Table 3.8-1). These landfills were created by filling areas of the river that had either naturally eroded, or had been excavated through gravel mining. There are no active municipal waste landfills in the project area, although both of the gravel mining companies, CalMat and United Metro, have active landfill operations within the Phoenix Reach. These operations involve the acceptance of both inert construction debris and inert miscellaneous materials to fill in areas excavated by their sand and gravel extractions.

Table 3.8-1 Existing Landfills Along the Salt River in Downtown Phoenix

Name	ID Number	Owner	Location	Status
19th Avenue	C11508 (49000000*)	City of Phoenix	N. and S. bank, east of 19th Avenue	Inactive, superfund clean up resulted in capping materials with soil cement and fill
7th Avenue	C11511	James McDonald	N. bank, west of 7th Avenue	Inactive, capped with fill, vacant land on top
Rio Salado #8	C11561	United Metro	S. bank, west of 7th Avenue	Active, United Metro accepting construction debris
Rio Salado #32	C11542	United Metro	S. bank, east of 7th Avenue	Inactive, gravel operations in progress on site
Central Avenue Landfill	C11505	United Metro	N. bank, west of Central Ave.	Inactive, vacant land on top of fill, permitted under GQPP G-007007
Rio Salado #6	C11560	CalMat Properties	S. bank, east of Central Ave.	Inactive, vacant land on top of fill
Rio Salado #3	C11539	(multiple) owners	N. bank, 0.8 km (0.5 miles) west of 16th Street	Inactive, capped with gabion lining and fill, buildings situated on top
Del Rio	C11507	City of Phoenix	S. bank, 0.4 km (0.25 miles) west of 16th Street	Inactive, capped with fill, City park and vacant land on top, under Water Quality Assurance Revolving Fund (WQARF) authority.
Rio Salado #27	C11538	CalMat Properties	0.4 km (0.25 miles) west of 24th St. on Raymond St.	Inactive, gravel operations in progress on site
Rio Salado #28	C11536	CalMat Properties	0.8 km (0.50 miles) west of 24th St. on Raymond St.	Inactive, gravel operations in progress on site
Rio Salado #29	C11537	CalMat Properties	NE corner of 16th & Elwood Streets	Inactive, gravel operations in progress on site
CalMat Landfill	None 07034300*	CalMat Properties	N. bank, west of 24th Street	Active, accepting construction debris
Rio Salado #26	C11535	Robert McIntyre	S. bank, east of 24th Street	Inactive, auto wrecking yard situated on top of fill

* Arizona Department of Environmental Quality (ADEQ) USAS Number. The numbers listed represent ID numbers in a format no longer used by ADEQ; as most of these landfills are inactive, the ID number was never updated to the new format. The ADEQ ID Number listed is therefore still current.

The Arizona Department of Environmental Quality and Maricopa County regulate the build-up of methane gas which occurs as a by-product of the decomposition process of solid waste. Because methane gas has been known to migrate and can become trapped under structures, the City of Phoenix has installed methane gas monitoring and migration control systems at the two former municipal landfills located along the Phoenix Reach.

No radioactive waste disposal sites are located within the project area.

3.8.2 REGULATORY SETTING

The **Federal Resource Conservation and Recovery Act of 1976** (RCRA) established a program administered by the U.S. Environmental Protection Agency (USEPA) for the regulation of the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA was amended in 1984 by the **Hazardous and Solid Waste Act** (HSWA), which affirmed and extended the "cradle to grave" system of regulating hazardous wastes. The use of certain techniques for the disposal of some hazardous wastes was specifically prohibited by HSWA.

The **Comprehensive Environmental Response, Compensation and Liability Act** (CERCLA) provides USEPA the authority to identify and clean up contaminated hazardous waste sites. CERCLA also contains enforcement provisions for the identification of liable parties, it details the legal claims which arise under the statute, and provides guidance on settlements with the USEPA. Section 120 of this Act addresses hazardous waste cleanups at Federal facilities and requires the creation of a Federal Agency Hazardous Waste Compliance Docket, which lists facilities that have the potential for hazardous waste problems. In addition, a Hazardous Substance Superfund was established to pay USEPA's cleanup and enforcement costs and certain natural resource damages, but also to pay for certain claims of private parties.

The **Occupational Safety and Health Administration (OSHA)** is the primary federal agency responsible for worker safety in the handling and use of chemicals in the workplace. The employer is required to monitor worker exposure to listed hazardous substances and notify workers of exposure (8 CCR Sections 337-340). The regulations specify requirements for employee training, availability of safety equipment, accident-prevention programs, and hazardous substance exposure warnings.

3.8.3 REFERENCES

USACE (U.S. Army Corps of Engineers). 1997. Los Angeles District, South Pacific Division. *Rio Salado Feasibility Report, Salt River, Arizona*. August.

3.9 AESTHETICS

3.9.1 ENVIRONMENTAL BASELINE

The study area for the evaluation of potential impacts on aesthetic resources includes the Phoenix and Tempe reaches of the Salt River channel and land uses immediately adjacent to the channel. In general, the Salt River itself tends to be dry for most of the year and supports little or no vegetation. The portions of the river in the proposed project study area are located within the highly urbanized areas of the Cities of Phoenix and Tempe. The study area is generally characterized by a mixture of land uses including heavy and light industrial, commercial, residential, recreational, and open space areas (mainly the river channel itself). See Table 3.6-2 in Section 3.6 (Land Use and Recreation) for land use types within and adjacent to the Salt River channel.

Phoenix Reach

The Phoenix Reach can be characterized as highly disturbed and having poor scenic quality. The majority of this reach consists of heavy industrial uses such as sand and gravel mining operations, active and inactive landfills, auto salvage yards, and warehouses that support manufacturing activities.

Long-range views from the downstream portions of this reach include the Papago Buttes to the north, the Tempe Butte to the South, Arizona State University to the southwest, and the continuation of the river channel to the east and west. Short-range views include vistas typical of city landscapes, such as bridge overcrossings, utility corridors, high- and low-rise commercial and industrial buildings, vehicular traffic, and deteriorating single-family residential units. The majority of this reach is channelized, with both slopes covered with soil cement. Within and along the banks of the river channel itself, there is man-made debris such as cement blocks, pipes, rubber, metal, bricks, and tires with occasional vegetation and cobblestones.

This reach is virtually devoid of vegetation. There is a small area south of the river channel adjacent to the Interstate 10 overcrossing that contains remnant riparian vegetation such as cottonwoods, willows, and mesquite (USACE, 1997b).

Tempe Reach

The Indian Bend Wash portion of the Tempe Reach extends north to south from McKellips Road to the Salt River confluence. The Rio Salado Golf Course is within the Indian Bend Wash channel between McKellips and Curry Roads. The Rio Salado Golf Course is planted with bermuda grass, eucalyptus and other non-native vegetation on the east bank, and with grass, trees, and Palo Verde on the west bank. South of Curry Road views become characteristic of native desert conditions, and are composed mainly of river run stone and a dry river bed, with a few remnant mesquite trees. Views to the west include a bike path that runs along the top of the west side levee of the river channel, and light industrial uses such as a lumber yard. Views to the east are dominated by numerous power poles and light industrial uses. Indian Bend Wash terminates at a soil cement triple drop structure at the confluence of the Salt River. The main visual feature at the southern end of Indian Bend Wash is the State Route 202 overpass which runs east to west along the north bank of the Salt River.

The Salt River portion of the Tempe reach extends west to east from Priest Drive to the downstream dam of Town Lake, and from the upstream dam of Town Lake to McClintock Road. It should be noted that the 3-km (2-mile) portion of the Salt River which includes Town Lake is not part of the Proposed Action. The river in this area is composed of a gravel and river-run rock low-flow channel, with steep side slopes. Levees have been constructed along the river banks to contain the flood flows within the channel, and this portion of Salt River is largely artificial, with few natural features, and very little vegetation being present. Long-range views include Papago Buttes located about 1.6 km (one mile) to the northwest, Tempe Butte and Arizona State University facilities (e.g., Sun Devil Stadium) to the south. Views to the south include sand and gravel pit operations and salvage yards, with the Arizona State University Karsten Golf Course bordering the Tempe Reach. Views to the north include State Route 202. Views to the west and east are composed of the river channel itself.

3.9.2 REGULATORY SETTING

Regulations, plans, and policies related to visual resources which are applicable to the Proposed Action are described below.

Phoenix General Plan

- Natural resources should be conserved
- The lifestyle of the citizens of Phoenix should be enriched by enhancing and maintaining wildlife and vegetation resources in the community
- Support the development of distinctive features to give neighborhoods a distinctive character and identity
- Provide, preserve, and maintain parks and open space.

City of Tempe, Rio Salado Plan

- Preserve open space in Tempe
- Utilize sensitive environmental planning
- Improve the quality of life in the region.

3.9.3 References

Phoenix, City of. 1995. *General Plan for Phoenix, 1985-2000: General Plan Summary and Land Use Map*. Prepared by the City of Phoenix Planning Department. February (Revised).

Tempe, City of. 1996. *Rio Salado Plan*. Prepared by the City of Tempe Community Development Department.

USACE (U.S. Army Corps of Engineers). 1997. *Rio Salado, Salt River, Arizona Feasibility Report*. Prepared by the U.S. Army Corps of Engineers. January.

_____. 1997b. Preliminary Environmental Impact Statement for the Rio Salado Environmental Restoration (rough draft). Prepared by the U.S. Army Corps of Engineers, Los Angeles District. January.

3.10 NOISE

This section describes the existing noise environment as it relates to the construction and operation of the proposed Rio Salado project, which is located in the Cities of Phoenix and Tempe. Specifically, Section 3.10.1 describes the existing environmental baseline conditions, while Section 3.10.2 describes the regulatory baseline. Refer to Section 2.1 for a detailed description of the Proposed Action.

3.10.1 ENVIRONMENTAL BASELINE

A noise environment consists of a base of steady "background" noise that is the sum of many distant and indistinguishable noise sources. Superimposed on this background noise is the sound from individual local sources. These sources can vary from an occasional aircraft overflight to virtually continuous noise from traffic on an adjacent street.

To describe noise environments and to assess impact on noise sensitive areas, a frequency weighting measure that approximates human perception is customarily used. It has been found that *A-weighting* of sound intensities best reflects the human ear's reduced sensitivity to low frequencies and correlates well with human perceptions of the annoying aspects of noise. The A-weighted decibel scale (dBA) is the one cited in most noise criteria. Table 3.10-1 lists typical sound levels measured in the environment and characterizes the subjective human response to various intensities of noise.

Table 3.10-1 Typical Sound Levels Measured in the Environment

Common Sounds	A-Weighted Sound Level in Decibels	Subjective Impression
Jet Takeoff at 200 feet	120	Pain Threshold
Rock Band at 200 feet	110	
707 Landing at 370 feet 707 Takeoff at 1000 feet	100	Very Loud
Diesel at 50 feet	90	
Garbage Disposal	80	Moderately Loud
Vacuum Cleaner at 10 feet	70	
Air Conditioner at 100 feet	60	
Quiet Urban Daytime	50	Quiet
Quiet Urban Nighttime	40	
Bedroom at Night	30	
Recording Studio	20	Just Audible
Threshold of Hearing	10 0	

Sources: Aviation Planning Associates. 1978. *Calculations of Maximum A-weighted Sound Levels (dBA) Resulting from Civil Aircraft Operations*; 1979. *Seminar on Noise Control Plan Development*. Arnold Peterson and Ervin Gross. 1963.

Several standards or "metrics" are used in the assessment of noise impacts. These include the median level, the day-night average, and the Community Noise Equivalent Level (CNEL). The median is the decibel level exceeded 50 percent of the time (and commonly designated by "L50"). The interval can be the day, night, or 24-hour period. The day-night average (L_{dn}) is a 24-hour weighted average, wherein 10 dBA is added to noise measured from 10 p.m. to 7 a.m. The CNEL is also a weighted average, wherein 5 dBA is also added to measured noise between 7 p.m. and 10 p.m. The "peak" noise level is often computed by L_{10}, the noise level exceeded 10 percent of the time. The background level is often computed in terms of L_{90}.

Physical Environment

As described in Section 2.1.1, the proposed Rio Salado project is located along two separate segments of the Salt River in the Cities of Phoenix and Tempe. The Phoenix Reach is a 8-km (5-mile) segment of the Salt River between 19th Avenue and Interstate 10 (see Figure 2-3), which is southwest of the Phoenix Sky Harbor International Airport. The Tempe Reach includes a portion of the Indian Bend Wash and the Salt River just north of Arizona State University (see Figure 2-4). The principal sources of noise in the general vicinity of the proposed Rio Salado project include: motor vehicle traffic along highways, railroad operations (e.g., Union Pacific Railroad Company), commercial and industrial operations, and commercial and military aircraft operations out of Phoenix Sky Harbor International Airport. A description of the noise generated from each source category is described below in the following paragraphs.

Motor Vehicle Traffic Along Highways. There are a number of Interstate (i.e., Interstate 10) and State Highways (e.g., Red Mountain Freeway) that cross or run parallel to the proposed Rio Salado project area. As described in Section 3.11.1, approximately 190,000 vehicles travel along Interstate 10 (between 19th Avenue and Broadway Road) on a daily basis (ADOT, 1997). Noise levels adjacent to major highways like Interstate 10 often exceed 70 dBA, which is usually characterized as a moderately loud noise level.

Railway Operations. Union Pacific Railroad Company operates a railway line that parallels the study area approximately 2.4 km (1.5 miles) south of Interstate 10. Noise generated from the trains passing along Union Pacific railway line is dependent on the speed of the trains, the number of rail-cars, and the operational frequency of the train's warning horn. According to Mr. Gary Houk of Union Pacific Railroad Company, approximately eight Union Pacific trains travel along the subject railway line each day (Union Pacific, 1997).

Commercial/Industrial Operations. As described in Section 3.6 (Land Use and Recreation), the study area is located in a urbanized setting and is generally characterized by a mixture of land uses. Specifically, the land use adjacent to the Phoenix Reach includes heavy and light industrial, commercial uses consisting of industrial warehouses and showrooms, sand and gravel mining operations, landfills, and professional offices. Open-pit mining activities are ongoing throughout the Phoenix Reach, with material extraction taking place outside of the river channel on the adjacent overbanks (USACE, 1997). These industrial operations, especially the open-pit mining operation, generate noise from heavy-duty construction equipment operations and from trucks transporting product to and from the subject area. However, these noise levels typically occur within the daytime hours and do not exceed the local noise standards.

There are a mixture of land uses along both portions of the Tempe Reach, they include commercial and light industrial uses, with recreational uses being the most predominant activity. In general, these land uses tend to generate less noise than those described for the Phoenix Reach.

Aircraft Operations. The closest airport to the study area is the Phoenix Sky Harbor International Airport, located north of Interstate 10 between 24th and 40th Streets. As described in Section 3.11 (Transportation), the Phoenix Sky Harbor International Airport is currently being expanded to include a third runway to the south. Expansion of the airport is currently underway and should be completed in the Spring or Fall of 1999 (City of Phoenix, 1997).

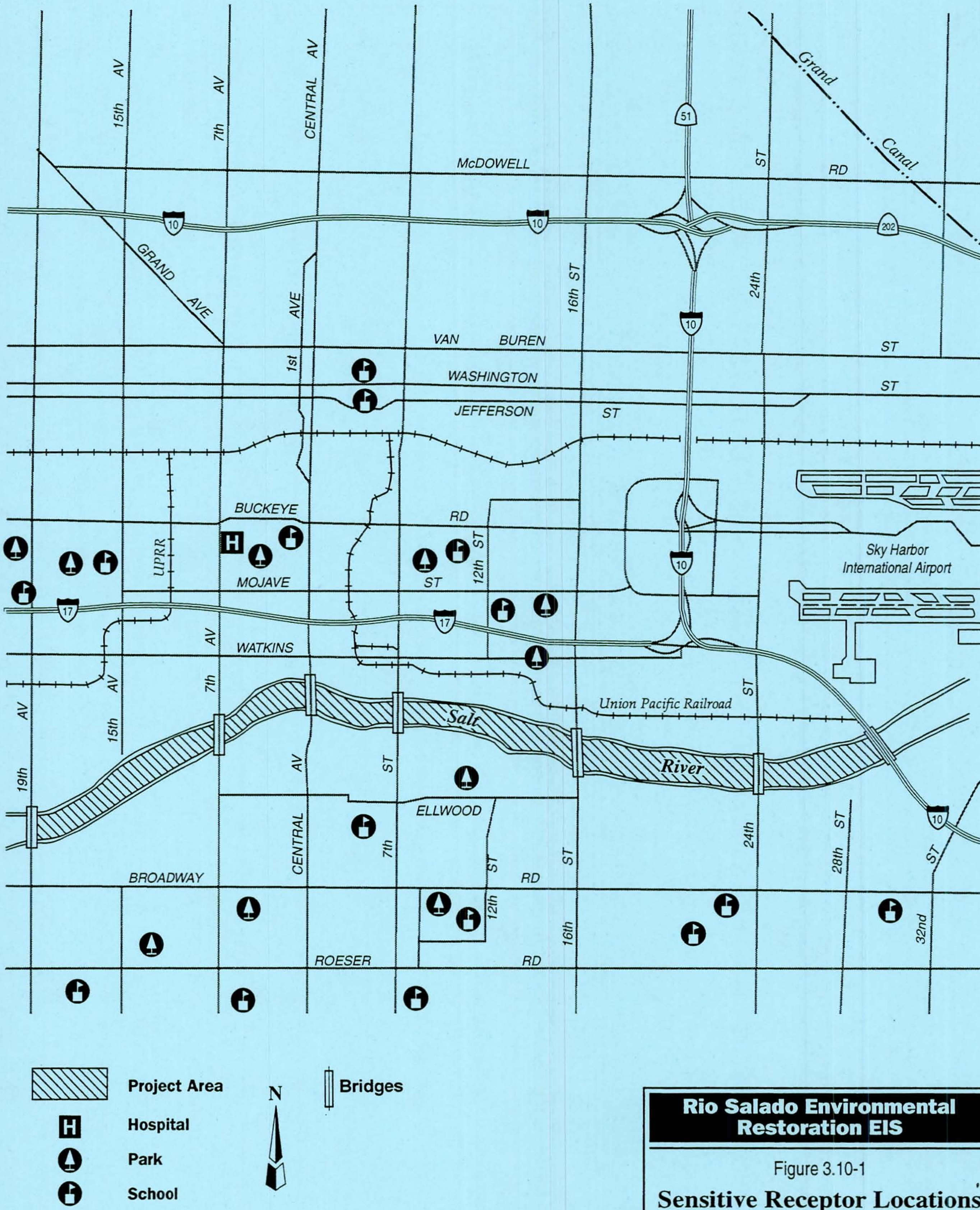
The City of Phoenix completed an Environmental Impact Statement (EIS) for the airport expansion in 1993, which included detailed maps illustrating the existing and projected noise environment near the subject airport. Based on the maps within the Final EIS, it appears that some areas along the Phoenix and Tempe Reaches would experience noise levels of 65 dBA from aircraft operating out of the Phoenix Sky Harbor International Airport (DOT, 1993). This is a result of the east-west flight patterns of the aircrafts landing and taking-off at the subject airport.

Sensitive Receptors. Sensitive noise receptors such as single-family residential units, parks, and schools are located within the subject study area. Refer to Figures 3.10-1 and 3.10-2 for locations of the sensitive receptors along the two reaches.

3.10.2 REGULATORY SETTING

Federal and State Standards and Regulations

There are no federal noise standards that directly regulate environmental noise from construction or project operation. Federal regulations safeguard the hearing of workers exposed to occupational noise, enforced by the Office of Safety and Health Administration (OSHA). Further, the U.S. Environmental Protection Agency (USEPA) has developed guidelines on recommended maximum noise levels to protect public health and welfare (USEPA, 1974). For example, 55 dBA is the maximum for the annual average day-night level in outdoor areas (USEPA, 1978).

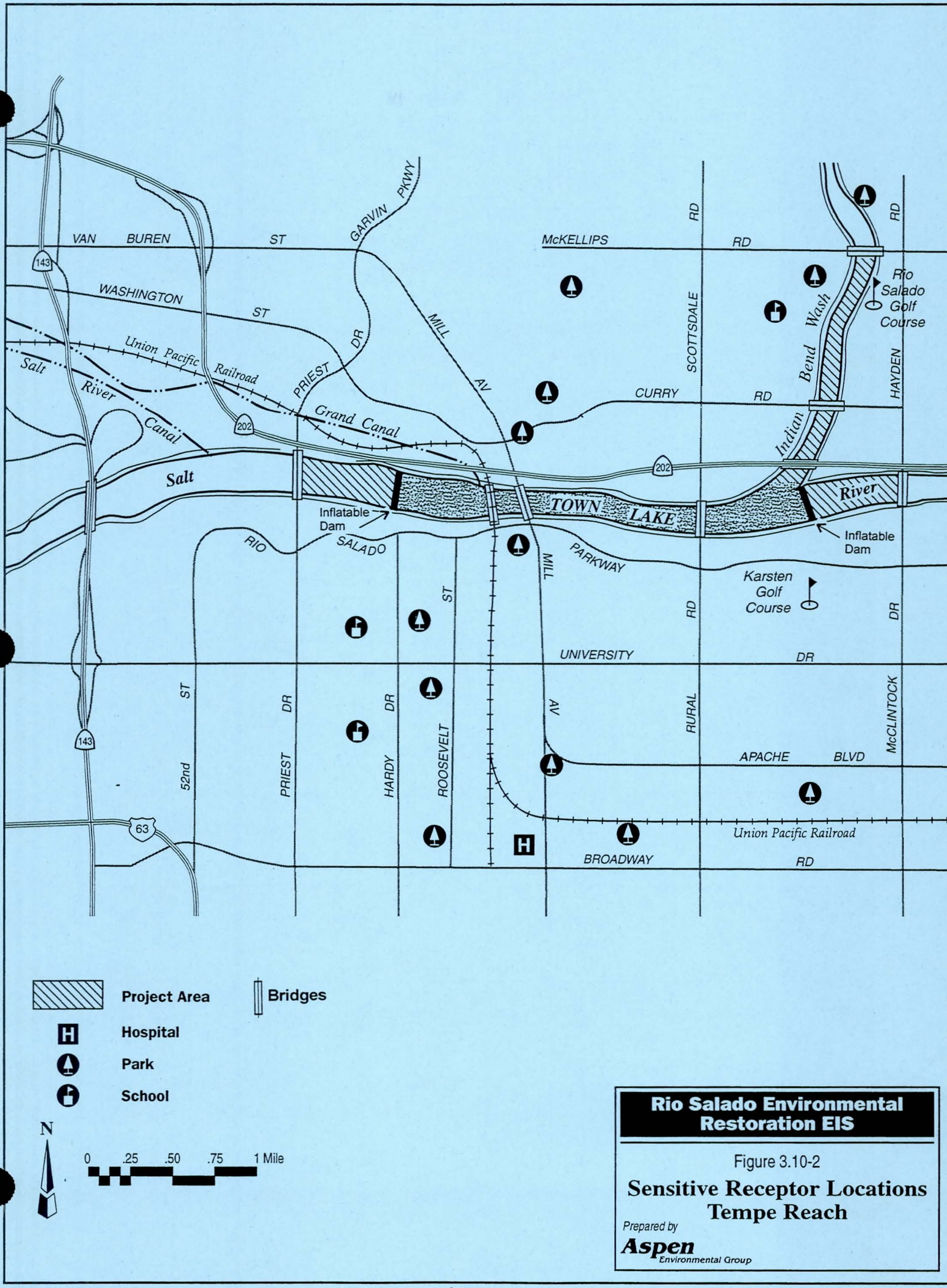


Rio Salado Environmental Restoration EIS

Figure 3.10-1

Sensitive Receptor Locations Phoenix Reach

Prepared by
Aspen Environmental Group



Rio Salado Environmental Restoration EIS

Figure 3.10-2

Sensitive Receptor Locations Tempe Reach

Prepared by

Aspen Environmental Group

Regional and Local Regulations and Standards.

City of Phoenix. The Phoenix Zoning Ordinance specifies the average noise levels for various land use categories. The City Code includes specific hours for construction operations. During weekdays, construction hours include the period between 6:00 a.m. and 7:00 p.m. from the first day of May to and including the 30th day of September, and between the hours of 7:00 a.m. and 7:00 p.m. beginning the first day of October to and including the 30th day of April. Extended construction work hour permits would be required for Saturdays, Sundays, and hours that are beyond the construction periods described above.

City of Tempe. The City of Tempe has specific codes that regulate noise levels from the construction and operation of a project. Table 3.10-2 lists the allowable noise levels for various land use zones, which are provided in Section 20 of the City Code. In addition, Section 20-8 of the City Code lists the specific times construction activities can operate during a given year. Refer to Table 3.10-3 for a list of start and stop times for construction operations in the City of Tempe. With regard to weekends and holidays, Section 20-8 specifies that construction or repair work shall not begin prior to 7:00 a.m. and must stop by 7:00 p.m., and concrete pouring should not begin prior to 6:00 a.m. and must stop by 7:00 p.m.

Table 3.10-2 Allowable Noise Levels

Zone	Time	Sound Level (dBA)
Residential	10:00 p.m. - 7:00 a.m.	45
	7:00 a.m. - 10:00 p.m.	55
Commercial	10:00 p.m. - 7:00 a.m.	55
	7:00 a.m. - 10:00 p.m.	65
Industrial	10:00 p.m. - 7:00 a.m.	60
	7:00 a.m. - 10:00 p.m.	70

Table 3.10-3 Start and Stop Times For Construction

Construction Activity	Part of Year	Time
Concrete Pouring	April 15 to October 15	5:00 a.m. - 7:00 p.m.
	October 16 to April 14	6:00 a.m. - 7:00 p.m.
All Other Construction in Residential Zones or within 500 hundred feet	April 15 to October 15	6:00 a.m. - 7:00 p.m.
	October 16 to April 14	7:00 a.m. - 7:00 p.m.
Construction in Commercial and Industrial Zones not within 500 hundred feet of a Residential Zone	All year	5:00 a.m. - 7:00 p.m.

3.10.3 REFERENCES

Aviation Planning Associates. 1979. *Seminar on Noise Control Plan Development.*

_____. 1978. *Calculations of Maximum A-weighted Sound Levels (dBA) Resulting from Civil Aircraft Operations.*

ADOT (Arizona Department of Transportation). 1997. Personal Communication with Bob Pike. July 30 and August 1.

DOT (Department of Transportation, Federal Aviation Administration Department). 1993. *Final Environmental Impact Statement for the Sky Harbor International Airport Master Plan Update Improvements.*

Phoenix, City of. 1997. Personal Communication with Joan Sherwood. August 1.

Union Pacific. 1997. Personal Communication with Gary Houk. August 1.

USEPA (U.S. Environmental Protection Agency). 1978. *Protective Noise Levels.* Condensed version of USEPA levels document (No. PB82-138827).

_____. 1974. *Information on Levels of Environmental Noise Requisite to Protection Public Health and Warfare with Adequate Margin of Safety.* Report No. 550/9-74-004. March.

3.11 TRANSPORTATION

This section addresses the effects on transportation that may result from the implementation of the proposed Rio Salado environmental restoration project in the Cities of Phoenix and Tempe, Arizona. Specifically, Section 3.11.1 describes the existing environmental baseline conditions within the subject study area, while Section 3.11.2 describes the applicable regulatory setting. Refer to Section 2 (Alternatives Considered, Including Proposed Action) for a detailed description of the proposed project and the study area boundaries.

3.11.1 ENVIRONMENTAL BASELINE

As described in Section 2.1.1, the proposed Rio Salado project consists of the restoration of two sites (Phoenix and Tempe Reaches) along the Salt River in the State of Arizona. The Phoenix Reach is approximately 8 kilometers (km) (5 miles) in length and it is located along the Salt River between 19th Street and Interstate 10, southwest of Sky Harbor International Airport. The Tempe Reach includes three areas which would be restored along the Salt River and Indian Bend Wash located between McKellips Road to the north, McClintock Drive to the east, Salt River to the South, and Priest Drive to the west. As illustrated in Figure 2-2 (Project Site Location), many highways and roadways cross or parallel the proposed Rio Salado project study area. A description of the local highways and roadways are provided below.

Interstate Highways. Interstate 10 is an interstate highway that extends from southern California to Jacksonville, Florida. Near the study area, Interstate 10 is a 8- to 10-lane highway that extends in a east-west direction from 19th Avenue (in Phoenix) to Broadway Road (in Tempe). According to the Arizona Department of Transportation (ADOT), the average daily traffic (ADT) volume along this segment of Interstate 10 is approximately 190,000 (ADOT, 1997). Within the vicinity of the study area, nine interchanges connect with Interstate 10 and they include: 19th Avenue, 7th Avenue, 7th Street, 16th Street, 24th Street, University Drive, 40th Street, 48th Street, and Broadway Road.

State Highways. There are four state highways in the vicinity of the study area, they include: Highway 51 (Squaw Peak Parkway), Highway 202 (Red Mountain Freeway), Highway 143 (Hohokam Expressway), and Highway 101 (Pima Freeway). Highway 51 is a local highway that connects at Interstate 10 and heads north-northeast for approximately 13 km (8 miles) and ends just north of the Phoenix Mountains Preserve. Highway 202 is a relatively new highway that parallels the Salt River portion of the Tempe Reach to the north and connects Highway 101 with Interstate 10. Highway 143 is a north-south trending freeway that connects Interstate 10 with Highway 202, and crosses the Salt River just east of Sky Harbor International Airport. In eastern Tempe, Highway 101 runs north-south connecting U.S. Highway 60 with Highway 202. Refer to Table 3.11-1 for the average daily traffic (ADT) volumes along the subject highways.

Table 3.11-1 Existing Traffic Volumes Along State Highways

Highway	Location	Daily Traffic Volumes	Year
Highway 51 (Squaw Peak Parkway)	Between Thomas Road and McDowell Road	131,800	1995
Highway 51 (Squaw Peak Parkway)	Between Indian School Road and Camelback Road	141,600	1995
Highway 101 (Pima Freeway)	Between Southern Avenue and Broadway Road	46,000[a]	1995
Highway 101 (Pima Freeway)	Between Apache Boulevard and University Drive	52,000[a]	1995
Highway 143 (Hohokam Expressway)	Between Washington Street and Highway 202	69,175	1995
Highway 143 (Hohokam Expressway)	Between University Drive and Interstate 10	94,448	1995
Highway 202 (Red Mountain Freeway)	Between Van Buren Street and Priest Drive	53,818	1995
Highway 202 (Red Mountain Freeway)	Between Scottsdale Road and McClintock Drive	50,000	1995

[a] Average Daily Traffic Volumes were recorded before Highway 101 connected with Highway 202
Source: Arizona Department of Transportation (ADOT). 1997.

Local Roadways. There is also a network of local roadways within the study area [see Figure 2-3 (Phoenix Reach) and Figure 2-4 (Tempe Reach)]. In general, the roads throughout the region are well laid out, and traffic flow tends to be relatively unrestricted due to synchronized traffic signals and wide streets with rush-hour lane controls. The ADT volumes for these roadways in the City of Phoenix are listed in Table 3.11-2, while table 3.11-3 lists the ADT along roadways within the City of Tempe.

Table 3.11-2 Existing Traffic Volumes Along Local Roadways within the City of Phoenix

Roadway	Location	Daily Traffic Volumes	Year
Buckeye Road	Between 19th Avenue and 7th Avenue	15,300	96
Buckeye Road	Between 16th Street and 24th Street	15,300	96
Buckeye Road	Between Central Avenue and 7th Street	17,100	96
Broadway Road	Between 19th Avenue and 7th Avenue	16,300	96
Broadway Road	Between 16th Street and 24th Street	18,500	96
Broadway Road	Between Central Avenue and 7th Street	19,800	96
19th Avenue	Between Broadway Road and Buckeye Road	27,300	96
7th Avenue	Between Broadway Road and Buckeye Road	20,000	96
Central Avenue	Between Broadway Road and Buckeye Road	28,000	96
7th Street	Between Broadway Road and Buckeye Road	27,900	96
Elwood Street	Between 7th Street and 16th Street	2,100	96
16th Street	Between Broadway Road and Buckeye Road	23,600	96
24th Street	Between Broadway Road and Buckeye Road	33,700	96
University Drive	Between Broadway Road and 40th Street	20,700	96

Source: City of Phoenix, 1996. "Major Traffic Flow" map

Table 3.11-3 Existing Traffic Volumes Along Local Roads in the City of Tempe

Roadway	Location	Daily Traffic Volumes	Year
Washington Street	Between 56th Street and Priest Drive	20,438	1993
Washington Street	Between Priest Drive and Mills Avenue	23,430	1993
Curry Road	Between Mill Avenue and College Avenue	31,989	1993
Curry Road	Between College Avenue and Scottsdale Road	24,583	1993
Curry Road	Between Scottsdale Road and McClintock Drive	19,842	1993
Scottsdale Road	Between McKellips Road and Curry Road	43,277	1993
Scottsdale Road	Between Curry Road and Rio Salado Parkway	44,530	1993
University Drive	Between 48th Street and Priest Drive	48,014	1991
University Drive	Between Priest Drive and Mill Avenue	39,724	1991
University Drive	Between Mill Avenue and Rural Road	41,767	1991
University Drive	Between Rural Road and McClintock Drive	38,817	1991
Rural Road	Between Rio Salado Parkway and University Drive	39,648	1991
Rural Road	Between University Drive and Apache Boulevard	46,026	1991
Rural Road	Between Apache Boulevard and Broadway Road	53,042	1991
Mill Avenue	Between Curry Road and University Drive	22,141	1993
Mill Avenue	Between University Drive and Apache Boulevard	41,406	1993
Mill Avenue	Between Apache Boulevard and Broadway Road	27,111	1993
McClintock Drive	Between McKellips Road and Curry Road	51,802	1991
McClintock Drive	Between Curry Road and Rio Salado Parkway	53,653	1991
McClintock Drive	Between Rio Salado Parkway and University Drive	50,328	1991
McClintock Drive	Between University Drive and Apache Boulevard	44,000	1991
McClintock Drive	Between Apache Boulevard and Broadway Road	50,849	1991
McKellips Road	Between College Avenue and Scottsdale Road	10,653	1993
McKellips Road	Between Scottsdale Road and McClintock Drive	19,447	1993
Rio Salado Parkway	Between 52nd Street and Priest Drive	2,006	1993
Rio Salado Parkway	Between Priest Drive and Hardy Drive	20,280	1993
Rio Salado Parkway	Between Hardy Drive and Mill Avenue	21,887	1993
Rio Salado Parkway	Between Mill Avenue and Rural Road	21,102	1993
Rio Salado Parkway	Between Rural Road and McClintock Drive	15,396	1993
Priest Drive	Between Van Buren Street and Washington Street	10,574	1993
Priest Drive	Between Washington Street and Rio Salado Parkway	21,496	1993
Priest Drive	Between Rio Salado Parkway and University Drive	29,085	1993
Priest Drive	Between University Drive and Broadway Road	29,085	1993

Source: City of Tempe, July 30, 1997 (www.tempe.gov/traffic)

Existing Rail Facilities. The Union Pacific Railroad Company operates a railway line that parallels the Phoenix Reach between the Salt River and Interstate 10 (see Figure 2-3). Approximately eight Union Pacific trains travel along the railway line on a daily basis (Union Pacific, 1997). In addition, there are also several railroad spurs that connect the gravel pits and industrial facilities located adjacent to the Salt River with the main railway line described above.

Airports. The Phoenix Sky Harbor International Airport is located on the north bank of the Salt River between 24th and 44th Streets, which is northeast of the Phoenix Reach (see Figure 2-2). The airport handles both commercial and Air National Guard aircraft with approximately 530,000 annual aircraft operations (City of Phoenix, 1997). Expansion of the airport is currently underway, and a third runway is planned for the southern portion of the airport adjacent to the Salt River, and scheduled to be complete in the Spring or Fall of 1999 (City of Phoenix, 1997).

3.11.2 REGULATORY SETTING

Construction of the proposed Rio Salado project could potentially affect roadway conditions, access, traffic flow, and parking on public streets and highways. Therefore, it may be necessary for the non-federal sponsors and/or the construction contractor to obtain encroachment permits or similar legal agreements from the public agencies responsible for each affected roadway. Such permits would be needed for any location where an activity would occur physically within the right-of-way of a public road. These encroachment permits may be issued by Arizona Department of Transportation, Maricopa County, City of Phoenix, and the City of Tempe, depending upon which roadways are affected.

3.11.3 REFERENCES

ADOT (Arizona Department of Transportation). 1997. Personal Communication with Bob Pike. July 30 and August 1.

Phoenix, City of. 1997. Personal Communication with Joan Sherwood. August 1.

_____. 1996. "Major Traffic Flow" Map.

Tempe, City of. 1997. City of Tempe's Internet website (www. tempe.gov/traffic). July 30.

Union Pacific. 1997. Personal Communication with Gary Houk. August 1.

SECTION 4. ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This section of the EIS (Section 4, Environmental Consequences) addresses the potential environmental and socioeconomic impacts associated with the Proposed Action and each of the alternatives. The impacts of the Proposed Action and each alternative were evaluated in relation to the existing baseline conditions described in Section 3 (Affected Environment). The analysis attempts to identify all relevant impacts for each issue, including both adverse and beneficial effects of the project. For each issue area, potential impacts were identified and compared with pre-determined significance criteria. Environmental Commitments (also known as mitigation measures) have been presented that would serve to avoid or reduce the adverse effects of each identified significant impact. Each impact has been classified based on the applicable significance criteria and mitigation commitment effectiveness, as follows:

Class I:	Significant; cannot be mitigated to a level that is not significant.
Class II:	Significant; can be mitigated to a level that is not significant.
Class III:	Adverse, but not significant.
Class IV:	Beneficial.

4.2 GEOLOGY AND GEOMORPHOLOGY

This section describes the potential impacts of the Proposed Action and alternatives for the Phoenix and Tempe Reaches relating to geology, landform, and soils. The examination of impacts focuses on effects which the project may have on local landforms and geologic features as well as on constraints and potential hazards presented by geologic and soil conditions. Both adverse and beneficial effects are described.

4.2.1 DEFINITION AND USE OF SIGNIFICANCE CRITERIA

In accordance with NEPA, the effects of a project are evaluated to determine if they would result in a significant adverse impact on the environment. This EIS focuses on the potential effects of the Proposed Action and offers mitigation measures to reduce or avoid any significant impacts which are identified. Based upon the following significance criteria concerning the Proposed Action's effect on geology and soils, the Proposed Action would have significant adverse impact on the environment if it would:

Geology

- Be located within a know active fault zone, or an area characterized by surface rupture that might be related to a fault
- Be constructed on substrate that consists of material subject to liquefaction or other secondary seismic hazards in the event of ground shaking
- Expose of people or structures to geologic hazards, soil and/or seismic conditions so unfavorable that they could not be overcome by special design using reasonable construction and/or maintenance practices
- Substantially alter topography beyond that which would result from natural erosion and deposition
- Trigger or accelerate geologic processes such as landslides, by construction or other disturbance of landforms.

Soils

- Significantly increase wind or water erosion of soils, either on or off site
- Subject project facilities to damage resulting from the presence of shrink-swell, corrosive, or collapsible soils.

4.2.2 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.2.2.1 Proposed Action

Phoenix Reach

Faults and Seismic Hazards. As described in Section 3.2, the project site is not located near an active fault zone nor in an area of significant seismic activity; therefore, the project is not subject to hazards associated with earthquakes, such as ground shaking and surface rupture. Although the alluvial soils and high ground water level in the area represent conditions which could produce liquefaction during an episode of strong ground shaking, the low level of seismic activity in the area precludes a significant hazard. Because the potential for significant seismic activity is low, potential hazards associated with earthquakes are not considered significant **(Class III)**.

Topography. Some landform alteration would be necessary to implement the proposed project, primarily excavation and grading to form the low-flow channel and adjacent benches. Some of the bank areas will also be re-graded. Minor excavation will be required to create the ponds and marshes in the wetland habitat areas, as well as the pools in the low-flow channel. These alterations are necessary to further the objectives of the project, including the restoration of traditional river habitats and protection of these habitats from low-level flood flows (through construction of the low-flow channel). The topography of the channel has already been highly modified by past activities, including sand and gravel mining, landfills, flood control improvements, and bank reinforcement. Natural processes, primarily flood flows, also alter the form and shape of the river channel. After flooding, some grading and excavation will need to be re-initiated to restore the habitat areas and remove sediment from ponds and streams. Although the grading required to implement the project may be extensive, the effects on landform are not considered significant due the highly altered and degraded condition of the river channel **(Class III)**.

Landslides/Slope Stability. The stability of channel banks must be maintained in order to avoid slope failures which might affect properties along the overbanks of the river channel. Although most project construction activities will be confined to the river bottom, some grading of portions of the banks of the river channel is anticipated in order to implement the proposed restoration plan. No specific impacts related to slope stability are anticipated; however, implementation of Environmental Commitments G-1 and G-2 (below) should ensure the avoidance of any potentially significant effects **(Class II)**.

G-1 A soils investigation shall be performed for the project by a professional engineer. The soils investigation shall investigate soil conditions in those portions of the channel where grading is planned and in any areas where structural foundations will be constructed. The soils investigation shall include recommendations for slope stabilization, as necessary, and these recommendations shall be incorporated into construction plans.

G-2 A detailed grading plan shall be prepared for the project delineating existing and final grade elevations and incorporating measures, as necessary, for stabilizing slopes.

Soil Erosion. During periods of large water flows, a continuing process of soil erosion and transport occurs in the river channel. This process will continue with or without the implementation of the proposed project. Although the establishment of native plant materials in the river bottom may help stabilize soils, large flows are expected to wash away a substantial amount of these plants and accompanying soils. The upper banks of the channel are subject to water erosion from surface runoff during small and moderate storms as well as major flood events. The project's establishment of native plant materials on the upper banks of the river may help reduce erosion from surface runoff, producing a potentially beneficial effect

(Class IV). Disturbance of soils during project construction would temporarily increase erosion potential. Erosion from surface runoff is generally more severe on steep, sparsely vegetated slopes and areas of fine sandy or silty soils, and erosion from strong winds is most severe in areas of loose sandy soils. Because some construction activities could take place during periods of precipitation and/or strong winds, some erosion is likely to occur. However, with the implementation of Environmental Commitment G-3 (below), potentially significant erosion impacts would be reduce be reduced to a less-than-significant level **(Class II)**.

G-3 A comprehensive Erosion Control Plan shall be prepared for project construction. The Plan shall identify measures to be implemented to minimize the erosion effects of grading and excavation. Erosion control methods to be described in the Plan and implemented shall include, but not be limited to, the following:

- Avoiding soil disturbance during periods of heavy precipitation or high winds
- Keeping disturbed areas to the minimum necessary for construction
- Reducing surface water flows across graded or exposed areas
- Use of straw bales, soil mats, or silt fences to stabilize disturbed areas, where appropriate
- Use of culverts, ditches, water bars, and sediment traps to control runoff and sedimentation.

Shrink-Swell, Corrosive, or Collapsible Soils. Surface soils in the river channel currently consist primarily of cobbles and gravel. Soils in the proposed habitat areas may have to be modified to create suitable growing conditions for the native plant species to be established on the benches and banks of the channel. Existing soils will need to be amended with organic material or new soil material may need to be imported to the restoration sites. Although soils may need to be modified for restoration purposes, no soil-related impacts are anticipated.

Tempe Reach

Faults and Seismic Hazards. As described in Section 3.2, the project site is not located near an active fault zone nor in an area of significant seismic activity; therefore, the project is not subject to hazards associated with earthquakes, such as ground shaking and surface rupture. Although the alluvial soils and high ground water level in the area represent conditions which could produce liquefaction during an episode of strong ground shaking, the low level of seismic activity in the area precludes a significant hazard. Because the potential for significant seismic activity is low, potential hazards associated with earthquakes are not considered significant **(Class III)**.

Topography. Relatively little landform modification would be required to implement the proposed project. The existing topographic configurations of both Indian Bend Wash and the Salt River currently are generally suitable for the implementation of the proposed project. Some excavation will be required adjacent to the upstream and downstream dams of Town Lake to create the freshwater marsh habitats planned for the Salt River. Some of this excavation has already occurred as a result of the recent construction of the Town Lake dams. No landform alteration will be necessary to implement the restoration of Indian Bend Wash. After the habitat areas have been constructed, some excavation will be needed periodically to remove sediment which is expected to accumulate in the marsh and pond areas from storm flows. After conveying large flood flows, it is anticipated that remedial earthwork will be needed to repair damaged habitat areas in both the Salt River and Indian Bend Wash. Although some grading will be required to implement the project and periodically repair habitat areas, the effects on landform are not considered significant **(Class III)**.

Landslides/Slope Stability. Because the implementation of the proposed project will not involve any alteration of the banks of the channel, the project will have no effects related to slope stability or landslides.

Soil Erosion. During periods of large water flows, a continuing process of soil erosion and transport occurs in the river channel. This process will continue with or without the implementation of the proposed project. Although the establishment of native plant materials in the river bottom may help stabilize soils, large flows are expected to wash away a substantial amount of these plants and accompanying soils. However, the mesquite and other native species planted on the benches of Indian Bend Wash will help stabilize soils and may help reduce erosion experienced as a result of surface runoff during small and moderate storms. This is considered a potentially beneficial effect **(Class IV)**. Disturbance of soils during project construction would temporarily increase erosion potential. Erosion from surface runoff is generally more severe on steep, sparsely vegetated slopes and areas of fine sandy or silty soils, and erosion from strong winds is most severe in areas of loose sandy soils. Because some construction activities could take place during periods of precipitation and/or strong winds, some erosion is likely to occur. However, with the implementation of Environmental Commitment G-3, potentially significant erosion impacts would be reduce be reduced to a less-than-significant level **(Class II)**.

Shrink-Swell, Corrosive, or Collapsible Soils. Surface soils in the river channel currently consist primarily of cobbles and gravel. Soils in the proposed habitat areas may have to be modified to create suitable growing conditions for the native plant species to be established on the benches and banks of the channel. Existing soils will need to be amended with organic material or new soil material may need to be imported to the restoration sites. Although soils may need to be modified for restoration purposes, no soil-related impacts are anticipated.

4.2.2.2 Phoenix Reach Alternatives

Alternative P9: Gravel Pit Restoration, Five-Mile Perennial Stream

Inclusion of the gravel pits adjacent to the banks of the river channel would increase the size of the restoration project by 330 acres. The inclusion of the gravel pits would substantially increase the magnitude of grading and landform modification required for the project. No additional mitigation would be necessary to address this effect. In other regards, the effects of this alternative as they relate to geology and soils are similar to those of the Proposed Action.

Alternative P6: Gravel Pit Restoration, No Perennial Stream

With regard to geology and soils, the effects of this alternative are basically the same as those of Alternative P9 above. Inclusion of the gravel pits adjacent to the banks of the river channel would increase the size of the restoration project by 330 acres. The inclusion of the gravel pits would substantially increase the magnitude of grading and landform modification required for the project. No additional mitigation would be necessary to address this effect. In other regards, the effects of this alternative are similar to those of the Proposed Action.

Alternative P2: No Perennial Stream, No Gravel Pit Restoration

With regard to geology and soils, the effects of this alternative are basically the same as those of the Proposed Action. The amount of area which would be disturbed by grading and construction activities (550 acres) is the same as the Proposed Action.

Alternative P5: Five-Mile Perennial Stream, No Gravel Pit Restoration

With regard to geology and soils, the effects of this alternative are basically the same as those of the Proposed Action. The area which would be disturbed by grading and construction activities is the same as the Proposed Action.

4.2.2.3 Tempe Reach Alternatives

Alternative T3: Indian Bend Wash, Upstream Salt River, and Downstream Salt River (Low-Water Use)

This alternative does not involve the establishment of marsh or riparian habitats and, therefore, would not require any excavation in the Salt River to create ponds. Because this alternative would result in the creation of less habitat area in general, less ground disturbance would occur during construction. In other regards, the effects of this alternative are essentially the same as those of the Proposed Action.

Alternative T4: Indian Bend Wash and Downstream Salt River (High-Water Use)

Grading would be reduced under this alternative because it does not involve the establishment of habitat area in the upstream portion of the Salt River. In other regards, the effects of this alternative are essentially the same as those of the Proposed Action.

Alternative T2: Indian Bend Wash only (Low-Water Use)

This alternative does not include habitat restoration in either segment of the Salt River and involves only the restoration of 20 acres of habitat in the lower portion of Indian Bend Wash. As a result, very little grading and land disturbance would occur under this alternative.

Alternative T6: Downstream Salt River only (High-Water Use)

Under this alternative, habitat would only be created in the downstream portion of the Salt River and, therefore, substantially less grading would be required in comparison to the Proposed Action. Some excavation would be required to create the pond and marsh habitat below the Town Lake dam. Impacts would be similar to those of the Proposed Action, but substantially reduced in magnitude.

4.2.2.4 No Action Alternative

Under the No Action Alternative, conditions along the river channel are expected remain essentially the same as current conditions. The landform of the Salt River and Indian Bend Wash would remain in their current condition, although subject to some modification from large flood flows. Areas of sparse vegetation and erodible soils along the banks and overbanks of the channel would continue to subject to erosion from surface runoff.

4.3 AIR QUALITY

This section describes the potential impacts of the Proposed Action and alternatives for the Phoenix and Tempe Reaches relating to air quality. The examination of impacts focuses on effects which the project may have on air quality due to both project construction and ongoing operation and maintenance activities of the Rio Salado project.

4.3.1 DEFINITION AND USE OF SIGNIFICANCE CRITERIA

Air quality impacts can result from the construction and operation of a proposed project or action. Construction impacts are generally short-term, while impacts from operations can be both short-term and long-term. Employing criteria from the U.S. Environmental Protection Agency (USEPA), the project would be considered to have a significant adverse impact on the environment if it would:

- Cause construction or operational emissions that would result in direct violation of an air quality standard or contribute substantially to an existing or projected air quality violation

- Cause emissions that exceed any Federal Prevention of Significant Deterioration increment threshold

- Cause emissions that would exceed thresholds that trigger emission offset requirements under New Source Review

- Result in non-compliance with the Federal General Conformity Rule (40 CFR Parts 6, 51, and 93) requirements. Under Section 176(c) of the Clean Air Act Amendments (CAAA) of 1990, the U.S. Army Corps of Engineers must make a determination of whether the Proposed Action "conforms" with the State Implementation Plan (SIP). However, under 40 CFR, Section 93.153 (Applicability), if the total direct and indirect emissions from the Proposed Action are below the General Conformity Rule "de minimis" emission thresholds, the Proposed Action would be exempt from performing a comprehensive Air Quality Conformity Analysis, and would be considered to be in conformity with the SIP. Because the study area is in "moderate" non-attainment of the NAAQS for O_3, the General Conformity "de minimis" emission thresholds for ozone (O_3) are 100 tons per year for nitrogen oxides (NO_x) and reactive organic compounds (ROC). It should be noted that there is a potential for the study area to be re-classified as a "serious" non-attainment area for the NAAQS for O_3. Under serious non-attainment status, the "de minimis" emission thresholds are 50 tons per year for NO_x and ROC. However, since the study area has not been re-classified at the time of this study, the "de miminis" thresholds for moderate non-attainment will be used in the analysis. Other "de minimis" thresholds are 100 tons per year for carbon monoxide (CO), and 70 tons per year for fine particulate matter (PM_{10})

- Cause objectionable odors off site

- Pose a significant threat to the public health of safety due to potential accidental release of air toxics emissions or acutely hazardous materials.

4.3.2 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.3.2.1 Proposed Action

As described in Section 2.1.1, the Proposed Action includes the restoration of two segments along the Salt River in the Cities of Phoenix and Tempe. The proposed restoration would involve the construction or modification of a 60-meter (200-foot) wide low-flow channel in the river bottom, and the establishment of riparian and mesquite habitat in the river bottom and on the banks and overbanks of the river channel. Table 4.3-1 lists the specific construction tasks and applicable schedules (time required to complete each task) for the Phoenix and Tempe Reaches. In addition, Table 4.3-2 lists the specific operation and maintenance aspects of the Proposed Action.

Table 4.3-1 Construction Aspects of the Phoenix and Tempe Reaches

#	Construction Tasks	Phoenix Reach		Tempe Reach	
		Description	Schedule (months)	Description	Schedule (months)
1	• Removal of broken concrete and trash	Along the Salt River near 19th Avenue	8	Not required	----
2	• Excavation and grading of a low-flow channel in the river bottom	Along the entire Reach	6	Minor grading along Salt River; not required along Indian Bend Wash	2
3	• Lining the sides of the low-flow channel with soil cement	Along the entire Reach	2	Not required	---
4	• Construction of drop structures	Five drop structures	6	Not included in designs	---
5	• Construction of several shallow pools in the low-flow channel	Four shallow retention pools	2	Not included in designs; No low flow channel	---
6	• Construction of wetland marshes	Four wetland ponds	2	Two wetland ponds near Town Lake	1
7	• Installation of appropriate soil for planting	Along the entire Reach	4	Along the entire Reach	2
8	• Construction of wells on the overbank	Six wells	1	Not required, utilization of an existing well along Indian Bend Wash	---
9	• Installation of water treatment equipment for the subject well(s)	Water treatment equipment at six locations	2	Water treatment equipment at one location	0.5
10	• Construction of conveyance systems to bring water from overbanks to the habitat areas	Near the water wells	4	Near the water well	2
11	• Installation of above-ground irrigation systems	Near habitat locations	2	Near habitat locations	2
12	• Installation of vegetation along areas of the low-flow channel, bench, and overbank	Refer to Table 2-1	6	Refer to Table 2-2	4

Table 4.3-2 Operation and Maintenance for the Phoenix and Tempe Reaches

#	Description	Time Required
1	Irrigation of new planting, replacement of dead or diseased plants, and removal of invasive exotic plants	20 - 30 weeks per year
2	Debris removal and habitat repair after a storm	5 - 10 weeks*
3	Replacement of new plants after heavy flows	5 - 10 weeks*
4	Test and repair of water well pumps and water treatment equipment	2 weeks per year

* This assumes the subject area experiences a 25-50 year flood

Phoenix Reach

Construction Emissions. Construction emissions can be distinguished as either on site or off site. On-site air pollutant emissions during construction would principally consist of exhaust emissions from heavy duty diesel- and gasoline-powered construction equipment, as well as fugitive particulate matter from soil disturbed during grading and trenching operations. Off-site exhaust emissions would result from workers commuting to and from the job site, as well as from trucks transporting material (e.g., soil, broken concrete) to local landfills. A description of the assumptions used in quantifying the total emissions from these emission sources are described in the following paragraphs, and are listed in Appendix B to this document.

Because no definite construction plans and schedules were available, assumptions have been developed to evaluate the potential air quality impacts from the Proposed Action. The potential air quality impacts were evaluated based on annual emission levels that may occur during the construction of the Proposed Action. The emission levels per pollutant were then compared to the General Conformity "de minimis" emission thresholds listed in Table 4.3-3. Exceedance of any one of the thresholds would indicate the potential for the Proposed Action to result in a significant air quality impact.

Table 4.3-3 General Conformity "de minimis" Emission Thresholds

Pollutant	Emission Threshold (tons/year)
Nitrogen Oxides (NO_x)	100
Reactive Organic Compounds (ROC)	100
Particulates Matter (PM_{10})	70
Carbon Monoxide (CO)	100

Sources: USEPA, 1994. General Conformity Guidance: Questions and Answers.
40 CFR Part 81.303

On-Site Construction Emissions. In order to quantify the emissions from construction activities, it was assumed that the construction contractor would use heavy duty diesel- and gasoline-powered construction equipment (e.g., backhoe, dozer, motorized grader). With regard to particulate emissions, fugitive dust would occur from trucks and equipment disturbing soil within and around the exposed construction sites, as well as from wind blowing across unstabilized construction areas.

For quantifying emissions, it was assumed that a 3.2- to 4.8-km (2- to 3-mile) segment of the Phoenix Reach would be constructed during the first year of a projected 2- to 3-year construction period. Approximately 8 acres [335 meters (1,100 feet) in length x 90 meters (300 feet) in width] would be disturbed each month during grading operations. It was also assumed that disturbed areas would be stabilized after grading operations were completed for each construction segment.

The emissions from construction activities were calculated using emission factors from the U.S. Environmental Protection Agency's (USEPA) AP-42 emission factors for construction equipment (USEPA, 1994). Total suspended particulates were quantified using the emission factor of 1.2 tons per acre-month (USEPA, 1995). This is a very conservative approach considering that the emission factor assumes that the construction operations would occur in a semi-arid location with moderate silt content within the disturbed soil.

Particulates less than ten microns in diameter (PM_{10}) were assumed to represent 64 percent of the total suspended particulate emissions (CARB, 1992). In addition, the construction site would be watered down at least two times a day to reduce the fugitive emission levels during construction. The emission reduction (50% emission reduction - SCAQMD, 1993) potential from the implementation of watering down the construction site was also included within the emission calculations. On site exhaust emissions and fugitive particulate emissions are listed in Table 4.3-4 below. Refer to Appendix B for a detailed description of the other assumptions used in quantifying the maximum emission levels.

Off-Site Construction Emissions. It was assumed that approximately 10 to 30 workers would be required at the job site during the construction of the proposed of the Phoenix Reach. The off-site emissions calculations assumed that each worker would travel 24 km (15 miles) to and from the job site, at an average speed of 72 kilometers per hour (kph) [45 miles per hour (mph)].

As described in Table 4.3-1, broken concrete and trash near 19th Avenue would be removed. It was determined that approximately 42,000 trips (200 round trips/day x 210 days) would be required to transport the broken concrete and debris from the Salt River to a disposal facility that is adjacent to the subject construction site. It was determined that approximately 900 concrete truck trips (20 round trips/day x 45 days) would be required to construct the drop structures along the 4-km (2.5-mile) segment. It was assumed that approximately 250,000 cubic yards of gravel would be obtained from the material within the Salt River channel. The material truck trips were assumed to travel 8 km (5 miles) to and from the construction area at an average speed of 40 kph (25 mph), while the cement truck trips were assumed to travel 32 km (20 miles) at an average speed of 72 kph (45 mph).

Off-site mobile emissions were quantified using the California Air Resources Board's (CARB) EMFAC7EP emission factors for mobile sources (SCAQMD, 1993). Table 4.3-4 presents the total construction emissions for off-site emission sources. Refer to Appendix B for a list of the other assumptions used in the air quality calculations.

Table 4.3-4 Project Construction Emissions - Phoenix Reach (tons/yr)

Construction Activity	ROC	NO_x	SO_x	CO	PM_{10}
On-Site Exhaust Emissions	2.38	23.75	2.67	16.76	1.86
Off-Site Exhaust Emissions	0.55	1.53	0.03	4.17	0.15
Fugitive Particulate Emissions					35.00
TOTAL CONSTRUCTION EMISSIONS (tons)	2.93	25.28	2.70	20.93	37.01
General Conformity "de minimis" Emission Thresholds	100	100	---	100	70
EXCEEDANCE OF THE EMISSION THRESHOLDS?	NO	NO	---	NO	NO

Sources: USEPA, 1995. Compilation of Air Pollutant Emission Factors, Volume I (Stationary Sources).
USEPA, 1994. Compilation of Air Pollutant Emission Factors, Volume II (Mobile Sources).
CARB, 1991. Identification of Volatile Organic Compound Species Profiles.
CARB, 1992. Method Used to Develop a Size-Segregated Particulate Matter Inventory (Draft). PM10 Fractions from Profiles 118.
SCAQMD, 1993. CEQA Air Quality Handbook

As listed in Table 4.3-4, the total construction emissions fall well below the General Conformity "de minimis" emission thresholds and, therefore, the temporary emissions associated with construction of the Phoenix Reach would be adverse, but not significant **(Class III)**. However, it should be noted that even though mitigation is not required, the NO_x and PM_{10} emissions could be substantially reduced through the implementation of the suggested mitigation measures listed in Table 4.3-5 below. These measures are not required and their implementation is at the discretion of the Corps and the local sponsors.

Table 4.3-5 Suggested Mitigation Measures for Construction

Pollutant	Mitigation Measures	Emission Reduction Efficiency
NO_x	Retard the injection timing 4 degrees before top center on all diesel engines	15-20%
NO_x	Install high pressure injectors on all diesel engines	10-15%
NO_x	Use alternatively fueled vehicles (methanol, natural gas, electricity)	NQ
PM_{10}	Sweep streets at the end of the day if visible soil material is carried onto public paved roads.	25-60%
PM_{10}	Install wheel washers where vehicles enter and exit unpaved roads onto paved roads, or wash off trucks and equipment leaving the site each trip	40-70%
PM_{10}	Traffic speeds on all unpaved roads is to be reduced to 15 mph or less	40-70%

Note: NQ = Not Quantified
Sources: SCAQMD, 1993. CEQA Air Quality Handbook
SBCAPCD, 1997. SBCAPCD Diesel Control Efficiencies Summary Table

Operational Emissions. As described in Section 2.1.4, the local sponsor would be responsible for the maintenance and operational activities (listed in Table 4.3-2) along the Phoenix Reach. It should be noted that heavy duty construction activities may need to be reinitiated in order to repair damage caused to habitat areas by heavy storms flows and prolonged inundation of the river bottom. More routine maintenance activities related to the habitat areas, recreation facilities, and flood control facilities would be a minor source of air pollutant emissions.

Total operational emissions were quantified using emission factors from the USEPA, the CARB and the SCAQMD. Table 4.3-6 lists the maximum annual operational emissions (tons/yr) associated with the maintenance activities along the Phoenix Reach. Refer to Appendix B for a detailed description of the assumptions used in quantifying the total operational emissions.

Table 4.3-6 Annual Operational Emissions Associated with the Phoenix Reach (tons/yr)

Operations	ROC	NO_x	SO_x	CO	PM_{10}
On-Site Emissions	0.40	3.29	0.37	5.11	0.25
Off-Site Emissions	0.03	0.04	<0.01	0.23	<0.01
Fugitive Emissions					7.70
TOTAL CONSTRUCTION EMISSIONS (tons)	0.43	3.33	0.38	5.34	7.96
General Conformity "de minimis" Emission Thresholds	100	100	---	100	75
EXCEEDANCE OF THE EMISSION THRESHOLDS	NO	NO	---	NO	NO

Sources: USEPA, 1995. Compilation of Air Pollutant Emission Factors, Volume I (Stationary Sources).
USEPA, 1994. Compilation of Air Pollutant Emission Factors, Volume II (Mobile Sources).
CARB, 1991. Identification of Volatile Organic Compound Species Profiles.
CARB, 1992. Method Used to Develop a Size-Segregated Particulate Matter Inventory (Draft).
SCAQMD, 1993. CEQA Air Quality Handbook

As listed in Table 4.3-6, the total construction emissions fall well below the General Conformity "de minimis" emission thresholds, and therefore, the emissions associated with the operation and maintenance of the Phoenix Reach would be adverse, but not significant **(Class III)**. No mitigation would be required.

General Conformity. Under Section 176(c) of the Clean Air Act Amendments (CAAA) of 1990, the U.S. Army Corps of Engineers must make a determination of whether the Proposed Action "conforms" with the State Implementation Plan (SIP). However, because the emissions associated with construction and operation of the Phoenix Reach are well below the General Conformity "de minimis" emission thresholds, the restoration of the Phoenix Reach would be exempt from the General Conformity requirements, and would be considered to be in conformity with the SIP.

Air Toxics. During construction and operation, the sponsor or contractor may store small amounts of fuel near the job site for support of the construction and maintenance operations. These fuels contain benzene and other known hazardous substances that are considered air toxics. However, because such air toxics would not be expected to affect distant off-site sensitive receptors (several hundred feet away), no significant air toxic impacts would result from the Proposed Action.

Tempe Reach

Construction Emissions. The construction of the proposed Tempe Reach would be similar to the construction methodology described above for the Phoenix Reach. However, the number of construction days would be less for the Tempe Reach because of the following factors: the Tempe Reach is shorter in overall distance, the Tempe Reach does not require the construction of a low-flow channel, the Tempe

Reach requires only minor grading within the channel, and the Tempe Reach will not require the construction of a water well.

The emission factors used for the Phoenix Reach were also utilized to quantify the total construction emissions for the Tempe Reach. Table 4.3-7 lists the total emissions associated with constructing approximately one mile of the Tempe Reach during the first year of a projected two-year construction period. Refer to Appendix B for a detailed description of the assumptions used in the emission calculations.

Table 4.3-7 Project Construction Emissions - Tempe Reach (tons/yr)

Construction Activity	ROC	NO_x	SO_x	CO	PM_{10}
On-Site Exhaust Emissions	0.83	8.43	0.94	7.74	0.61
Off-Site Exhaust Emissions	0.05	0.06	<0.01	0.43	<0.01
Fugitive Particulate Emissions					13.80
TOTAL CONSTRUCTION EMISSIONS (tons)	0.88	8.49	0.95	8.17	14.42
General Conformity "de minimis" Emission Thresholds	100	100	---	100	70
EXCEEDANCE OF THE EMISSION THRESHOLDS?	NO	NO	---	NO	NO

Sources: USEPA, 1995. Compilation of Air Pollutant Emission Factors, Volume I (Stationary Sources).
USEPA, 1994. Compilation of Air Pollutant Emission Factors, Volume II (Mobile Sources).
CARB, 1991. Identification of Volatile Organic Compound Species Profiles.
CARB, 1992. Method Used to Develop a Size-Segregated Particulate Matter Inventory (Draft). PM10 Fractions from Profiles 118.
SCAQMD, 1993. CEQA Air Quality Handbook

Similar to the Phoenix Reach, the emissions associated with the construction of the Tempe Reach would be well below the General Conformity "de minimis" emission thresholds. As a result, the temporary emissions may be adverse, but would not cause any significant air quality impacts **(Class III)**. However, it should be noted that even though mitigation is not required, the NO_x and PM_{10} emissions could be substantially reduced through the implementation of the suggested mitigation measures listed above (see Table 4.3-5).

Operational Emissions. Similar to the Phoenix Reach, emissions associated with the operation and maintenance of the Tempe Reach would result from the actions listed in Table 4.3-2. Total operational emissions were quantified using the emission factors from the USEPA, the CARB and the SCAQMD. Table 4.3-8 lists the maximum annual operational emissions (tons/yr) associated with the maintenance activities along the Tempe Reach.

As listed in Table 4.3-8, the total construction emissions fall well below the General Conformity "de minimis" emission thresholds, and therefore, the emissions associated with the operation and maintenance of the Tempe Reach may be adverse, but not significant **(Class III)**. No mitigation would be required.

Table 4.3-8 Annual Operational Emissions Associated with the Tempe Reach (tons/yr)

Operations	ROC	NO_x	SO_x	CO	PM_{10}
On-Site Emissions	0.21	1.65	0.18	3.03	0.12
Off-Site Emissions	<0.01	<0.01	<0.01	0.13	<0.01
Fugitive Emissions					3.8
TOTAL CONSTRUCTION EMISSIONS (tons)	0.22	1.66	0.19	3.16	3.93
General Conformity "de minimis" Emission Thresholds	100	100	---	100	75
EXCEEDANCE OF THE EMISSION THRESHOLDS	NO	NO	---	NO	NO

Source: USEPA, 1995. Compilation of Air Pollutant Emission Factors, Volume I (Stationary Sources).
USEPA, 1994. Compilation of Air Pollutant Emission Factors, Volume II (Mobile Sources).
CARB, 1991. Identification of Volatile Organic Compound Species Profiles.
CARB, 1992. Method Used to Develop a Size-Segregated Particulate Matter Inventory (Draft).
SCAQMD, 1993. CEQA Air Quality Handbook

General Conformity. Under Section 176(c) of the Clean Air Act Amendments (CAAA) of 1990, the U.S. Army Corps of Engineers must make a determination of whether the Proposed Action "conforms" with the State Implementation Plan (SIP). However, because the emissions associated with construction and operation of the Tempe Reach are well below the General Conformity "de minimis" emission thresholds, the proposed action would be exempt from the General Conformity requirements, and would be considered to be in conformity with the SIP.

Air Toxics. Similar to the Phoenix Reach, the sponsor or contractor may store small amounts of fuel near the job site for support of the construction and maintenance operations. These fuels contain benzene and other known hazardous substances that are considered air toxics. However, because such air toxics would not be expected to affect distant off-site sensitive receptors (several hundred feet away), no significant air toxic impacts would result from the Proposed Action.

4.3.2.2 Phoenix Reach Alternatives

Alternative P9: Gravel Pit Restoration, Five-Mile Perennial Stream

In comparison to the Proposed Action, this alternative includes a perennial stream flowing within the entire 8-km (5-mile) length of the low-flow channel, it eliminates the construction of the shallow retention pools within the low-flow channel, it contains more aquatic strand habitat within the low-flow channel, and incorporate the local gravel pits into the restoration plan. To incorporate the gravel pits into the restoration plan, the levees which separate the gravel pits from the river channel would be lowered and the slope angles reduced.

The emissions associated with the construction and operation of this alternative would be higher than the Proposed Action because of the extensive construction requirements of incorporating the gravel pits into the restoration plan. However, it appears that the emissions would be below the General Conformity "de minimis" emission thresholds, and therefore, no significant impacts would result **(Class III)**. The suggested mitigation measures listed in Table 4.3-5 would help to reduce the NO_x and PM_{10} emissions from the construction of this alternative.

Alternative P6: Gravel Pit Restoration, No Perennial Stream

This emissions associated with the construction and operation of this alternative would be similar to Phoenix Reach Alternative P9. In comparison to the Proposed Action, this alternative would generate higher emission levels because of the extensive construction requirements of incorporating the gravel pits into the restoration plan. Similar to Phoenix Reach Alternative P9, it appears that the emissions generated from the construction and operation of this alternative would be below the General Conformity "de minimis" emission thresholds, and therefore, no significant impacts would result **(Class III)**. The suggested mitigation measures listed in Table 4.3-5 would help to reduce the NO_x and PM_{10} emissions from the construction of this alternative.

Alternative P2: No Perennial Stream, No Gravel Pit Restoration

In comparison to the Proposed Action, this alternative does not include a perennial stream flowing within the low-flow channel nor the restoration of the local gravel pits. The area subject to disturbance due to grading and construction activities is the same as the Proposed Action. Because of the similar area and operational characteristics, the emissions associated with the construction and operation of this alternative would be similar to the Proposed Action.

Alternative P5: Five-Mile Perennial Stream, No Gravel Pit Restoration

In comparison to the Proposed Action, this alternative includes a perennial stream flowing within the entire 8-km (5-mile) length of the low-flow channel, but eliminates the restoration of the local gravel pits. The emissions associated with the construction and operation of this alternative would be similar to the Proposed Action.

4.3.2.3 Tempe Reach Alternatives

Alternative T3: Indian Bend Wash, Upstream Salt River, and Downstream Salt River (Low-Water Use)

This alternative would be similar to the Proposed Action, but would require less water to support the planned habitat. In general, this alternative would generate levels of construction emissions similar to those projected for the Proposed Action. However, because less water would be involved under this alternative, there may be a potential for higher levels of PM_{10} emissions during the operation and maintenance phase of this alternative. Overall, the construction and operational emissions associated with this alternative would be below the General Conformity "de minimis" emission thresholds, and therefore, no significant impacts would result **(Class III)**. The suggested mitigation measures listed in Table 4.3-5 would help to reduce the NO_x and PM_{10} emissions from the construction of this alternative.

Alternative T4: Indian Bend Wash and Downstream Salt River (High-Water Use)

Under this alternative, the open water and wetland marsh would not be constructed at the upstream side of Town Lake dam. This alternative would still include the restoration of the Indian Bend Wash and a portion of the Salt River below Town Lake.

The emission levels associated with construction and maintenance of this alternative would be less than what is listed in Tables 4.3-7 and 4.3-8 for the Proposed Action. Overall, the construction and operational emissions associated with this alternative would be below the General Conformity "de minimis" emission thresholds, and therefore, no significant impacts would result **(Class III)**. The suggested mitigation measures listed in Table 4.3-5 would help to reduce the NO_x and PM_{10} emissions from the construction of this alternative.

Alternative T2: Indian Bend Wash only (Low-Water Use)

Under this alternative, Indian Bend Wash would be the only segment of the Tempe Reach that would be restored to a more natural state. As a result, construction and maintenance emissions associated with this alternative would be less than what is projected for the Proposed Action. It should be noted that the construction and operational emissions associated with this alternative would be below the General Conformity "de minimis" emission thresholds, and therefore, no significant impacts would result **(Class III)**. The suggested mitigation measures listed in Table 4.3-5 would help to reduce the NO_x and PM_{10} emissions from the construction of this alternative.

Alternative T6: Downstream Salt River only (High-Water Use)

This alternative include only the restoration of the Salt River segment downstream of Town Lake. Similar to Tempe Reach Alternative T2, construction and maintenance emissions associated with this alternative would be less than what is projected for the Proposed Action. It should be noted that the construction and operational emissions associated with this alternative would be below the General Conformity "de minimis" emission thresholds, and therefore, no significant impacts would result **(Class III)**. The suggested mitigation measures listed in Table 4.3-5 would help to reduce the NO_x and PM_{10} emissions from the construction of this alternative.

4.3.2.4 No Action Alternative

Under the No Action Alternative, the proposed Phoenix and Tempe reaches would not be constructed. As a result, no emissions would be generated from construction or operation of the proposed action and, therefore, no significant air quality impacts would result.

4.3.3 REFERENCES

CARB (California Air Resources Board). 1991. *Identification of Volatile Organic Compound Species Profiles.*

_____. 1992. *Method Used to Develop a Size-Segregated Particulate Matter Inventory (Draft).*

SBCAPCD (Santa Barbara County Air Pollution Control District). 1997. SBCAPCD Diesel Control Efficiencies Summary Table.

SCAQMD (South Coast Air Quality Management District). 1993. *CEQA Air Quality Handbook.* April.

USEPA (U.S. Environmental Protection Agency). 1995. *Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources.*

_____. 1994. *Compilation of Air Pollutant Emission Factors, Volume II: Mobile Sources.*

4.4 HYDROLOGY AND WATER QUALITY

This section describes the potential impacts of the Proposed Action and alternatives for the Phoenix and Tempe Reaches relating to hydrology and water quality, including both surface and ground water resources.

4.4.1 DEFINITION AND USE OF SIGNIFICANCE CRITERIA

Impacts to surface and ground water resources are considered significant if one or more of the following conditions would result from implementation of the Proposed Action.

- Substantial change in rate and amount of surface runoff or change in amount of water in any water body
- Substantial degradation of water quality
- Contamination or substantial reduction of a public water supply
- Substantial degradation or depletion of groundwater resources
- Substantial interference with groundwater recharge or direction and rate of groundwater flow
- Location of facilities within a flood-prone area or alterations to the course or flow of flood waters
- Substantial flooding, erosion, or siltation.

4.4.2 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.4.2.1 Proposed Action

Phoenix Reach

Surface Water. Implementation of the Proposed Action will introduce a perennial flow of water into the river channel to supply the ponds and marshes in the habitat areas and the streams and pools in the low-flow channel. In addition, surface runoff from surrounding urban areas will continue to flow into the Salt River channel from storm drain outlets. With the proposed project, this urban runoff will be directed to the low-flow channel and conveyed downstream. The project will have no effect on the amount of surface runoff conveyed to the channel. From a flood control standpoint, the additional water flow introduced into the channel to supply the habitat areas should cause no adverse impact due to the substantial capacity of the channel and the various conveyance improvements which will be constructed as part of the project (e.g., the low-flow channel). It is estimated that the flows associated with a 100-year flood event can be contained within the existing river channel. The current capacity of the river channel to convey flood flows will not be reduced with the implementation of the proposed project. The water introduced into the river channel to support habitat areas will seep back into the river bed and, therefore, is not expected to flow beyond the limits of the project area. The introduction of additional water into the river to support the habitat areas is not considered a significant impact **(Class III)**.

Water Quality. Water drawn from near-surface aquifers will be the water source to supply the habitat areas within the Phoenix Reach. For the purposes of this study, it is assumed that the ground water will be treated to bring its quality up to appropriate standards before being released into the channel. A portion of this well water will eventually infiltrate back into the ground water aquifer below the river. Because this water will have been treated as needed to meet water quality standards before being released into the river, the infiltration of this treated water should contribute to an improvement in the overall quality of local ground water. The pumping and treatment of the contaminated ground water may also help prevent the migration of the contaminated ground water to other areas by drawing the water to each of the pumping sites along the Phoenix Reach. The project's potential contribution to improvement of the quality of local ground water is considered a beneficial effect **(Class IV)**. A standard NPDES permit will be required for the direct discharges of ground water into the river channel. A NPDES general stormwater permit will also be required for project construction.

In the past, when large flows have entered the Salt River channel during flood events, a subsequent rise in ground water levels has resulted in leaching of hazardous materials from landfills adjacent to the river channel, causing these contaminants to migrate into the ground water aquifer. This will still be a potential problem during periods of flooding. With regard to the Proposed Action, the relatively small amount of water introduced into the channel to support the habitat areas and to create a perennial flow in the low-flow channel is not expected to cause ground water levels to rise appreciably. However, as a precaution, no water is proposed to be introduced into the Salt River channel in the vicinity of the 19th Avenue Superfund site in order to avoid potential problems associated with leaching of hazardous substances. The potential for leaching of hazardous substances due to the introduction of water to support the Proposed Action is not considered a significant impact **(Class III)**.

Water Supply. The water required to support the restored habitats and maintain a perennial stream will not result in a shortage of supplies needed to meet public demands. The water located in near-surface aquifers is not utilized for domestic purposes and, therefore, its use to support the project will not affect domestic water supplies. This is not considered a significant impact **(Class III)**.

Flooding. Although facilities (e.g., habitat areas and trails) will be located in a flood-prone area (i.e., the flood plain of the river), these facilities will be designed with the expectation of periodic flooding and will either be designed to withstand inundation and heavy flows or will be replaced/repaired as necessary after damaging flood events. The project assumes that substantial operation and maintenance costs will be incurred in order to reconstruct habitat areas and repair facilities after flooding. The City of Phoenix has indicated a willingness to incur these costs on a continuing basis in order to provide the required level of maintenance. Therefore, this impact is not considered significant **(Class III)**.

Erosion and Siltation. Flooding, erosion, and siltation are natural processes associated with river environments and the project will be affected by these processes. The project is designed in recognition of these constraints. The project is also designed so as not to exacerbate to flooding, erosion, and siltation problems. It is recognized that substantial ongoing maintenance will be required to maintain the flood control capacity of the channel and to combat the natural forces of erosion and siltation. Accumulated sediment in the pools in the low-flow channel will need to be removed on a periodic basis. It is anticipated that sediment will need to be removed from the ponds on the benches after each large flood event. Because maintenance to remove sediment and repair flood damage is incorporated into project operations, this impact is not considered significant **(Class III)**.

Tempe Reach

Surface Water. Implementation of the Proposed Action will introduce a substantial amount of water into the river channel. From a flood control standpoint, the water flows introduced to the river should cause no adverse impact due to the substantial flood control capacity of the channel. The current capacity of the river channel to convey flood flows will be maintained with the proposed project. It is estimated that the flows associated with a 100-year flood event can be contained within the existing river channel. The water introduced into the river channel to support habitat areas will seep back into the river bed and, therefore, is not expected to flow significantly beyond the limits of the project area. The introduction of additional water into the river to support the habitat areas is not considered a significant impact **(Class III)**.

Water Quality. Water drawn from near-surface aquifers will be the water source to supply the habitat areas within the Tempe Reach. Unlike wells supplying the Phoenix Reach, there should be no need the well water used to supply the Tempe Reach. A portion of the well water used to supply the Tempe Reach will eventually infiltrate back into the ground water aquifer below the river. A standard NPDES permit will be required for the direct discharge of groundwater into Indian Bend Wash. A NPDES general stormwater permit will also be required for project construction.

Water Supply. The water required to support the restoration areas will not result in a shortage of supplies needed to meet public demands. The City of Tempe has recently been granted status as a water provider having a 100-year Assured Water Supply Designation by the Arizona Department of Water Resources. This designation provides for a specific amount of underground water supplies that can be withdrawn by the City each year. The City of Tempe has sufficient underground water reserves available to supply the project and has made a long-term commitment to supplying the project from these underground water allocations. Therefore, this is not considered a significant impact **(Class III)**.

Flooding. Although facilities will be located in a flood-prone area (i.e., the flood plain of the river), these facilities will be designed with the expectation of periodic flooding and will either be designed to withstand inundation and heavy flows or will be replaced/repaired as necessary after damaging flood events. The project assumes that substantial operation and maintenance costs will be incurred in order to reconstruct habitat areas and repair facilities after flooding. The City of Tempe has indicated a willingness to incur these costs on a continuing basis in order to provide the required level of maintenance. Therefore, this impact is not considered significant **(Class III)**.

Erosion and Siltation. Flooding, erosion, and siltation are natural processes associated with river environments and the project will be affected by these processes. The project is designed in recognition of these constraints. The project is also designed so as not to exacerbate to flooding, erosion, and siltation problems. It is recognized that substantial ongoing maintenance will be required to maintain the flood control capacity of the channel and to combat the natural forces of erosion and siltation. This impact is not considered significant **(Class III)**.

4.4.2.2 Phoenix Reach Alternatives

Alternative P9: Gravel Pit Restoration, Five-Mile Perennial Stream

This alternative would introduce a somewhat greater amount of water into the low-flow channel, including a perennial flow of water into the low-flow channel for the entire 8-km (5-mile) length of the Phoenix Reach. Due to the longer perennial stream and greater emphasis on riparian and wetland habitat, this alternative would require more water than the Proposed Action. In other regards, the effects of this alternative are very similar to those of the Proposed Action. This alternative would not effect the channel's ability to convey urban runoff and flood flows **(Class III)**. Similar to the Proposed Action, water drawn from near-surface aquifers would be used to supply the perennial stream and support the habitat areas. Because this water may be treated and allowed to infiltrate back into the aquifer below the river, the overall quality of local ground water could improve over time **(Class IV)**. Since water from the near-surface aquifer is not used for domestic purposes, an adequate supply of water is available to support this alternative **(Class III)**. Although some habitat and recreation areas would be subject to periodic flooding and inundation, necessary maintenance activities to repair damage from flooding are incorporated into the project **(Class III)**.

Alternative P6: Gravel Pit Restoration, No Perennial Stream

This alternative would not incorporate any perennial flow of water into the low-flow channel and would emphasize mesquite habitat over wetland habitat. As a result, this alternative would require less water than the Proposed Action. In other regards, the effects of this alternative are very similar to those of the Proposed Action. This alternative would not effect the channel's ability to convey urban runoff and flood flows **(Class III)**. Similar to the Proposed Action, water drawn from near-surface aquifers would be used to support the habitat areas. Because this water may be treated and allowed to infiltrate back into the aquifer below the river (after being released into the low-flow channel), the overall quality of local ground water could improve over time **(Class IV)**. Since water from the near-surface aquifer is not used for domestic purposes, an adequate supply of water is available to support this alternative **(Class III)**.

Although some habitat and recreation areas would be subject to periodic flooding and inundation, necessary maintenance activities to repair damage from flooding are incorporated into the project **(Class III)**.

Alternative P2: No Perennial Stream, No Gravel Pit Restoration

Like Alternative P6 above, this alternative would not incorporate any perennial flow of water into the low-flow channel and would emphasize mesquite habitat over wetland habitat. As a result, this alternative would require less water than the Proposed Action. In other regards, the effects of this alternative are very similar to those of the Proposed Action. This alternative would not effect the channel's ability to convey urban runoff and flood flows **(Class III)**. Similar to the Proposed Action, water drawn from near-surface aquifers would be used to support the habitat areas. Because this water may be treated and allowed to infiltrate back into the aquifer below the river (after being released into the low-flow channel), the overall quality of local ground water could improve over time **(Class IV)**. Since water from the near-surface aquifer is not used for domestic purposes, an adequate supply of water is available to support this alternative **(Class III)**. Although some habitat and recreation areas would be subject to periodic flooding and inundation, necessary maintenance activities to repair damage from flooding are incorporated into the project **(Class III)**.

Alternative P5: Five-Mile Perennial Stream, No Gravel Pit Restoration

This alternative is similar to Alternative P9 above, and includes a perennial flow of water into the low-flow channel for the entire 8-km (5-mile) length of the Phoenix Reach. Due to the longer perennial stream and greater emphasis on riparian and wetland habitat, this alternative would require more water than the Proposed Action. In other regards, the effects of this alternative are very similar to those of the Proposed Action. This alternative would not effect the channel's ability to convey urban runoff and flood flows **(Class III)**. Similar to the Proposed Action, water drawn from near-surface aquifers wold be used to supply the perennial stream and support the habitat areas. Because this water may be treated and allowed to infiltrate back into the ground water aquifer below the river, the overall quality of local ground water could improve over time **(Class IV)**. Since water from the near-surface aquifer is not used for domestic purposes, an adequate supply of water is available to support this alternative **(Class III)**. Although some habitat and recreation areas would be subject to periodic flooding and inundation, necessary maintenance activities to repair damage from flooding are incorporated into the project **(Class III)**.

4.4.2.3 Tempe Reach Alternatives

Alternative T3: Indian Bend Wash, Upstream Salt River, and Downstream Salt River (Low-Water Use)

This alternative places a greater emphasize on mesquite habitat rather than wetland habitat and, as a result, would require less water than the Proposed Action. In other regards, the effects of this alternative are very similar to those of the Proposed Action for the Tempe Reach. This alternative would not effect the channel's ability to convey urban runoff and flood flows **(Class III)**. Similar to the Proposed Action, water drawn from near-surface aquifers would be used to supply the perennial stream and support the habitat areas. The City has adequate reserves of underground water for long-term supply of the project **(Class III)**. Although some habitat and recreation areas would be subject to periodic flooding and inundation, necessary maintenance activities to repair damage from flooding are incorporated into the project **(Class III)**.

Alternative T4: Indian Bend Wash and Downstream Salt River (High-Water Use)

Because this alternative does not include restoration of the upstream portion of the Salt River, less water would be required to support habitat areas. In other regards, the effects of this alternative are basically the same as those of the Proposed Action for the Tempe Reach.

Alternative T2: Indian Bend Wash only (Low-Water Use)

Because this alternative only includes restoration of Indian Bend Wash and does not incorporate any wetland or riparian habitat, this alternative would require substantially less water than the Proposed Action. In other regards, the effects of this alternative are similar to those of the Proposed Action for the Tempe Reach.

Alternative T6: Downstream Salt River only (High-Water Use)

Because this alternative only includes restoration of the downstream portion of the Salt River, this alternative would require less water than the Proposed Action. In other regards, the effects of this alternative are similar to those of the Proposed Action for the Tempe Reach.

4.4.2.4 No Action Alternative

Under the No Action Alternative, conditions along the river channel are expected remain essentially the same as current conditions. The river channel would continue to be utilized to receive surface runoff from surrounding urban areas and to convey flood flows. Since the river no longer flows perennially, most of the river bottom within both the Phoenix and Tempe Reaches would remain dry except during periods of storms and flood events.

surrounding urban areas and to convey flood flows. Since the river no longer flows perennially, most of the river bottom within both the Phoenix and Tempe Reaches would remain dry except during periods of storms and flood events.

4.5 BIOLOGICAL RESOURCES

This section describes the potential impacts of the Proposed Action and alternatives for the Phoenix and Tempe Reaches relating to biological issues. The examination of impacts focuses on effects which the project may have on existing vegetation and wildlife on the proposed project site as well as the biological resources in the immediate vicinity of the project site that may be affected by the project's construction, implementation and operation. Both adverse and beneficial effects are described. Each impact has been classified based on the significance criteria and designated as either a Class I, II, III, or IV impact as defined in Section 4.1.

A habitat valuation analysis was performed on the Phoenix and Tempe Reaches using a modified Habitat Evaluation Procedures (HEP) approach (see Appendix C). The analysis provides quantitative estimates of projected beneficial effects expected from the alternatives.

4.5.1 DEFINITION AND USE OF SIGNIFICANCE CRITERIA

In accordance with NEPA, the effects of a project are evaluated to determine if they would result in a significant adverse impact on the biological resources. This EIS focuses on the potential effects of the Proposed Action and offers mitigation measures to reduce or avoid any significant impacts which are identified. Based upon the following significance criteria concerning the Proposed Action's effect on vegetation and wildlife, the Proposed Action would have significant adverse impact on the environment if it would:

- Substantial loss of natural vegetation
- Substantial loss of species or community diversity in natural vegetation and wildlife habitat
- Loss of critical habitat or sensitive plant communities.
- Loss of individuals or populations of a Federally- or State-listed endangered or threatened species or habitat for sensitive species
- Substantial loss of populations or habitat of Federal Species of Concern (FSOC) and species considered sensitive by the Arizona Department of Game and Fish that would jeopardize the continued existence of the species within the region
- Loss or long-term disruption of a major wildlife movement corridor.

4.5.2 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.5.2.1 Proposed Action

Phoenix Reach

Vegetation. As described in Section 3.5.1.2, the majority of the vegetation within the Phoenix Reach consists of ruderal herbs and non-native grasses scattered in the cobbly wash or thinly distributed on the channel banks. The replacement of this vegetation with any of the habitat types outlined in the Project Description (mesquite, cottonwood/willow riparian, freshwater marsh, or aquatic strand) would be a beneficial impact because it would serve to restore some of the native habitat that once naturally occurred in the area prior to urbanization and the implementation of vegetation clearing regimes **(Class IV)**.

A small disturbed cottonwood-willow community occurs on the south bank of the river, just west of the Interstate 10 bridge. Because the goal of the project is to restore riparian and other natural habitat types to the project area, it is unlikely that this small riparian woodland would be removed. However, this community does contain some highly invasive weedy species such as tamarisk, which could invade any restored habitat near this riparian community. Tamarisk produces massive quantities of easily dispersed seeds but also can readily reproduce vegetatively, it can establish and thrive in saline soils and water, seedlings and mature plants can survive periods of inundation and dessication, subsequent to seedling establishment it displays a high rate of root growth and greatly absorbs water from any permanent water source or water table, and it secretes salt from salt glands on leaves and stems that eventually add to the salinity of the area and results in a leaf litter that inhibits the growth of most understory plants (Sala, et. al., 1996). The further spread of tamarisk from this established riparian area could potentially significantly impact the restored habitats if tamarisk out competes desired plant species for water, space and other resources, thus defeating the purpose and goals of the Proposed Action. Implementation of Environmental Commitments B-1, B-2, and B-3 should ensure the avoidance of any potential impacts from tamarisk **(Class II)**.

B-1 All tamarisk shall be removed from the existing riparian area and the project site.

B-2 Tamarisk eradication in this riparian community shall not occur during the months of February through August when birds, mammals and some amphibians may be using the area for breeding.

B-3 Prior to any activity in this riparian area, a consultation with U.S. Fish and Wildlife Service and Arizona Game and Fish Department will be held to determine the potential for occurrence of any sensitive amphibian species (such as lowland leopard frog). If determined to be present or have potential to occur, the schedule for tamarisk eradication shall be revised to avoid fall breeding of the species.

A highly disturbed desert scrub community occupies the south bank between 7th Avenue and 7th Street. This community consists of mesquite, palo verde, tamarisk, some native shrubs and an understory of mostly non-native herbs and non-native grasses. Because the area contains a great deal of rubble and trash, and because many of the herbaceous species present are weeds, it is likely that the area will be cleared and replanted. Loss of the non-native arboreal and herbaceous species would be considered beneficial because removal of such species (and subsequent disposal of weed debris offsite) will decrease the likelihood of these weedy species spreading to other restored areas **(Class IV)**. The impact from the removal of the native shrubs and trees would be adverse but not significant because the species present are common and likely to be replanted, although keeping all native trees and large shrubs in place would save the time and expense of installing all new plant stock **(Class III)**.

The clearing and reconfiguring of the channel and the banks by earth-moving equipment during the early construction phase could result in a potentially significant impact to habitat adjacent to the proposed project by creating high levels of fugitive dust. Fugitive dust could settle on adjacent vegetation to such a degree that photosynthesis is diminished thereby resulting in lower metabolic activity of the vegetation and eventually affecting the overall health of the community. Implementation of Environmental Commitment B-4 will ensure the avoidance of any potential impacts from fugitive dust **(Class II)**.

B-4 During all construction phases, water trucks, no-toxic dust suppressing chemicals or soil binders will be used to dampen haul roads, staging areas, and construction sites.

The preparation of the soil for the installation of container plants and/or hydro seed (such as grading and the adding of top soil or soil amendments) within the restoration areas may create conditions suitable for the early establishment of weedy species. This could constitute a significant impact if left unchecked the area could become dominated with non-native species, thus defeating the goals of the Proposed Action. Implementation of Environmental Commitments B-5, B-6, and B-7 should ensure the avoidance of any potential impacts from weed establishment **(Class II)**.

B-5 Only weed-free clean top soil shall be added to the restoration sites.

B-6 A weeding regime will be implemented during the early stages of the restoration to insure weeds do not establish in the restoration areas.

B-7 If used for erosion control during construction, only sterile weed-free hay bales will be used.

Implementation of the Proposed Action will increase the amount of surface water in the restoration site and potentially raise the level of moisture in the ground. At the present time, the lack of accessible water has kept the tamarisk present from establishing the type of dense thickets that once occupied the channel. With the return of a steady water source, more tamarisk may establish and invade the area, ultimately to the detriment of the restored native vegetation. This would constitute an adverse impact if a regular tamarisk abatement regime is not employed **(Class II)**. Implementation of Environmental Commitment B-1 should ensure the avoidance of any potential impacts from tamarisk due to increased water in the area.

Wildlife. The implementation of the Proposed Action would result in restored habitat and thus would increase the amount of native vegetation in the Phoenix area. The increase of native vegetation will also serve as better, more protective habitat and provide more forage for the wildlife species already utilizing the Phoenix Reach. Because the urban environment surrounding the Phoenix Reach serves as a substantial barrier to mammals and reptiles not already found in the marginal habitat present, it is reasonable to predict that wildlife most able to reach and utilize the restored areas are most likely to be bird and bat species. Resident and migratory birds typically utilize riparian area for cover, shade, foraging, breeding and nesting. Bat species use riparian and marsh habitat for insect foraging. Ponds and areas of standing water that may successfully support native fish and amphibian species. The implementation of the Proposed Action would result in a beneficial impact to the area because this alternative would result in riparian, marsh and aquatic habitat to the area **(Class IV)**.

The clearing of the disturbed desert scrub community located in the western end of the Phoenix Reach will result in the displacement of the small mammals, reptiles, and a suite of bird species presently using the area. The temporary loss of common wildlife species in this area constitutes an adverse but not significant impact **(Class III)**. The clearing of this area would constitute a significant but temporary impact to birds in the area by loss of nesting sites and disruption to foraging and other activities by construction activities until the installation and establishment of the restored vegetation **(Class II)**.

The increase for the potential establishment of tamarisk into the project area from tamarisk on or off site because of the presence of more water and fertile open area could create a significant impact to wildlife. As discussed above, tamarisk out competes many native herbaceous and arboreal species for space and resources in areas which it has invaded. Monotypic tamarisk communities are poor habitats for most birds and mammals **(Class II)**. Implementation of Environmental Commitment B-1 should ensure the avoidance of any potential impacts from tamarisk to wildlife.

Increased standing water in the area may become suitable habitat for the introduction of common and sensitive native fish species **(Class IV)**. However, an increase in standing water may also result in an increase of mosquitoes, which may eventually warrant the implementation of an abatement program for the sake of public health. Commonly, the most efficient and economical method employed for mosquito abatement is by the stocking of ponds with mosquito fish (*Gambusia affinis*), a species which feeds on the insect larvae. Mosquito fish also have the undesirable trait of feeding on native fish eggs and hatchlings, which can decimate a native fish population. This would result in a potentially significant impact on any native fish the project proponents may hope to establish in the restoration area **(Class II)**. Implementation of Environmental Commitment B-8 should ensure the avoidance of any potential impacts from the introduction of mosquitoes into the restored area.

B-8 In order to minimize the use of chemical pesticides within the habitat area, native predators should be introduced or attracted to the area to help control mosquitoes. Native predators include waterstriders, gaint water bugs, common backswimmers, dragonflies, water boatman, barn swallows, black phoebes, song sparrows, bats, and native fish. Although the use of native fish species (e.g., Gila topminnow) would be preferable, the introduction of mosquitofish to help control mosquito populations shall not be prohibited.

A restoration of habitat may also result in an increase of pet dumping or unrestrained pets in the area. An increase in abandoned cats, dogs, and amphibians (such as non-native frogs, toads, and turtles) could prey on native species that the restoration efforts were meant to attract **(Class II)**. Implementation of Environmental Commitments B-9 and B-10 should ensure the avoidance of any potential impacts from pets in restored habitats.

B-9 Signs shall be posted prohibiting the dumping of pets or the use of the areas by unrestrained pets.

B-10 Feral or free-ranging cats and dogs pets shall be reported to the local office of Animal Control.

Tempe Reach

Vegetation. The Tempe Reach is almost completely without vegetation within the channel and consists mostly of barren cobbly wash with rock rip rap reinforced banks or banks sparsely vegetated by small ruderal species and lacks any permanent surface water. The replacement of this barren habitat with any of the habitat types outlined in the Project Description would be a beneficial impact because it would serve to restore approximately 106 acres of native habitat that once naturally occurred in the area **(Class IV)**.

The implementation of the Proposed Action will require the clearing and reconfiguring of the channel and the banks by earth moving equipment during the early construction phase that could result in a potentially significant impact to habitat adjacent to the proposed project by creating high levels of fugitive dust. Implementation of Environmental Commitment B-4 will ensure the avoidance of any potential impacts from fugitive dust **(Class II)**.

The preparation of the soil for the installation of container plants and/or hydro seed (such as grading and the adding of top soil or soil amendments) within the restoration areas may create conditions suitable for the early establishment of weedy species. Implementation of Environmental Commitments B-5, B-6, and B-7 should ensure the avoidance of any potential impacts from weed establishment **(Class II)**.

Implementation of the Proposed Action will increase the amount of surface water in the restoration site and potentially raise the level of moisture in the ground making conditions suitable for the re-establishment of tamarisk into the area. This would constitute an adverse impact if a regular tamarisk abatement regime is not employed **(Class II)**. Implementation of Environmental Commitment B-1 should ensure the avoidance of any potential impacts from tamarisk due to increased water in the area.

Wildlife. The implementation of the Proposed Action would result in restored habitat and thus would increase the amount of native vegetation in the Tempe area. The increase of native vegetation will also serve as better, more protective habitat and provide more forage for the wildlife species already utilizing the Tempe Reach. The implementation of the Proposed Action would result in a beneficial impact to the area because this alternative would result in riparian, marsh and aquatic habitat to the area **(Class IV)**.

The increase for the potential establishment of tamarisk into the project area from tamarisk on or offsite because of the presence of more water and fertile open area could create a significant impact to wildlife. Monotypic tamarisk communities are poor habitats for most birds and mammals **(Class II)**. Implementation of Environmental Commitment B-1 should ensure the avoidance of any potential impacts from tamarisk to wildlife.

Increased standing water in the area may become suitable habitat for the introduction of common and sensitive native fish species **(Class IV)** but standing water may also result in an increase of mosquitoes, which may eventually warrant the implementation of an abatement program. This would result in a potentially significant impact on any native fish the project proponents may hope to establish in the restoration area if a non-native mosquito predator or pesticides are used **(Class II)**. Implementation of Environmental Commitment B-8 should ensure the avoidance of any potential impacts from the introduction of mosquitoes into the restored area.

A restoration of habitat may also result in an increase of pet dumping or unrestrained pets in the area **(Class II)**. Implementation of Environmental Commitment B-9 and B-10 should ensure the avoidance of any potential impacts from pets in restored habitats.

4.5.2.2 Phoenix Reach Alternatives

Alternative P9: Gravel Pit Restoration, Five-Mile Perennial Stream

Inclusion of the gravel pits adjacent to the banks of the river channel would increase the size of the overall restored habitat by 118 acres which would constitute a beneficial effect **(Class IV)**.

Alternative P9 would result in a perennial stream that runs the entire 8-km (5-mile) length of the Phoenix Reach. This stream alignment would result in open water occurring close to the Sky Harbor International Airport located at the eastern end of the Phoenix Reach. Because the perennial stream and the associated vegetation would attract birds, the potential for bird strikes by incoming and outgoing aircraft near the airport would likely increase. Without a design change, this could constitute a significant, non-mitigable impact **(Class I)**.

All other impacts are the same as those described for the Phoenix Reach of the Proposed Action.

Alternative P6: Gravel Pit Restoration, No Perennial Stream

Inclusion of the gravel pits adjacent to the banks of the river channel, but the exclusion of any perennial stream would result in a decrease in the overall restored habitat by 77 acres. However, because of the current poor condition of the Phoenix Reach, any restoration of natural habitat would constitute a beneficial effect **(Class IV)**.

All other impacts are the same as those described for the Phoenix Reach of the Proposed Action.

Alternative P2: No Perennial Stream, No Gravel Pit Restoration

With regard to biological resources, the impacts of Alternative P2 are the same as those described for the Proposed Action.

Alternative P5: Five-Mile Perennial Stream, No Gravel Pit Restoration

Alternative P5 would result in a perennial stream that runs the entire 8-km (5-mile) length of the Phoenix Reach. This stream alignment would result in open water occurring close to the Sky Harbor International Airport located at the eastern end of the Phoenix Reach. Because the perennial stream and the associated vegetation would attract birds, the potential for an increase of bird strikes by incoming and outgoing aircraft near the airport. Without a design change, this could constitute a significant, non-mitigable impact **(Class I)**.

All other impacts are the same as those described for the Phoenix Reach of the Proposed Action.

4.5.2.3 Tempe Reach Alternatives

Alternative T3: Indian Bend Wash, Upstream Salt River, and Downstream Salt River (Low-Water Use)

This alternative does not involve the establishment of marsh or riparian areas and, therefore, results in only 30 acres of restored mesquite habitat. Although the restoration of any habitat in this area would be considered an improvement **(Class IV)**, in comparison to the Proposed Action and Tempe Reach Alternatives T4 and T6, this alternative would exclude the establishment of any waterfowl and aquatic insect feeding mammals, such as bats.

With the exception of impacts described regarding the potential introduction of mosquitoes into wet habitats, all impacts regarding vegetation and wildlife are the same as described for the Tempe Reach of the Proposed Action.

Alternative T4: Indian Bend Wash and Downstream Salt River (High-Water Use)

Tempe Reach Alternative T4 would preclude the restoration of habitat in the upstream Salt River portion of the Tempe Reach, resulting in 18 less acres of restored habitat than under the Proposed Action. However, the 88 acres restored under this alternative would constitute a beneficial impact in comparison to the current conditions in the Tempe Reach **(Class IV)**.

All impacts regarding vegetation and wildlife are the same as described for the Tempe Reach of the Proposed Action.

Alternative T2: Indian Bend Wash only (Low-Water Use)

Under Tempe Reach Alternative T2, only 20 acres of mesquite habitat would be restored in the Indian Bend Wash portion of the Tempe Reach **(Class IV)**. The impacts to vegetation and wildlife from this alternative are the same as those described for Tempe Reach Alternative T4.

Alternative T6: Downstream Salt River only (High-Water Use)

Under this alternative, habitat would only be created in the downstream portion of the Salt River and would exclude the creation of any mesquite habitat, therefore, result in only 18 acres of habitat overall. Impacts would be similar to those of the Proposed Action, but substantially reduced in magnitude.

4.5.2.4 No Action Alternative

Under the No Action alternative, conditions along the river channel are expected remain essentially the same as current conditions. No specific beneficial impacts related to biological resources are anticipated.

This alternative could result in adverse impacts to what little habitat and wildlife presently exists within this reach because of the harm from continued illegal trash dumping and unrestricted access by people and the potential harm trespassers may cause (such as fires).

4.5.3 References

Sala, A., et al. 1996. Water Use by Tamarix ramosissima Associated Phreatophytes in a Mojave Desert Floodplain. *Ecological Applications, 6(3), pp. 888-898.*

USFWS (U.S. Fish and Wildlife Service). 1997. Draft Fish and Wildlife Coordination Act Report for Dominguez Gap Restoration Project, Los Angeles County, CA. Prepared for the U.S. Army Corps of Engineers, Los Angeles District.

4.6 LAND USE AND RECREATION

This section describes the potential impacts of the Proposed Action and alternatives for the Phoenix and Tempe Reaches relating to land use and recreation. Both adverse and beneficial effects are described. Detailed information on proposed recreational facilities is presented in Appendix I of the Rio Salado Feasibility Report. Please note that local plans for recreational facilities associated with the restoration of the Salt River are more extensive than those included in the Proposed Action. The Proposed Action only includes those recreational facilities that are proposed to be constructed with Federal funds.

4.6.1 DEFINITION AND USE OF SIGNIFICANCE CRITERIA

In accordance with NEPA, the effects of a project are evaluated to determine if they would result in a significant adverse impact on the environment. This EIS focuses on the potential effects of the Proposed Action and offers mitigation measures to reduce or avoid any significant impacts which are identified. There are two main components associated with the land use analysis: (1) determination of potential short- and long- term conflicts with surrounding land uses; and (2) identification of potential inconsistencies with land use/recreational policies, ordinances, and regulations. The criteria used to determine the significance of impacts on land uses (including recreational activities) are based on the long-term compatibility of the Proposed Action with existing and future land uses. The criteria for determining impact significance are:

- Long-term disturbances that would diminish or change the quality and character of a particular land use
- Permanent preclusion of a permitted use or a particular land use
- Long-term loss or degradation of the recreational value of a major recreational facility
- Conflict with federal, state, county, or city land use plans, policies, or regulations
- Conflict with established recreational, educational, religious, or scientific uses of an area.

4.6.2 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Incidental to the primary objective of the Proposed Action (environmental restoration) is the creation of passive recreational opportunities associated with the restored habitat areas, including the use of maintenance roads as trails for walking and biking, and areas for observing wildlife and learning about the natural history of the river. In addition, unpaved trails are planned for equestrian use. The roads and trails will be located on the benches on either side of the low-flow channel and on the banks and overbanks of the river. Interpretive signs will be installed for visitors wishing to learn about the habitats and natural history associated with the river channel.

4.6.2.1 Proposed Action

Phoenix Reach

Along the Phoenix Reach, public access points will be constructed at three locations -- the south side of the river at 16th Street, the north side of the river at Central Avenue, and the south side of the river at 7th Avenue. These public access points will include parking areas, interpretive displays, and ramadas, as well as access to the trail system.

In general, the environmental restoration of the river channel is not expected to have any significant adverse impacts on land use and recreation in the Phoenix Reach. However, during project construction, land uses in the study area could be affected by disturbances such as noise, dust, odors, and traffic congestion generated from construction equipment and activities. For a discussion of these impacts see Sections 4.3 (Air Quality), 4.10 (Noise), and 4.11 (Transportation).

The primary purpose of the Rio Salado environmental restoration project is to restore natural habitat. Incidental to this objective is the creation of passive recreational opportunities associated with the restored habitat areas. As described in Section 3.6 (Land Use and Recreation), the predominant land use types along the Phoenix Reach are industrial and commercial uses and very few recreational facilities currently exist in the area. With this in mind, environmental restoration in the Phoenix Reach would result in an overall beneficial impact **(Class IV)** on land use and recreation in the study area. Potential beneficial impacts would include:

- By creating natural habitat, the quality and character of the river's land use (open space) would be greatly improved, thereby benefitting surrounding land uses. The project would remove much of the existing debris and rubble from the river channel itself and along its banks
- By providing recreational opportunities (currently not existing) along the Phoenix Reach, the recreational value of the river would be greatly improved
- Environmental restoration is compatible with the applicable land use and recreation plans, policies, and regulations of the City of Phoenix and actually furthers many of the goals the City has for conservation and promotion of open space and recreational uses.

After completion of the Proposed Action, operation and maintenance activities will be conducted on an ongoing basis in the habitat areas. Potential impacts to recreational activities such as bird watching, biking, walking, and jogging resulting from habitat maintenance activities along the Phoenix Reach would include:

- During, and for a short period of time following, removal of debris and accumulated sediment, fishing and bird watching activities may be hindered, because the disturbance of wildlife habitat could result in a decrease in the number of fishes and birds (see Section 4.5)
- On temporary basis, air pollutant emissions and noise from the operation of equipment could adversely affect the recreational experience of joggers and recreational walkers utilizing river trails.

Due to the temporary and relatively infrequent nature of operations and maintenance activities, impacts on these recreational uses would be adverse **(Class III)** but not significant.

Tempe Reach

In general, land use and recreation impacts in the Tempe Reach are similar to impacts in the Phoenix Reach. Potential disturbances to land use and current recreational activities resulting from construction activities along the Tempe Reach would include noise, dust, and traffic congestion. For a discussion of these impacts see Sections 4.3 (Air Quality), 4.10 (Noise), and 4.11 (Transportation). Construction could potentially impact activities at the Rio Salado Golf Course in the Indian Bend Wash portion of the Tempe Reach. However, since no heavy construction activities are required within the low-flow channel of Indian Bend Wash, construction impacts are expected to be short-term and not intensive enough to result in significant adverse impacts. South of Curry Road, construction activities may also temporarily disrupt recreational use of the existing trail along the bank of Indian Bend Wash **(Class III)**.

Similar to the Phoenix Reach, environmental restoration in the Tempe Reach would result in beneficial impacts **(Class IV)** by: improving the quality and character of the river; creating additional recreational opportunities for the citizens of Tempe; and helping the City of Tempe accomplish its goal for the overall improvement of the quality of life. Due to the temporary and infrequent nature of operations and maintenance activities, impacts on land use and recreation would be considered adverse **(Class III)** but not significant.

4.6.2.2 Phoenix Reach Alternatives

Alternative P9: Gravel Pit Restoration, Five-Mile Perennial Stream

Land use and recreation effects related to this alternative would be similar to those of the Proposed Action. Similar to the Proposed Action, this alternative includes three public gateways to the river as well as maintenance roads on the benches, banks, and overbanks of the river channel which will also serve as recreational trails. Trails would also be constructed along the edges of the restored gravel pits. Since this alternative places a greater emphasis on riparian habitat and contains more habitat area than the Proposed Action, the beneficial effects of this alternative would be incrementally greater than those of the Proposed Action. Conversely, construction disturbances may be incrementally increased due to construction activities associated with the establishment of a larger habitat area (e.g., incorporation of the three gravel pits). See Section 2.3.1 for a more detailed description of Phoenix Reach Alternative P9. Impacts resulting from operations and maintenance activities for this alternative would be similar to the Proposed Action.

Phoenix Reach Alternative P6: Gravel Pit Restoration, No Perennial Stream

Similar to the Proposed Action and Phoenix Reach Alternative P9, this alternative would include three public gateways to the river and maintenance roads which would serve as recreational trails. Therefore, land use and recreation impacts resulting from this alternative would be similar to those of the Proposed Action and Phoenix Reach Alternative P9.

Alternative P2: No Perennial Stream, No Gravel Pit Restoration

Similar to the Proposed Action, this alternative would include three public gateways to the river, and maintenance roads serving as recreational trails. Therefore, land use and recreation impacts resulting from this alternative would be similar to those of the Proposed Action.

Alternative P5: Five-Mile Perennial Stream, No Gravel Pit Restoration

This alternative also includes three public gateways to the river and maintenance roads serving as recreational trails. As a result, impacts of this alternative are expected to be similar to those of the Proposed Action.

4.6.2.3 Tempe Reach Alternatives

Alternative T3: Indian Bend Wash, Upstream Salt River, and Downstream Salt River (Low-Water Use)

Land use and recreation impacts associated with this alternative would be similar to those of the Proposed Action.

Alternative T4: Indian Bend Wash and Downstream Salt River (High-Water Use)

Since this alternative includes only Indian Bend Wash and Downstream Salt River, the overall improved quality and character of the river's land uses and recreational benefits associated with the project would be less than those realized with the implementation of the Proposed Action. Construction disturbances associated with this alternative would be reduced in comparison to the Proposed Action. Impacts resulting from operations and maintenance activities would be similar to the Proposed Action.

Alternative T2: Indian Bend Wash only (Low-Water Use)

Because this alternative includes only Indian Bend Wash, the overall improved quality and character of the river's land uses and recreational benefits associated with the project would be less than those realized with the implementation of the Proposed Action. Construction disturbances associated with this alternative would be less intense. Impacts resulting from operations and maintenance activities would be similar to the Proposed Action.

Alternative T6: Downstream Salt River only (High-Water Use)

Because this alternative includes only Downstream Salt River, the overall improved quality and character of the river's land uses and recreational benefits associated with the project would be reduced in comparison to the Proposed Action. Construction disturbances associated with this alternative would be less intense. Impacts resulting from operations and maintenance activities would be similar to the Proposed Action.

4.6.2.4 No Action Alternative

Under the No Action alternative, it is expected that the river channel and the areas along the channel would remain in their current condition. In both the Phoenix and Tempe Reaches, the recreational benefits associated with environmental restoration would not be realized. Furthermore, the overall quality and character of the river's land use (open space) would not be improved.

4.7 CULTURAL RESOURCES

This section describes the potential impacts of the Proposed Action and alternatives for the Phoenix and Tempe Reaches relating to cultural resources. The examination of impacts focuses on effects which the project may have on pre-historic and historic sites which may exist in the project area.

4.7.1 DEFINITION AND USE OF SIGNIFICANCE CRITERIA

In accordance with the National Historic Preservation Act of 1996, and the Advisory Council Regulations 36 CFR Part 800.9, Criteria of Effect and Adverse Effect, impacts to cultural resources are considered significant if one or more of the following conditions would result from implementation of the Proposed Action.

(a) An undertaking has an effect on a historic property when the undertaking may alter characteristics of the property that may qualify the property for inclusion in the National Register. For the purpose of determining effect, alteration to features of a property's location, setting, or use may be relevant depending on a property's significant characteristics and should be considered.

(b) An undertaking is considered to have an adverse effect when the effect on a historic property may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects on historic properties include, but are not limited to:

(1) Physical destruction, damage, or alteration of all or part of the property

(2) Isolation of the property from or alteration of the character of the property's setting when that character contributes to the property's qualification for the National Register

(3) Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting

(4) Neglect of a property resulting in its deterioration or destruction

(5) Transfer, lease, or sale of the property.

The "National Register Bulletin, Number 15, How to Apply the National Register Criteria for Evaluation" published by the U.S. Department of the Interior, National Park Service, recognizes different types of values embodied in districts, sites, buildings, structures, and objects. These values fall into the following categories:

Associative Value (Criterion A and B): Properties significant for their association or linkage to events (Criteria A) or persons (Criteria B) important in the past.

Design or Constructive Value (Criterion C): Properties significant as representatives of the manmade expression of culture or technology.

Information Value (Criterion D): Properties significant for their ability to yield important information about prehistory or history.

4.7.2 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.7.2.1 Proposed Action

Phoenix Reach

An intensive pedestrian survey by Corps archaeologists of the Phoenix Reach identified two historic refuse landfills. Neither landfill is eligible for listing in the National Register of Historic Places. A previously recorded archaeological site could not be relocated, and is most likely destroyed. Therefore, the Phoenix Reach portion of the project does not contain known resources eligible for, or listed in, the National Register of Historic Places. In the event that previously unknown resource sites are discovered during project construction, implementation of Environmental Commitment C-1 (below) should ensure the avoidance of any potentially significant effects.

C-1 If evidence of subsurface cultural resources is found during construction, excavation and other construction activity in the area shall cease. A Corps archaeologist shall evaluate the findings in consultation with the Arizona State Historic Preservation Officer regarding eligibility for the National Register of Historic Places, in accordance with federal laws and regulations.

Tempe Reach

The Tempe portion of the project has been studied by the Corps as part of the Indian Bend Wash project in the 1970s. Archaeological surveys identified one archaeological site (AZ U:9:45) near Indian Bend Wash. The site was tested by the Arizona State Museum in 1974, and does not qualify for the National Register of Historic Places. More recent studies by the Corps and the Arizona Department of Transportation covering the remainder of the Tempe Reach portion did not encounter significant cultural resources. Therefore, the Tempe Reach portion of the project does not contain known resources eligible for, or listed in, the National Register of Historic Places. Implementation of Environmental Commitment C-1 (above) should ensure the avoidance of any potentially significant effects.

4.7.2.2 Phoenix Reach Alternatives

Alternative P9: Gravel Pit Restoration, Five-Mile Perennial Stream

The potential effects to cultural resources associated with the implementation of this alternative are similar to those of the Proposed Action. Because this alternative includes the restoration of three gravels pits along the edges of the river channel, a larger area would need to be surveyed for cultural resources. However, due to the degree of ground disturbance in the gravel pit areas, the likelihood of finding intact sites is low. Implementation of Environmental Commitments C-1 and C-2 should ensure the avoidance of any potentially significant effects.

C-2 A survey of the project site shall be performed by a qualified archaeologist prior to project construction. If the survey identifies any cultural resource sites within the project site, and the site(s) is determined eligible for the National Register of Historic Places, measures to mitigate the project's impact on such sites shall be negotiated by Corps archeologists resulting in a Memorandum of Agreement (MOA) among the Corps, Arizona State Historic Preservation Officer and the Advisory Council on Historic Preservation. Mitigation measures stipulated in the MOA will be implemented prior to the initiation of any construction activity in the vicinity of the site(s).

Alternative P6: Gravel Pit Restoration, No Perennial Stream

The potential effects to cultural resources associated with the implementation of this alternative are similar to those of Alternative P9 described above. Due to the degree of ground disturbance in the gravel pit areas, the likelihood of finding intact sites in these areas is low. Implementation of Environmental Commitments C-1 and C-2 should ensure the avoidance of any potentially significant effects.

Alternative P2: No Perennial Stream, No Gravel Pit Restoration

A prior survey and site investigation concluded that the area of potential effects (APE) eligible for, or listed in, the National Register of Historic Places. The area subject to disturbance from grading and construction activities is the same as the Proposed Action. Implementation of Environmental Commitment C-1 should ensure the avoidance of any potentially significant effects.

Alternative P5: Five-Mile Stream, No Gravel Pit Restoration

A prior survey and site investigation concluded that the APE does not contain resources eligible for, or listed in, the National Register of Historic Places. The area subject to disturbance from grading and construction activities is the same as the Proposed Action. Implementation of Environmental Commitment C-1 should ensure the avoidance of any potentially significant effects.

4.7.2.3 Tempe Reach Alternatives

Alternative T3: Indian Bend Wash, Upstream Salt River, and Downstream Salt River (Low-Water Use)

Because this alternative involves the restoration of the same areas of the Tempe Reach as the Proposed Action, the potential impacts to cultural resources are identical to those of the Proposed Action. A prior survey and site investigation concluded that the APE not contain resources eligible for, or listed in, the

National Register of Historic Places. Implementation of Environmental Commitment C-1 should ensure the avoidance of any potentially significant effects.

Alternative T4: Indian Bend Wash and Downstream Salt River (High-Water Use)

A prior survey and site investigation concluded that the APE does not contain resources eligible for, or listed in, the National Register of Historic Places. Implementation of Environmental Commitment C-1 should ensure the avoidance of any potentially significant effects.

Alternative T2: Indian Bend Wash only (Low-Water Use)

A prior survey and site investigation of the Indian Bend Wash concluded that the APE does not contain resources eligible for, or listed in, the National Register of Historic Places. Therefore, implementation of this alternative would not result in any impacts to cultural resources. Implementation of Environmental Commitment C-1 should ensure the avoidance of any potentially significant effects.

Alternative T6: Downstream Salt River only (High-Water Use)

A prior survey and site investigation concluded that the APE does not contain resources eligible for, or listed in, the National Register of Historic Places. Implementation of Environmental Commitment C-1 should ensure the avoidance of any potentially significant effects.

4.7.2.4 No Action Alternative

With the No Action Alternative, the proposed project would not be undertaken and the project sites would not be disturbed by construction activities associated with implementation of restoration plans for the Phoenix and Tempe Reaches. On the other hand, construction activities would result in more stable rivers banks, and therefore would provide long-term protection to any resources in the vicinity from continued erosion (i.e., an indirect beneficial effect).

4.8 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

This section describes the potential impacts of the Proposed Action and alternatives for the Phoenix and Tempe Reaches relating to hazardous, toxic, or radioactive waste. The examination of impacts focuses on effects of the project related to both construction and operation.

4.8.1 DEFINITION AND USE OF SIGNIFICANCE CRITERIA

The Proposed Action would have a significant adverse impact related to hazardous, toxic, or radioactive waste if it would:

- Result in soil contamination that exceeds Federal hazardous waste limits established by 40 CFR Part 261 and Title 22
- Involve construction activities that could result in mobilizing contaminants currently existing in the soil, creating potential pathways of exposure to humans or wildlife
- Expose workers and/or the public to contaminated or hazardous materials that would exceed permissible exposure levels set by OSHA in Title 29 CFR Part 1910
- Result in an increase in the generation of hazardous substances that would require disposal at regional landfill and/or treatment facilities.

4.8.2 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.8.2.1 Proposed Action

Phoenix Reach

Soil Contamination Impacts from Construction. During project construction, various hazardous substances (e.g., fuel, hydraulic fluids, lubricants) would need to be stored at the construction site for operation and minor maintenance of construction equipment. An accidental spill or release of these hazardous substances would contaminate the soil and could potentially migrate to surface waters and the ground water table. Due to the potential for contamination of soil and water resources, an accidental spill or release of these hazardous substances would be considered a significant impact. Implementation of Environmental Commitment H-1 (below) should avoid potentially significant effects related to an accidental release of hazardous substances at the construction site **(Class II)**.

H-1 In the event of a spill or release of hazardous substances at the construction site, the contaminated soil shall be immediately excavated and treated per Federal and State regulations.

Existing Contamination. Areas along portions of the banks of the river channel at the western end of the Phoenix Reach have been used for past dumping of broken concrete and debris. In addition, the areas along the river channel have a history of use as landfills, and several of these former landfill sites are underlain with ground water containing low levels of hazardous chemicals. As a result, it is possible that debris removal, grading, and excavation activities associated with the construction of the Proposed Action could disturb areas of previously undetected contamination, potentially exposing workers to unsafe levels of hazardous substances. Implementation of Environmental Commitments H-2 and H-3 (below) should avoid any potentially significant effects related to existing soil contamination **(Class II)**.

H-2 Prior of construction, a Phase I environmental site assessment of the project site shall be conducted to identify areas potentially containing hazardous substances. The Phase I site assessment should include a review of existing information on known sites of contamination, and a survey of the entire project site for the purpose of identifying suspected areas of uncontrolled chemical releases (e.g., discolored soils, unusual odors, vegetation stress). Based on the results, recommendations shall be made for testing suspected areas and determining the nature and extent of possible contamination. If testing indicates that contamination does exist, the area shall be cleaned up in accordance with applicable State regulations.

H-3 During construction, should an area of suspected contamination be encountered, construction activity in the area shall be stopped and soil sampling shall be conducted to determine the nature and extent of the potential contamination. If testing indicates that contamination does exist, the area shall be cleaned up in accordance with applicable State and federal regulations.

Generation of Hazardous Substances. It is assumed that any potential contamination encountered during construction would be cleaned up through the implementation of mitigation measures H-2 and H-3. Therefore, no significant impacts would result related to the generation hazardous substances.

Groundwater Contamination. The 19th Avenue Superfund site is located adjacent to the north bank of the river channel at the western end of the Phoenix Reach. Extensive work was recently completed to contain contaminants at the site, including the construction of a cap over the top of the landfill, the widening of the river channel, and the construction of levees to protect flood water and rain water from infiltrating the site. Because infiltration of water could adversely impact the existing contamination, the Proposed Action does not include any surface water features near the landfill. Although the specific sites for the production wells have not yet been identified, they will all be located upstream from the 19th Avenue Superfund site; therefore, contaminants are not expected to migrate toward the wells. Prior to construction, a well permit and aquifer protection permit will need to be obtained for the project. Appropriate analysis will be required prior to obtaining these permits in order to address potential impacts to the aquifer and existing contamination plumes. Preliminary results of comprehensive flow modeling completed by the Corps indicate that pumping water to supply the restoration project would have only a minor effect on existing ground water flow patterns (see Appendix A of the Rio Salado Feasibility Report).

There is also a concern that the water supplies required to support the restoration plan would infiltrate the low-flow channel and would raise the existing groundwater table, causing the leaching of contaminants from the landfill sites to the local ground water. As described in Section 4.4, the limited amount of water that would infiltrate back into the local ground water table would not cause the ground water table rise appreciably. Therefore, it is anticipated that no leaching of contaminants would occur.

Tempe Reach

Soil Contamination Impacts from Construction. Similar to the Phoenix Reach, various hazardous substances would be stored at staging areas to support the operation of the construction equipment. An accidental spill or release of these hazardous substances would contaminate the soil and potentially migrate to surface waters and the ground water table. However, any accidental releases of hazardous substances at the construction site would be reduced to a less-than-significant level through the implementation of Environmental Commitment H-1 **(Class II)**.

Existing Contamination. Based on the information presented in Section 3.8, no contaminated sites have been identified within the project limits of the Tempe Reach. However, it is possible that debris removal, grading, and excavation activities associated with the construction of the Proposed Action could disturb areas of previously undetected contamination, potentially mobilizing contaminants in the soil and exposing workers to potentially unsafe levels of hazardous substances. Implementation of Environmental Commitments H-2 and H-3 should avoid any potentially significant effects related to existing soil contamination **(Class II)**.

Generation of Hazardous Substances. Similar to the Phoenix Reach, the construction and operation of the Proposed Action would not generate any material that would be considered hazardous. In addition, it is assumed that any potential contamination encountered during construction would be cleaned up through the implementation of mitigation measures H-2 and H-3. Therefore, no significant impacts would result from the generation hazardous substances.

Groundwater Contamination. Based on the information in Section 3.8, there is an existing treatment facility along Indian Bend Wash that removes contaminants from the ground water by air-stripping processes. The pumping of the ground water has two beneficial results in that it both slows the movement of the underground plume and cleans up the aquifer by treating and removing the contamination. Ground water which would be pumped to supply the Tempe Reach is not contaminated and, therefore, no well-head treatment of this water would be needed.

4.8.2.2 Phoenix Reach Alternatives

Alternative P9: Gravel Pit Restoration, Five-Mile Perennial Stream

This alternative includes a perennial stream flowing within the low-flow channel for the entire 8-km (5-mile) length of the Phoenix Reach. It eliminates the construction of the shallow retention pools within the low-flow channel and incorporates several of the local gravel pits into the restoration plan. To incorporate the gravel pits into the restoration plan, the levees which separate the gravel pits from the river channel would be lowered and the slope angles reduced.

Similar to the Proposed Action, various hazardous substances would need to be stored at the construction site for operation and minor maintenance of construction equipment. Due to the potential for contamination of soil and water resources, an accidental spill or release of these hazardous substances would be considered a significant impact. Implementation of Environmental Commitment H-1 should avoid potentially significant effects related to an accidental release of hazardous substances at the construction site **(Class II)**.

Based on the information presented in Section 3.8, no contaminated sites are located within the Salt River. However, it is possible that debris removal, grading, and excavation activities associated with the construction of the Proposed Action could disturb areas of previously undetected contamination Implementation of Environmental Commitments H-2 and H-3 should avoid any potentially significant effects related to soil contamination **(Class II)**.

Similar to the Proposed Action, the construction and operation of this alternative would not generate any material that would be considered hazardous.

Under this alternative, higher volumes of water would be required to support the planned habitat along the Salt River and adjacent gravel pits. Higher water levels may increase the potential for higher infiltration rates, which could potentially raise the existing ground water table. Although there is a potential for the this alternative to raise the groundwater table, it appears that the groundwater table would not be raised to a level that would cause leaching of contaminants from the landfill sites.

Alternative P6: Gravel Pit Restoration, No Perennial Stream

Under this Alternative, no perennial streams would be constructed or operated, but the incorporation of the local gravel pits into the restoration plan would still occur. The construction and operational impacts associated with this alternative would be similar to what was identified for the Proposed Action and Phoenix Reach Alternative P9.

Alternative P2: No Perennial Stream, No Gravel Pit Restoration

Under this Alternative, there would be no perennial streams within the low-flow channel, and local gravel pits would not be incorporated into the restoration plan. The construction and operational impacts associated with this alternative would be similar to what was identified for the Proposed Action and Phoenix Reach Alternative P9.

Alternative P5: Five-Mile Perennial Stream, No Gravel Pit Restoration

This alternative includes a perennial stream flowing within the low-flow channel for the entire 8-km (5-mile) length of the Phoenix Reach, but eliminates the construction of the shallow retention pools within the low-flow channel.

Similar to the Proposed Action, various hazardous substances would need to be stored at the construction site for operation and minor maintenance of construction equipment. Due to the potential for contamination of soil and water resources, an accidental spill or release of these hazardous substances would be considered a significant impact. Implementation of Environmental Commitment H-1 should avoid potentially significant effects related to an accidental release of hazardous substances at the construction site **(Class II)**.

Based on the information presented in Section 3.8, no contaminated sites are located within the Salt River. However, it is possible that debris removal, grading, and excavation activities associated with the construction of the Proposed Action could disturb areas of previously undetected contamination Implementation of Environmental Commitments H-2 and H-3 should avoid any potentially significant effects related to soil contamination **(Class II)**.

Similar to the Proposed Action, the construction and operation of this alternative would not generate any material that would be considered hazardous.

Under this alternative, higher volumes of water would be required to support the planned habitat along the Salt River and adjacent gravel pits. Higher water levels may increase the potential for higher infiltration rates, which could potentially raise the existing ground water table. Although there is a potential for the this alternative to raise the groundwater table, it appears that the groundwater table would not be raised to a level that would cause leaching of contaminants from the landfill sites.

4.8.2.3 Tempe Reach Alternatives

Alternative T3: Indian Bend Wash, Upstream Salt River, and Downstream Salt River (Low-Water Use)

Similar to the Proposed Action, all three segments of the Tempe Reach would be restored under this alternative. This alternative contains less riparian and wetland habitat than the Proposed Action and, therefore, less water would be required to support the habitat areas. The impacts of this alternative are basically the same as those of the Proposed Action.

Alternative T4: Indian Bend Wash and Downstream Salt River (High-Water Use)

Because this alternative does not involve restoration of upstream Salt River, there is less potential for soil contamination related to project construction (through accidental release of hazardous substances). Under this alternative, there is also less potential for disturbance of previously undetected areas of contamination during project construction. In other regards, the effects of this alternative are similar to those of the Proposed Action.

Alternative T2: Indian Bend Wash only (Low-Water Use)

Because this alternative only involves restoration of Indian Bend Wash, there is less potential for soil contamination related to project construction (through accidental release of hazardous substances). There is also less potential for disturbance of previously undetected areas of contamination during project construction. In other regards, the effects of this alternative are similar to those of the Proposed Action.

Alternative T6: Downstream Salt River only (High-Water Use)

Because this alternative only involves restoration of downstream Salt River, there is less potential for soil contamination related to project construction (through accidental release of hazardous substances). There is also less potential for disturbance of previously undetected areas of contamination during project construction. In other regards, the effects of this alternative are similar to those of the Proposed Action.

4.8.2.4 No Action Alternative

Under the No Action Alternative, existing conditions along the Phoenix and Tempe Reaches of the river would remain basically unchanged. Without the implementation of the project, no construction activities would occur in the river channel related to environmental restoration. Therefore, no potential impacts related to project construction would occur (accidental release of hazardous substances and disturbance of previously contaminated areas).

4.9 AESTHETICS

This section describes the potential impacts of the Proposed Action and alternatives for the Phoenix and Tempe Reaches relating to aesthetics. The examination of impacts focuses on effects that the project may have on visual resources, including views of the project area. Both adverse and beneficial effects are described.

4.9.1 DEFINITION AND USE OF SIGNIFICANCE CRITERIA

In accordance with NEPA, the effects of a project are evaluated to determine if they would result in a significant adverse impact on the environment. This EIS focuses on the potential effects of the Proposed Action and offers mitigation measures to reduce or avoid any significant impacts which are identified. Based upon the following significance criteria concerning the Proposed Action's effect on aesthetics, the Proposed Action would have significant adverse impacts on the environment if it would cause:

- Direct, permanent changes to important existing scenic characteristics of a landscape that is viewed by a large number of viewers and/or one or more residences
- Changes that would generate major new sources of light and glare
- The impairment of, or obstruction to, views from public gathering places of scenic resources identified in Federal, State, and local plans
- Changes that would add significantly to a cumulative visual alteration
- Loss of naturalness, community solitude, and the opportunity for private and unconfined recreation.

4.9.2 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.9.2.1 Proposed Action

Phoenix Reach

Since the primary purpose of the Rio Salado environmental restoration project is to restore the natural habitat of the river, the implementation of the Proposed Action would result in an overall beneficial impact **(Class IV)** by improving visual conditions in the Phoenix Reach. The natural habitat areas which would be created by the project would replace the current barren conditions along most of the river channel.

In view of the urban nature of the majority of land uses surrounding the Phoenix Reach, construction activities (such as the presence of construction equipment and personnel during excavation of the low-flow channel, the laying of pipe for irrigation and pumping, earth-moving equipment for the creation of the habitat terraces, and the installation of the vegetation) would only result in short term and temporary disruption of short range views of the channel. This is considered an adverse **(Class III)** but not significant impact. Long-range views to the north and south would not be greatly impaired by the construction activities of the Proposed Action, since the majority of visual access is already blocked by industrial development and city landscapes.

It should be noted that the Proposed Action is highly compatible with the City of Phoenix's general goals of: 1) enriching the lifestyles of its citizens through he enhancement and maintenance of wildlife and vegetation resources in the community; 2) supporting the development of distinctive features to give neighborhoods a distinctive identity and character; and 3) providing, preserving and maintaining open space. The Proposed Action would result in a beneficial impact **(Class IV)** by helping accomplish the City's General Plan goals.

Tempe Reach

Although overall visual conditions along the Tempe Reach are better than the Phoenix Reach, the majority of this reach is devoid of vegetation. With the exception of the Rio Salado Golf Course portion of Indian Bend Wash, the Tempe Reach is basically barren. Therefore, similar to the Phoenix Reach, the implementation of the Proposed Action within the Tempe Reach would have a beneficial impact **(Class IV)** on the visual quality of the study area through the introduction of natural vegetation.

Impacts to the views of the current recreational users of the Tempe Reach would be adverse **(Class III)** but not significant during both the construction and operational phases of the Proposed Action. Construction activities such as the presence of construction equipment and personnel during grading, the laying of pipe for irrigation and pumping, the creation of the habitat areas, and the installation of the vegetation would only involve relatively short-term visual intrusions. Similarly, operations and maintenance activities that involve use of large equipment for debris removal and repairs may be unpleasant to the viewer. However, given the infrequent and temporary nature of these activities, these impacts are considered negligible.

The City of Tempe's Rio Salado Plan requires the City to preserve open space and improve the quality of life in the region. The implementation of the Proposed Action would aid the City in accomplishing the goals of this plan, thereby resulting in a beneficial impact **(Class IV)**.

4.9.2.2 Phoenix Reach Alternatives

Alternative P9: Gravel Pit Restoration, Five-Mile Perennial Stream

In general, the aesthetic effects related to this alternative would be similar to those of the Proposed Action. However, since this alternative would restore a larger area than the proposed project, there would be a greater degree of visual improvement to the area. In particular, the implementation of this alternative would increase the scenic value of the study area by converting the poor visual quality of industrial land uses (i.e., three gravel pits) into open space areas through the establishment of vegetation and natural habitat. Conversely, construction disturbances may be increased due to construction activities associated with the establishment of a larger habitat area such and the incorporation of the three gravel pits into the restoration effort. See Section 2.3.1 for a more detailed description of Phoenix Reach Alternative P9. Impacts resulting from operations and maintenance activities for this alternative would be similar to the Proposed Action.

Alternative P6: Gravel Pit Restoration, No Perennial Stream

Impacts on aesthetic resources resulting from the implementation of this alternative would be similar to those of Phoenix Reach Alternative P9.

Alternative P2: No Perennial Stream, No Gravel Pit Restoration

Impacts on aesthetic resources resulting from this alternative would be similar to those of the Proposed Action.

Alternative P5: Five-Mile Perennial Stream, No Gravel Pit Restoration

Aesthetic impacts associated with this alternative would be similar to those of the Proposed Action.

4.9.2.3 Tempe Reach Alternatives

Alternative T3: Indian Bend Wash, Upstream Salt River, and Downstream Salt River (Low-Water Use)

Aesthetic impacts associated with this alternative would be similar to those of the Proposed Action.

Alternative T4: Indian Bend Wash and Downstream Salt River (High-Water Use)

Since this alternative includes only Indian Bend Wash and Downstream Salt River, the overall improved visual quality and character of the river associated with the project would be less than those realized with the implementation of the Proposed Action or Tempe Reach Alternative T3. Construction disturbances associated with this alternative would be less intense. Impacts resulting from operations and maintenance activities would be similar to the Proposed Action.

Alternative T2: Indian Bend Wash only (Low-Water Use)

Because this alternative includes only Indian Bend Wash, the overall improved visual quality and character of the river associated with the project would be less than those realized with the implementation of the Proposed Action or Tempe Reach Alternatives T3 and T4. Construction disturbances associated with this alternative would be less intense. Impacts resulting from operations and maintenance activities would be similar to the Proposed Action.

Tempe Reach Alternative 4: Downstream Salt River only (High-Water Use)

Similar to Tempe Reach Alternative T2, the overall improved visual quality and character of the river associated with the implementation of this alternative would be less than those realized with the implementation of the Proposed Action or Tempe Reach Alternatives T3 and T4. Construction disturbances associated with this alternative would be less intense. Impacts resulting from operations and maintenance activities would be similar to the Proposed Action.

4.9.2.4 No Action Alternative

Under the No Action alternative, conditions along the river channel are expected remain essentially the same as current conditions. Without the establishment of natural habitat areas, the river channel would remain barren and the general visual quality of the study area would not be improved. In particular, within the Phoenix Reach, much of the man-made debris that is currently in the channel would remain and the highly disturbed and poor scenic quality of the area would continue to exist.

4.10 NOISE

This section describes the potential impacts of the Proposed Action and alternatives for the Phoenix and Tempe Reaches relating to noise. The examination of impacts focuses on effects which the project may have on the noise environment due to both project construction and ongoing operation and maintenance activities.

4.10.1 DEFINITION AND USE OF SIGNIFICANCE CRITERIA

There are two basic methodologies for evaluating noise impacts from the construction and operation of a proposed project. First, noise levels projected for the project must comply with the relevant federal, state, and local standards or regulations. This is primarily enforced through the local noise ordinance, supported by nuisance complaints and subsequent investigation. The second method for evaluating noise impacts from a proposed project is to determine if there would be an increase in noise levels above the existing ambient level as a result of the introduction of a new source of noise. A change in noise level due to a new noise source can create an impact on people. Based on these two methodologies, impacts from noise would be considered significant if:

- Adopted local standards, noise element, or ordinance would be exceeded in noise level, timing, or duration
- The Proposed Action would increase the ambient noise level above ordinance-specified limits for the land use zoning or by more than 3 dBA in areas already exceeding the limits
- An increase in noise levels of 15 dB or more would occur over a period of at least one-half day at a sensitive receptor at any ambient noise level; permanent increases of 10 dB would also be significant
- Long-term noise would conflict with state or local guidelines, interior noise levels, and 24-hour averages, and specifically, noise levels exceeding a day-night average sound pressure level L_{dn} of 60 dBA at the nearest noise sensitive receptor
- Noise increments to the ambient that are as low as 5 dB would be significant if they occur during quieter hours at night (between 10 p.m. and 7 a.m.).

4.10.2 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.10.2.1 Proposed Action

Phoenix Reach

Construction. Construction noise can be created from on-site and off-site sources. On-site noise during construction would occur primarily from heavy-duty diesel- and gasoline-powered construction equipment (e.g., dozers, graders, backhoes). Noise levels from these pieces of construction equipment range from 75 dBA to 90 dBA at a distance of approximately 15 meters (50 feet), and 53 dBA to 65 dBA at a distance of approximately 120 meters (400 feet). It should be noted that noise levels are calculated based on the assumption that noise from localized sources typically falls off by 8 dBA with each doubling of distance from the source of noise. Table 4.10-1 presents the typical equipment that would be used to construct the proposed Phoenix Reach, as well as the noise intensity levels at various distances from the noise source.

Table 4.10-1 Equipment and Associated Noise Intensity

Equipment Type	Engine Type	Power Rating (hp)	Noise Intensity (dBA)[1]			
			15 m (approx. 50 ft.)	120 m (approx. 400 ft.)	250 m (approx. 800 ft.)	490 m (approx. 1600 ft.)
Dozer	Diesel	250	89	65	57	49
Grader	Diesel	250	89	65	57	49
Backhoe	Diesel	100	86	62	54	46
Dump Truck	Diesel	200	77	53	45	37
Fuel Truck	Diesel	100	77	53	45	37
Water Truck	Diesel	100	77	53	45	37

1 Data are adopted from U.S. Environmental Protection Agency NTID 300.1, 1972, pg.2-108, and other sources (levels are in dBA at 15.25 meter reference distance). These values are based on a range of equipment and operating conditions. Values are intended to reflect noise levels from equipment in good condition, with well-fitted mufflers, air intake silencers, etc., operating at near-peak level. In addition, these values assume some averaging of sound level over all directions from the listed piece of equipment.

Table 4.3-1 in the Air Quality Section lists the specific construction tasks associated with the restoration of the Phoenix Reach. A majority of the on-site noise sources would be associated with the removal of broken concrete and trash along the Salt River near 19th Avenue, and the excavation and grading of a low-flow channel along the Salt River. As listed in Appendix B, a number of construction equipment would be operated within the channel and would generate noise levels similar to those presented in Table 4.10-1. Because the closest noise receptors are approximately 60 to 90 meters (200 to 300 feet) from the noise source, and that the noise within the channel would be partially shielded by the overbank, it was determined that the noise levels may be adverse, but would not pose any significant impacts **(Class III)**. Environmental commitments (Mitigation Measures) N-1 and N-2 would help to reduce the adversity of the construction noise.

N-1 Conduct all construction activities involving motorized equipment between the hours of 7 a.m. and 7 p.m., Monday through Saturday, or for a shorter period if so stipulated in the applicable noise ordinance. Incorporate these restrictions in all construction plans prior to construction.

N-2 Maintain proper mufflers on all internal combustion and vehicle engines used in construction to reduce noise to the maximum feasible extent.

Off-site noise would be generated from trucks delivering material (e.g., cement) and equipment, as well as from vehicles used by workers commuting to and from the proposed job site. Under the Proposed Action, it is assumed that approximately 10 to 30 workers would be required to construct the Phoenix Reach. In addition, trucks would transport broken concrete and trash near 19th Avenue to a disposal facility adjacent to the subject construction site. Noise levels from these off-site sources are generally low and would not affect any ambient noise levels **(Class III)**.

Operation and Maintenance. There would be very few ongoing noise sources associated with the Proposed Action. On a periodic basis, minor noise levels would result from temporary construction activities that would be required to repair damaged habitat areas caused heavy storm flows, from well pumps and water treatment equipment, and from maintenance vehicles traveling within the subject channel. Noise levels from these sources would not create any significant impacts on ambient conditions, and would not impact any local sensitive receptors **(Class III)**.

Sensitive Receptors. As illustrated in Figure 3.10-1, there are a number of sensitive receptors near the construction site. Noise levels from construction may be a nuisance to sensitive receptors during the period of project construction, but will cease after construction is complete **(Class III)**. Environmental commitments (Mitigation Measures) N-1 and N-2 would help to reduce the adversity of the construction noise.

Tempe Reach

Construction. Temporary noise levels from construction of the Tempe Reach would be similar to those projected for the Phoenix Reach, but would occur for a shorter period of time. Therefore, noise levels from construction may be adverse, but would not be significant **(Class III)**. Environmental commitments (N-1 and N-2) listed above would help to reduce the adversity of the construction noise.

Operation and Maintenance. Similar to the Phoenix Reach, minor noise levels would result from the operation and maintenance (refer to Table 4.3-2 for a description of the operation and maintenance) of the Tempe Reach. Noise levels from these sources would not create any significant impacts on ambient conditions **(Class III)**.

Sensitive Receptors. As illustrated in Figure 3.10-2, there are a number of sensitive receptors (i.e., hospitals, parks, schools) along the Tempe Reach. Noise levels from construction may be a nuisance to sensitive receptors during the period of project construction, but will cease after construction is complete **(Class III)**. Environmental commitments (Mitigation Measures) N-1 and N-2 would help to reduce the adversity of the construction noise.

4.10.2.2 Phoenix Reach Alternatives

Alternative P9: Gravel Pit Restoration, Five-Mile Perennial Stream

The noise levels associated with the construction and operation of this alternative would be similar to those projected for the Proposed Action. However, the duration of the construction noise would be longer under this alternative as a result of the extensive construction requirements of incorporating the gravel pits into the restoration plan. In addition, the construction activities would occur in areas that may be closer in distance to sensitive receptors. This may result in a significant noise impact, but would be reduced to a non-significant level through the implementation of the environmental commitments (N-1 and N-2) listed above **(Class II)**.

Periodically, noise would be produced from the operation and maintenance of the Phoenix Reach. Temporary noise levels would be similar to the Proposed Action, but would occur for a longer period of time. This would result in an adverse, but non-significant noise impact **(Class III)**.

Alternative P6: Gravel Pit Restoration, No Perennial Stream

The noise levels associated with the construction and operation of this alternative would be similar to those projected for the Proposed Action and Phoenix Reach Alternative P9. However, the duration of the construction noise would be longer under this alternative as a result of the extensive construction requirements of incorporating the gravel pits into the restoration plan. In addition, the construction activities would occur in areas that may be closer in distance to sensitive receptors. This may result in a significant noise impact, but would be reduced to a non-significant level through the implementation of the environmental commitments (N-1 and N-2) listed above **(Class II)**.

Periodically, noise levels would be produced from the operation and maintenance of the Phoenix Reach. Temporary noise levels would be similar to the Proposed Action, but would occur for a longer period of time. This would result in an adverse, but non-significant, noise impact **(Class III)**.

Alternative P2: No Perennial Stream, No Gravel Pit Restoration

The noise levels associated with the construction and operation of this alternative would be similar to those projected for the Proposed Action. Noise levels associated with project construction would be similar to the Proposed Action. In addition, minor noise levels would occur on a periodic basis from temporary construction activities that would be required to repair damaged habitat areas caused heavy storm flows. Noise would also be generated from well pumps and water treatment equipment, and from maintenance vehicles traveling within the subject channel. This would result in an adverse, but non-significant, noise impact **(Class III)**.

Alternative P5: Five-Mile Perennial Stream, No Gravel Pit Restoration

The noise levels associated with the construction and operation of this alternative would be similar to those projected for the Proposed Action. Noise levels associated with project construction would be similar to the Proposed Action. In addition, minor noise levels would occur on a periodic basis from temporary construction activities that would be required to repair damaged habitat areas caused heavy storm flows. Noise would also be generated from well pumps and water treatment equipment, and from maintenance vehicles traveling within the subject channel. This would result in an adverse, but non-significant, noise impact **(Class III)**.

4.10.2.3 Tempe Reach Alternatives

Alternative T3: Indian Bend Wash, Upstream Salt River, and Downstream Salt River (Low-Water Use)

This alternative would be similar to the Proposed Action, but would require less water to support the planned habitat. Under this alternative, noise levels would occur for a shorter period of time. No significant noise impacts would result from the implementation of this alternative **(Class III)**.

Alternative T4: Indian Bend Wash and Downstream Salt River (High-Water Use)

This alternative would be similar to the Proposed Action, but the open water and wetland marsh would not be constructed at the upstream side of Town Lake. Under this alternative, noise levels would occur for a shorter period of time. No significant noise impacts would result from the implementation of this alternative **(Class III)**.

Alternative T2: Indian Bend Wash only (Low-Water Use)

This alternative would be similar to the Proposed Action, but would not include the restoration of the Salt River portion of the proposed Tempe Reach. Under this alternative, noise levels would occur for a shorter period of time. As a result, no significant noise impacts would result from the implementation of this alternative **(Class III)**.

Alternative T6: Downstream Salt River only (High-Water Use)

This alternative would be similar to the Proposed Action, but would not include the Indian Bend Wash portion of the proposed Tempe Reach. Noise levels would occur for a shorter period of time under this alternative. As a result, no significant noise impacts would result from the implementation of this alternative **(Class III)**.

4.10.2.4 No Action Alternative

Under the No Action alternative, conditions along the river channel are expected remain essentially the same as current conditions. No specific impacts related to noise are anticipated. The noise expected to be generated by project construction and maintenance activities would not occur under this alternative.

4.10.3 REFERENCES

USEPA (U.S. Environmental Protection Agency). 1972. Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances. NTID 300.1

4.11 TRANSPORTATION

This section describes the potential impacts of the Proposed Action and alternatives for the Phoenix and Tempe Reaches relating to traffic and transportation. The examination of impacts focuses on effects which the project may have on the local vehicular circulation and access as well as on public transit systems. No effects related to rail, air, or waterborne transportation are anticipated.

4.11.1 DEFINITION AND USE OF SIGNIFICANCE CRITERIA

A project can affect transportation and circulation in the short-term through blockages of nearby roadways and highways, or in the long-term through the generation of additional trips. Impacts from the Proposed Action would be considered significant if one or more of the following conditions were to occur as a result of construction or operations.

- Project activities would increase the demand for and/or reduce the supply of parking spaces and there would be no provisions for accommodating the resulting parking deficiencies
- Construction activities would substantially impede pedestrian movements or bike trails in the area and there would be no suitable alternative pedestrian/bicycle access routes
- An unreasonable increase in roadway wear or damage in the vicinity of the site would occur as a result of heavy truck or construction equipment movements, resulting in noticeable deterioration of pavement or roadway surface without compensatory repairs being made
- Construction activities or operation of the proposed project would result in safety problems for vehicular traffic, pedestrians, or transit operations
- Construction activities would conflict with planned transportation projects in the project vicinity
- The Proposed Action and its siting would conflict with planned transportation improvements in the area.
- An increase in vehicle trips associated with additional commuter and truck trips would result in an unacceptable reduction in level of service (LOS) standards of local jurisdictions on roadways in the project vicinity.

4.11.2 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.11.2.1 Proposed Action

Phoenix Reach

As described in Section 2.1.1, the Proposed Action includes the restoration of the Salt River between 19th Avenue and Interstate 10. The proposed restoration would involve the removal of broken concrete and trash near 19th Avenue, construction or modification of a 60-meter (200-foot) wide low-flow channel in the river bottom, and the establishment of riparian and mesquite habitat on the benches, banks, and overbanks of the river channel.

Construction Impacts on Circulation and Road Capacity. During the period of project construction, trucks would transport equipment and materials to staging areas along the Phoenix Reach, and vehicles will transport workers to the job site. In addition, it was assumed that trucks would be transporting broken concrete and trash from the construction site (near 19th Avenue) to a landfill that is located adjacent to the Salt River. It was assumed that these trucks would utilize dirt roadways located between the excavation site and the landfill, and would not travel on local roadways. Refer to Table 3 in Appendix B for the number of truck trips and commuter trips associated with the construction of the Phoenix Reach.

Based on the truck and vehicle trips listed in Table 3 of Appendix B, the volume of truck and vehicle trips will not be large enough to affect levels of service (LOS) on local roadways; however, it is possible that concentrations of construction vehicles entering and exiting the project site at specific access points could cause localized disruptions of traffic (i.e., trucks slowing or temporarily blocking traffic). This could present a potential traffic safety issue and could also inconvenience some motorists. This would represent an adverse, but non-significant impact on circulation or roadway capacities **(Class III)**. Environmental commitment T-1 would help to reduce the adversity of the construction traffic.

T-1 Flagmen shall direct vehicle traffic on affected roadways when a lane would be blocked, or large equipment or trucks would enter or exit the project site.

Although a large volume of construction traffic is not anticipated, a traffic control plan may be needed for construction operations. As needed, the traffic control plan would identify access points to the site for construction vehicles, limit times of truck ingress/egress, provide direction for the deployment of construction sign and barricades, establish detour routes or other traffic routing plans, and provide for the use of flag men or other temporary traffic control measures.

Construction Impacts on Transportation Infrastructure. Construction activities would occur onsite with construction vehicles stored within or adjacent to the Salt River channel. The only encroachment upon local roadways would occur during preparations for and the pouring of concrete and asphaltic concrete when constructing the maintenance road driveways. Damage to the surface of local roadways is expected to be minimal and any roadway damage would be repaired with implementation of Environmental Commitment T-2. Therefore, the impact from the potential damage to the surface of local roadways would be considered insignificant **(Class III)**.

T-2 Within 30 days of completion of construction activities, any damage to local roadways related to project construction activities and vehicles shall be repaired to pre-construction conditions.

Construction Impacts on Parking, Pedestrian and Bicycle Circulation. It is assumed that all construction equipment, construction vehicles, and individual cars would be parked within or adjacent to the Salt River channel during construction. Therefore, no demand would be placed upon off-site or curb-side parking and the impact on parking facilities would not be significant **(Class III)**. As a result, no mitigation measures are required.

No adverse impacts related to pedestrian or bicycle circulation are anticipated, except to the degree that construction traffic may disrupt sidewalks or bike routes on local roadways. After construction, the project will be beneficial to pedestrian and bicycle circulation in that maintenance roads within the river corridor will be used as hiking/biking trails **(Class IV)**.

Construction Impacts on Public Transit. Public transit should not be adversely affected by construction activities, except to the degree that construction traffic may affect circulation along local roadways. Access points to the construction areas will need to be selected so as not to adversely affect bus stops. If impacts to a bus stop cannot be avoided, arrangements shall be made to temporarily relocate the bus stop or implement some comparable measure, depending on the preferences of the transit agency **(Class III)**.

Operation and Maintenance. Under the Proposed Action, approximately 2 to 10 workers would commute to the Salt River channel for routine maintenance activities, depending on the level of flow that has occurred within the channel. It is assumed that they would commute from within a 24-km (15-mile) radius from the Proposed Action Area, and would utilize several of the major freeways (e.g., I-10, 202) in Maricopa County. Besides the commuter trips, several truck trips would be required to transport construction equipment. No significant traffic impacts are anticipated from the operation and maintenance of the Phoenix Reach **(Class III)**.

Visitors to the recreational facilities planned for the river corridor are expected to arrive primarily by automobile, creating a demand for parking. Three public access points to the river corridor are planned and each will include parking facilities. No impacts on local parking, circulation or road capacity would result from the implementation of the restoration of the local Phoenix Reach **(Class III)**.

Tempe Reach

As illustrated in Figure 2-2 (Project Site Location), the Tempe Reach includes three areas which would be restored along the Salt River and Indian Bend Wash located between McKellips Road to the north, McClintock Drive to the east, Salt River to the South, and Priest Drive to the west. Impacts associated with the construction and operation of the Tempe Reach are provided below.

Construction Impacts on Circulation and Road Capacity. Similar to the Phoenix Reach, the proposed construction of the Tempe Reach would require a number of pieces of construction equipment that would be transported to the site by trucks. In addition, approximately 10 to 30 workers would commute to the project site on a daily basis. It is assumed that the workers would travel approximately 24-km (15 miles) to and from the job site using major freeways such as Interstate 10, Highway 202, etc. Refer to Appendix B for a description of the number of truck trips required for the Tempe Reach.

Based on the information presented above, as well as the information listed in Tables 3.11-1, 3.11-2, and 3.11-3, the volume of truck and vehicle trips will not be large enough to affect levels of service (LOS) on local roadways. Therefore, no significant circulation or road capacity impacts would result **(Class III)**. Environmental commitment T-1 would help to reduce the adversity of the construction traffic.

Construction Impacts on Transportation Infrastructure. Similar to the Phoenix Reach, damage to the surface of local roadways is expected to be minimal and any roadway damage would be repaired with implementation of Environmental Commitment T-2. Therefore, the impact from the potential damage to the surface of local roadways would be considered insignificant **(Class III)**.

Construction Impacts on Parking, Pedestrian and Bicycle Circulation. All construction equipment, construction vehicles, and individual cars would be parked within or adjacent to the Salt River channel during construction. Therefore, no demand would be placed upon off-site or curb-side parking and the impact on parking facilities would not be significant **(Class III)**.

Similar to the Phoenix Reach, the project will be beneficial to pedestrian and bicycle circulation in that it will provide new hiking/biking trails within the river corridor **(Class IV)**.

Construction Impacts on Public Transit. Public transit should not be adversely affected by construction activities, except to the degree that construction traffic may affect circulation on local roadways. As described above, construction traffic should not result in any significant impacts on local roadways. Therefore, it is anticipated that the potential impacts to public transit would be minimal **(Class III)**.

Operation and Maintenance. Table 10 in Appendix B lists the number of vehicle trips associate with the operation and maintenance of the Tempe Reach. The number of vehicle trips listed in Table 10 would not result in any significant short-term or long-term traffic impacts **(Class III)**.

4.11.2.2 Phoenix Reach Alternatives

Alternative P9: Gravel Pit Restoration, Five-Mile Perennial Stream

In comparison to the Proposed Action, this alternative includes a perennial stream flowing within the low-flow channel, it eliminates the construction of the shallow retention pools within the low-flow channel, it contains more aquatic strand habitat within the low-flow channel, and incorporates local gravel pits into the restoration plan. The truck and vehicle volumes associated with this alternative would be higher than what was assumed for the Proposed Action. This is a result of the extensive construction requirements of incorporating the gravel pits into the restoration plan. The construction and operation of this alternative would have adverse, but not significant, effects on transportation **(Class III)**.

Alternative P6: Gravel Pit Restoration, No Perennial Stream

The construction and operation impacts associated with this alternative would be very similar to the impacts identified for Phoenix Reach Alternative P9. That is, the construction and operation of this alternative would have adverse, but not significant, effects on transportation **(Class III)**.

Alternative P2: No Perennial Stream, No Gravel Pit Restoration

The effects of this alternative are similar to those of the Proposed Action. The effects of project construction and operation on transportation would be adverse, but not significant **(Class III)**.

Alternative P5: Five-Mile Perennial Stream, No Gravel Pit Restoration

The effects of this alternative are similar to those of the Proposed Action. The effects of project construction and operation on transportation would be adverse, but not significant **(Class III)**.

4.11.2.3 Tempe Reach Alternatives

Alternative T3: Indian Bend Wash, Upstream Salt River, and Downstream Salt River (Low-Water Use)

This Alternative would be similar to the Proposed Action, but would require less water to support the planned habitat. The number of vehicles associated with the construction and operation of the Tempe Reach would be similar to what is identified for the Proposed Action in Table 9 of Appendix B. As a result, the construction and operation of this alternative would be adverse, but not significant **(Class III)**.

Alternative T4: Indian Bend Wash and Downstream Salt River (High-Water Use)

Under this Alternative, the open water and wetland marsh would not be constructed at the upstream side of Town Lake dam. The number of vehicles associated with the construction and operation of the Tempe Reach would be less than what was identified for the Proposed Action in Table 9 of Appendix B. As a result, the construction and operation of this alternative would be adverse, but not significant **(Class III)**.

Alternative T2: Indian Bend Wash only (Low-Water Use)

Under this alternative, Indian Bend Wash would be the only segment of the Tempe Reach that would be restored to its natural state. The number of vehicles associated with the construction and operation of the Tempe Reach would be less than what was identified for the Proposed Action in Table 9 of Appendix B. As a result, the construction and operation of this alternative would be adverse, but not significant **(Class III)**.

Alternative T6: Downstream Salt River only (High-Water Use)

This alternative includes only the restoration of the Salt River segment of downstream of Town Lake. The number of vehicles associated with the construction and operation of the Tempe Reach would be less than what was identified for the Proposed Action in Table 9 of Appendix B. As a result, the construction and operation of this alternative would be adverse, but not significant **(Class III)**.

4.11.2.4 No Action Alternative

Under the No Action Alternative, the proposed Phoenix and Tempe Reaches would not be constructed. As a result, no truck and vehicle volumes would be generated, and therefore, no significant transportation impacts would result.

4.11.3 REFERENCES

American Automobile Association. 1996. Phoenix Central and Western Suburbs - Citimap.

Rand McNally. 1996. Phoenix and Adjoining Cities - City Map.

California Department of Transportation. 1990. *Manual of Traffic Controls for Construction and Maintenance Work Zones*.

4.12 CUMULATIVE IMPACTS

4.12.1 CUMULATIVE PROJECTS CONSIDERED

The cumulative scenario consists of projects that are reasonably foreseeable (i.e., planned or projected) in the vicinity of the site of the Proposed Action. This section provides a listing of various projects comprising the cumulative scenario which, when considered together with the Proposed Action, may compound or increase environmental impacts. Table 4.12-1 presents the cumulative projects considered for this study. The cumulative projects list was compiled based on information provided by the planning departments of the Cities of Phoenix and Tempe.

Table 4.12-1 Cumulative Projects List

Project	Location	Project Type	Size	Construction Start Date
PHOENIX				
Public Golf Course	Del Rio landfill site (south side of Salt River channel between 7th Street and 16th Street	18-hole golf course and clubhouse	Approx. 120 acres	1-3 years
Sky Harbor International Airport Improvements	North side of the Salt River channel between 24th Street and 48th Street	Construction of a third runway, relocation of Air National Guard facilities, runway and taxiway extension, and terminal expansion.	Approx. 122 acres have been acquired for airport improvements.	Improvements in progress
TEMPE				
Town Lake	Salt River channel	Recreational lake	220 acres	August 1997
Hayden Ferry (Phases I-IV)	South side of the Salt River channel between Mill Avenue and Rural Road	Mixed Use Development	31.9 acres (net) Retail: 234,300 sq.ft. Office: 732,500 sq.ft. Apt./Condo.: 915 units Hotel: 275 rooms Parking: 4,654 spaces	Early 1998 (Phase I - Hotel & 180,000 sq.ft. of office space)
Ciudad del Lago (Phase I)	South side of the Salt River channel east of Rural Road	Commercial Development	Hotel & Conference Center: 1,310,000 sq.ft. (1,100-room hotel) Retail: 100,000 sq.ft.	June 1998
Ciudad del Lago (Phase II)	South side of the Salt River channel east of Rural Road	Commercial Development	Retail: 100,000 sq.ft. Restaurant: 50,000 sq.ft.	Not scheduled
Ciudad del Lago (Phase II)	North side of the Salt River channel east and west of Rural Road	Commercial Development	Not determined	Not scheduled
Papago Park Center	North of the Red Mountain Freeway, west of Van Buren Street	Commercial Development	9,077,536 sq.ft. (office, hotel, retail, research, entertainment)	Currently being developed

Cumulative projects do not include completed projects (with the exception of existing projects that would have increased activities over the baseline assumptions). These existing projects are considered part of the environmental setting for individual issue areas in Section 3 (Affected Environment).

4.12.2 CUMULATIVE EFFECTS

Geology and Geomorphology

Cumulative effects related to geology and soils are primarily related to project construction activities. The degree of land disturbance associated with the construction of planned development projects in the vicinity of the river channel (especially along the Tempe Reach) could increase erosion with most sediment eventually being deposited into the river channel. This is a temporary effect which be minimized through the implementation of erosion control measures during the construction period of each project (see Environmental Commitment G-3). Planned development will cumulatively alter the landform of properties along the bank of the channel; however, because these areas consist primarily of level or gently sloping terrain, this effect is not considered significant.

Air Quality

Construction of each of the anticipated future projects in the vicinity of the river channel would result in impacts to air quality due to exhaust emissions from heavy duty diesel- and gasoline-powered construction equipment, as well as fugitive particulate matter from soil disturbed during grading and trenching operations. Cumulative impacts on air quality would only be experienced if multiple construction projects occur simultaneously. Air quality impacts from construction activities could be substantially reduced if each construction site is watered regularly to keep down dust, and various other measures are implemented to reduce construction-related emissions (see Table 4.3-5).

There are a variety of operational emission sources associated with cumulative development, including emissions from vehicular traffic generated by future development projects, emissions from increased aircraft operations at Sky Harbor International Airport, and emissions related to the generation of electrical power to meet the increased demands of future development. In relation to anticipated cumulative projects (see Table 4.12-1), the proposed project would generate only minor amounts of operational emissions. These emissions would be generated from vehicles transporting visitors to and from the public recreational areas and from the electricity needed to operate the wells and treatment equipment which will supply the habitat areas with water.

Hydrology and Water Quality

Increased development in the vicinity of the river will lead to an increase in surface runoff. This runoff will be released into the river from storm drain outlets and may promote the growth of vegetation in the channel (similar to current conditions). However, because of the poor quality of this runoff it will need to be directed away from the proposed habitat areas in order to avoid any degradation of the habitat. The increase in surface runoff associated with urban development is caused by covering of the ground surface with impervious surfaces (e.g., buildings and pavement). This prevents water from seeping into the ground surface and replenishing ground water supplies. Because the restoration plan involves only a minor amount of pavement for maintenance roads and parking areas, the proposed project will not contribute significantly to this cumulative effect. Cumulative development will lead to an increase in water consumption, thereby placing an increased demand on existing water supplies. Because the water source for the proposed restoration project is not a source for domestic supply, the project will not contribute to an increased demand on current domestic water sources.

Biological Resources

Due to the urban conditions in the area, biological resources in the vicinity of the river channel are limited and habitat value is generally low. Therefore, development of vacant land in the vicinity of the river is not expected to affect any sensitive species nor destroy any high-value habitat. However, these projects will contribute to a continuing process of urbanization which replaces undeveloped land with urban uses. The conversion of natural areas to urban uses has the cumulative effect of degrading or destroying important habitat and adversely impacting a variety of native plant and wildlife species. The cumulative loss and degradation of natural areas caused by urbanization emphasizes the value of environmental restoration projects such as the Proposed Action.

Land Use and Recreation

Over time, new development in areas along the edges of the river channel will result in a gradual change in land use conditions in the vicinity. Along the Phoenix Reach, a new golf course is planned adjacent to Rio Salado Park. Although no other significant land use changes are currently planned along the Phoenix Reach, additional development is anticipated in the future. Along the Tempe Reach, a substantial amount of new development is planned along both the north and south overbanks of the river channel in the vicinity of Town Lake.

As a secondary effect, the improvement to conditions within the river channel resulting from the implementation of the proposed project could stimulate development along the river beyond what is already planned. Because economic development in the vicinity of the river is a goal of both cities, this potential secondary effect is considered beneficial.

Cultural Resources

On a cumulative basis, construction activities associated with the proposed restoration project and planned development in the vicinity of the river channel will increase the potential for discovery/disturbance of cultural resources. The Proposed Action's contribution to this potential impact can be mitigated through the implementation of Environmental Commitments C-1 and C-2.

Hazardous, Toxic, and Radioactive Waste

Construction associated with future development projects has the potential to disturb previously undetected contamination associated with prior use of these properties. Any such contamination will need to be remediated in order to avoid any threat to public health. The potential for the existence of hazardous, toxic, or radioactive substances will need to evaluated on a site-by-site basis prior to construction. In addition, land uses associated with future development projects may generate hazardous substances which will require handling and disposal in accordance with applicable regulations. No specific impacts related to site contamination or hazardous waste generation are anticipated at this time.

Aesthetics

Under cumulative conditions, the visual improvement of the river channel associated with the Proposed Action will be accompanied by changes in visual conditions along the overbanks of the river. Along the Phoenix Reach, the planned development of a golf course adjacent to Rio Salado Park will convert this area of the overbank from vacant and sparsely vegetated land to a green, highly vegetated landscape typical of golf course development. Airport improvements will also result in some visual changes. No other changes to visual conditions along the Phoenix Reach are currently planned. Along the Tempe Reach, a substantial change in visual conditions is anticipated due to cumulative development. Large portions of the both the north and south overbanks of the river channel in the vicinity of Town Lake are planned for development. The open visual landscape associated the vacant land which currently exists along the edges of the river channel will eventually be replaced with an urban landscape of multi-story commercial and residential development.

Noise

Construction of each of the anticipated future projects in the vicinity of the river channel would result in temporary noise impacts from construction operations. Cumulative construction noise impacts would only be experienced if multiple construction projects occur simultaneously. After planned development projects have been constructed and occupied, noise will be generated from traffic, from increase aircraft operations, and from miscellaneous land use activities (depending on the specific nature of the land uses).

Transportation

Future development in the vicinity of the river channel will result in an increase in traffic on local roadways and an increase in demand for public transit. Traffic generated by future development projects may adversely affect the level of service of local roadways and intersections. Sky Harbor International Airport will continue to be a major traffic generator for the area. Roadway improvements required to be constructed in conjunction with future development projects should at least partially offset the impacts caused by the increase in traffic generation. The proposed restoration project may make a minor contribution to cumulative increases in local traffic as a result of visitors traveling to and from the public recreational facilities which will be constructed in conjunction with the project. The traffic generated by the proposed project is not expected to be significant and will not necessitate any improvements to local roadways.

4.13 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY OF THE ENVIRONMENT

The Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act, Section 1502.16, require that the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity be discussed. This includes effects which narrow the range of beneficial uses of the environment or pose long-term health and safety risks. In addition, the reasons why the proposed project is justified now, rather than reserving an option for future alternatives, should be explained.

Implementation of the Proposed Action would result in short-term adverse impacts associated with project construction as discussed in Section 4. Over the long term, the effects of the project are generally beneficial, resulting in the establishment of native plant communities and wildlife habitat which either do not exist currently or which exist in a severely degraded condition. It is hoped that this project will restore some of the natural habitat value historically associated with the Salt River flood plain, thereby contributing the productivity of the river as natural riparian environment. Unlike past short-term uses of the river channel which have degraded the natural features of the river, the Proposed Action seeks to produce various long-term environmental benefits by restoring some of the river's natural function as a watercourse and productive habitat area. The project is justified at this time because of the need to address the regional decline in wetland and riparian habitat which has been experienced due to development and water diversion.

4.14 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Pursuant to the Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act, Section 1502.16, significant irreversible and irretrievable commitments of resources must be identified. This includes the use of non-renewable resources during the initial and continued phases of the project which would be irreversible because a large commitment of such resources makes removal or reuse thereafter unlikely.

During project construction, fossil fuels will be consumed by construction equipment and various natural materials will be committed in the construction of project improvements. For most practical purposes, the resources used in project construction are considered irretrievably committed to the project. Regular maintenance activities, such as removal of sediment and debris from the low-flow channel, and repair of damaged habitat and facilities after large floods will also require the consumption of fuel by construction equipment and the commitment of various materials. Energy will be required on an ongoing basis for the operation of pumping and treatment equipment used to supply water to each reach of the river.

The project requires a continuing commitment of water resources to support the proposed habitat areas. This water will be pumped from near-surface aquifers and conveyed for use in the habitat areas. A large portion of this water will infiltrate back into the aquifer through the silt and cobbles of the river bottom; however, much of the water will lost through transpiration and evaporation. Because water from near-surface aquifers is not utilized for domestic purposes, it is in relatively abundant supply and is not expected to be substantially depleted by the Proposed Action.

SECTION 5. PERSONS AND ORGANIZATIONS CONSULTED

Atonna, P. 1997. Deputy Planning Director, Planning Department, City of Phoenix. April.

Barusky, J. 1997. Transportation Division, City of Tempe. July.

Domsky, I. 1997. Air Quality Planning Section, Arizona Department of Environmental Quality. August.

Gibbs, J. 1997. Arizona Department of Environmental Quality. July.

Houk, G. 1997. Union Pacific Railroad Company. August.

Juniel, A. 1997. Air Quality Planning Section, Arizona Department of Environmental Quality. August.

Jessen, R. 1997. Air Quality Division, Arizona Department of Environmental Quality. July.

Kimes, D. 1997. Traffic Count Office, Street Transportation Department, City of Phoenix. August.

Messer, C. 1997. Rio Salado Senior Planner, Economic Development, City of Tempe. July.

Nielsen, S. 1997. Rio Salado Project Manager, Economic Development, City of Tempe. April.

Obergon, R. 1997. Arizona Department of Transportation. July.

Polito, R. 1997. Maricopa County Small Business Environmental Assistance Program. August.

Pike, B. 1997. Arizona Department of Transportation. August.

Prior, S. 1997. City of Tempe. August.

Sherwood, J. 1997. Aviation Department, City of Phoenix. August.

SECTION 6. LIST OF PREPARERS

Name	Degree	Study Role
U.S. Army Corps of Engineers, Los Angeles District		
Ruth Villalobos	M.A., Geography	Branch Chief, EIS/EIR Review
Nedenia Kennedy	Ph.D., Anthropology	Section Chief, EIS/EIR Review
Alex Watt	B.S., Geography	Environmental Coordinator
Reynaud Farve	M.S., Wildlife Biology	Project Biologist
Roderic McLean	B.A., Anthropology	Project Archaeologist
Mike Ternak	M.S., Engineering	Study Manager
Aspen Environmental Group		
Gary Meunier	D. Env., Environmental Science & Engineering; M.A., Biology; B.S., Wildlife and Fisheries Biology	Program Manager
Jon Davidson, AICP	M.U.R.P., Urban Planning and Regional Planning; B.A., Urban Planning	Project Manager
Jane Mallory	M.A., Biology; B.A., Biology	Biological Resources
Negar Vahidi	M.P.A., Public Administration; B.A., Political Science	Land Use, Recreation, Socioeconomics, Aesthetics
Thomas Murphy	M.A., Geography; B.A., Environmental/Earth Sciences	Air Quality; Noise; Transportation; Hazardous, Toxic and Radioactive Waste
Judy Spicer	B.A., English	Report Production
Vicky Tinkjian	B.S., Accounting/Finance	Project Accounting

SECTION 7. DISTRIBUTION LIST

W. Michael Ternak
USACE, CESPL-PD-WC
Planning Section C
3636 N. Central Avenue, Suite 740
Phoenix, AZ 85012-1936

John Lucyshin
USACE, CECW-PW
20 Massachusetts Ave., N.W. Room 7211
Washington, D.C. 20314-1000

Mark McKevitt
USACE, CECW-AR
7701 Telegraph Road
Alexandria, VA 22310-3860

South Pacific Division
Bob Sloan
333 Market Street, Room 1002S
San Francisco, CA 94105-2195

Los Angeles District Office
CESPL-PD-WA (Kraft)
911 Wilshire Blvd.
Los Angeles, CA 90017

Ms. Jane Dee Hull
Governor, State of Arizona
(602) 542-1374
1700 W. Washington Street
Phoenix, AZ 85007

Keely S. Varvel
Minority Staff
AZ State Senate-Capitol Complex
1700 W. Washington
Phoenix, AZ 8500

Mr. Skip Rimsza
Mayor, City of Phoenix
200 W. Washington
Phoenix, AZ 85003-1611

Phoenix City Hall
200 W. Washington
Phoenix, AZ 85003

City of Phoenix
Peter Atonna
Planning Department
200 W. Washington Street, 6th Floor
Phoenix, AZ 85003-1611

Phoenix Central Library
1221 N. Central
Phoenix, AZ 85004

Ocotillo Branch Library
102 W. Southern
Phoenix, AZ 85041

Harmon Branch Library
411 W. Yavapai
Phoenix, AZ 85003

Mr. Neil G. Giuliano
Mayor, City of Tempe
31 E. 5th Street
Tempe, AZ 85280

City of Tempe
Chris Messer
31 E. 5th Street, 2nd Floor
Tempe, AZ 85280

City of Tempe Public Library
3500 S. Rural Rd.
Tempe, AZ 85282

Arizona State University
Hayden Library
c/o Reference Department
(602) 965-6164
Tempe, AZ 85287-1006

University of Arizona
Main Library
ATTN: Reference Department
(520) 621-6441
1510 E. University
Tucson, AZ 85721-0055

Colorado State University
University Libraries
Reference Department
(970) 491-1841
Ft. Collins, CO 80523-1019

Environmental Protection Agency
Office of Federal Activities (A-104)
401 M Street, SW
Washington D.C. 20460

AZ Department of Commerce
State Clearinghouse
3800 N. Central Ave., Suite 1400
Phoenix, AZ 85012

Environmental Protection Agency
(Attn: David Farrel, Chief)
Office of Federal Activities
Main Code E-3
75 Hawthorne Street
San Francisco, CA 94105

William C. Withycombe
Regional Administrator
Western Pacific Region
(310) 725-3550
15000 Aviation Blvd.
Lawndale, CA 90261

Southwest Center for Biological Diversity
P.O. Box 39382
Phoenix, AZ 85069

Director, Ofc of Environmental Policy & Compliance
Department of the Interior
Main Interior Building, MS 2340
1849 C Street, NW
Washington D.C. 20240

AZ Department of Water Resources
500 N. Third Street
Phoenix, AZ 85004-3903

AZ Department of Environmental Quality
3033 N. Central Avenue
Phoenix, AZ 85001

AZ Game and Fish
2222 W. Greenway Road
Phoenix, AZ 85023

U.S. Fish and Wildlife Services
3616 W. Thomas Road, Suite 6
Phoenix, AZ 85019

Flood Control District of Maricopa County
(602) 506-1501
2801 W. Durango
Phoenix, AZ 85009

Mr. Dan Sagramoso
Kimley-Horne, Assoc.
7600 N. 15th Str., Suite 250
Phoenix, AZ 85020

David H. Harris
Jones & Stales Assoc.
4455 E. Camelback #E-160
Phoenix, AZ 85018

Jim Trythall
4220 S. Almeria Rd
Phoenix, AZ 85008

Rex Gulbranson
Executive Director
Papago Salado Association
426 N. 44th Street #375
Phoenix, AZ 85008

Ken Stewart
7102 Cortez
Scottsdale, AZ 82524

Joe Stewart
12411 N. 66th street
Scottsdale, AZ 85254

Mike Kiefer
KHA
P.O. Box 5205
Phoenix, AZ 85072-2025

Greg Kornrumph
KHA
P.O. Box 5205
Phoenix, AZ 85072-2025

Adron W. Reichert
6402 S. 107th Avenue
Tolleson, AZ 85353

Dave Wilson
5062 N. 19th Avenue
Phoenix, AZ 85015

Steve Priebe
4549 E. Michigan
Phoenix, AZ 85032

Donny Ellsworth
2801 W. Durango
Phoenix, AZ 85009

Vin Elmore
6229 N. 29th Place
Phoenix, AZ 85016

Mary McPherson
720 N. 82nd Street, #E-13
Scottsdale, AZ 85257

Henry Geint
815 N. Hayden
Scottsdale, AZ 85257

Sonja S. Phillips
4809 Birchot
Tempe, AZ 85282

Frank Williams
5427 W. McNiel
Lavern, AZ 85339

V.C. Danos
AMWUA
4041 N. Central Avenue, #900
Phoenix, AZ 85012

Michael Goodman
9001 S. 27th Street
Phoenix, AZ 85040

Joe Tofyal
3654 S 9th Street
Phoenix, AZ 85040

John Laubach
2241 W. South Mountain Avenue
Phoenix, AZ 85041

Mr. Anthony Aleman Abril, Jr.
1109 E. Hulton Avenue
Phoenix, AZ 85034

Travis Williams
5044 S. 21st Way
Phoenix, AZ 85040

Michael Dollin
3304 N. 3rd Street
Phoenix, AZ 85012

Helen Brock
1134 E. Maricopa Fwy
Phoenix, AZ 85034

Randy Bonney
AZ Wildlife Federation
3814 W. Vista
Phoenix, 85051

Bill VanAusdal
3475 W. Durango St.
Phoenix, AZ 85009

Julie A. Allbooles
P.O. Box 26032
Tempe, AZ 85285

Joan McMahon
1325 E. Avalon
Phoenix, AZ 85014

Robert E. McConnell
FAIA, Dean Emeritus
U of A College of Architecture
c/o 7001 N. Edgewood Place
Tucson, AZ 85704

April G. Reiner
P.O. Box 172
Avondale, AZ 85323

Mike Demlong
3649 W. Cavalier
Phoenix, AZ 85019

Charles Hill
627 E. Royal Palm Sq., N.
Phoenix, AZ 85020

Neil Urban
3829 E. Elm Street
Phoenix, AZ 85018

Joe C. Stewart
12411 North Street
Scottsdale, AZ 85254

Kari Frederick
ENTRANCO
2400 W. Dunlap, Suite 100
Phoenix, AZ 85020

Barry Shemer
400 E. Van Buren, Ste 600
Phoenix, AZ 85004

J.R. Hussey
319 E. Forest Hills Drive
Phoenix, AZ 85022

Frank M. Henry
818 E. Del Tiburon Drive
Scottsdale, AZ 85258

Mark Soden
c/o Design Workshop
310 S. Mill Avenue, Ste 201
Tempe, AZ 85281

Scott Frische
927 W. Sahuaro Drive
Phoenix, AZ 85029

SECTION 8. ACRONYMS AND GLOSSARY OF TERMS

100-year flood
A stream flow caused by a discharge that is exceeded, on the average, only once in 100 years. A 100-year flood has a 1% chance of occurrence in any given year.

500-year flood
A flood that has a 0.2% change of occurring in a given year.

AAQS
Ambient Air Quality Standard; a federal and state measure of the level of air contamination that is not to be exceeded in order to protect human health.

ac-ft
Acre foot; a unit of measure for water demand and supply. The volume of 1 acre foot would cover 1 acre to a depth of 1 foot and is equal to 325,851 gallons.

ADT
Average Daily Traffic; number of vehicles traveling per normal day on a roadway.

Aerosol
Wet or dry small particles in the atmosphere. Also called "particulate matter."

Aggradation (of a stream channel bed)
Raising of stream bed elevation, caused by sediment supply in excess of sediment-transport capacity.

Air quality standard
The specified average concentration of an air pollutant in ambient air during a specified time period, at or above which level the public health may be at risk; equivalent to AAQS.

Algae
A collective term for several taxonomic groups of primitive chlorophyll-bearing plants which are widely distributed in fresh and salt water and moist lands. This term includes the seaweeds, kelps, diatoms, pond scums, and stoneworts.

Alluvial fan
A land feature located at the mouth of a canyon or gorge formed of sediments deposited by a stream. The sediments are deposited when stream velocities decrease due to a decrease in gradient. Alluvial fans most typically occur in arid or semi-arid regions where intermittent streams spill out onto a lowland and spread or fan out.

Alluvium
Soil, sand, gravel, and other material which has been transported and deposited by flowing water. An *alluvial* feature is formed by material which has been deposited by water.

Ambient air
Any unconfined portion of the atmosphere; the outside air.

Ambient noise level
Noise from all sources, near and far. ANL constitutes the normal or existing level of environmental noise at a given location.

Anti-cyclone
Clockwise circulation of air about a high-pressure center.

Antidunes
Ripple bed forms that occur in rapidly-flowing alluvial channels.

APCD
Air Pollution Control District; a regional government bureau responsible for attainment and management of air quality standards through permitting and regulating of the emission sources.

APN
Assessor Parcel Number, given to a parcel, or a specified area, of land by County tax assessors.

AQAP
Air Quality Attainment Plan; equivalent to Air Quality Management Plan (AQMP), which outlines rules and regulations for improving and maintaining the quality of air in the region.

AQMP
Air Quality Management Plan.

Aquatic Strand/Scrubland
This habitat is associated with the low-flow channel portion of the riparian habitat where the most frequent flows occur. It is below the flood terrace and contains aquatic vegetation if there is a perennial flowing portion of the channel. Adjacent to the aquatic vegetation within the low-flow channel, a strand of native grasses and shrubs are typically found. Larger trees and upland species are typically not found in this habitat due to the more frequent flows and longer root saturation periods.

Arroyo
A stream channel or gully in arid country, usually with steep banks, dry much of the time.

Atmospheric stability
The resistance to or enhancement of vertical and horizontal air movement, which regulates the amount of air exchange and affects pollution concentration or dispersion.

Average
As a measure, the sum of the measurements (over a specified period) divided by the number of measurements.

Avifauna
Birds.

Backfill
Earth that is replaced after a construction excavation.

BACT
Best Available Control Technology; the most improved devices or air emission reduction technology currently available for controlling pollutant emissions.

BARCT
Best Available Retrofit Control Technology.

Barranca
A ravine caused by rain, or a water course.

Baseline
A set of existing conditions against which change is to be described and measured.

Bed forms
Local topographical interruptions to the uniformity of a channel bed occurring during the passage of a stream flow. Antidunes are an example of bed forms.

Bench
A relatively level portion of the river bed adjacent to (and raised above) the low-flow channel.

Berm
A narrow shelf, path, or ledge typically at the top or bottom of a slope; also, an earthen, mounded wall.

Biota
Living organisms.

BLM
Bureau of Land Management

Block faulting
Faulting along one or both sides of a mountain (uplifted block), adjoining depression(s) from down-dropped block(s).

Blowsand
Small-grained sand particles easily transported by high-velocity winds.

BOD
Biological Oxygen Demand; the free oxygen-removing capability of biologically derived materials in the environment.

Brackish
Pertaining to water, generally estuarine, in which the salinity ranges from 0.5 to 17 parts per thousand by weight.

Calcified
Changed into a hard, stony condition by the deposit of calcium carbonate.

CERCLA
Federal Comprehensive Environmental Response, Compensation and Liability Act.

CERCLIS
Comprehensive Environmental Response Compensation and Liability Information System.

CFR
Code of Federal Regulations.

Chaparral
Dense thicket of shrubs and small trees, characteristic of southwestern U.S.

Channel lining
Artificial hardening of the sides and/or bed of a stream channel to prevent erosion. Concrete, soil cement and rock riprap are typical channel linings.

CNEL
Community Noise Equivalent Level; the averaging of noise levels on a measurement scale of decibels that increases the actual noise measurement, to account for an increased sensitivity to noise during late evening, nighttime, and morning hours (the increments are 5 dB from 7 to 10 pm and 10 dB from 10 pm to 7 am).

CO
Carbon Monoxide; a colorless, odorless, toxic gas produced by incomplete combustion of carbon in fossil fuels.

Coastal block
Geologic term describing area adjacent to the coast, which may be faulted or fractured.

Colluvium
Rock detritus and soil accumulated at the foot of a slope.

Conglomerate
Consolidated (sedimentary) stone composed primarily of large, gravel-sized particles.

Cottonwood/Willow Dominant Habitat
This habitat is dominated by a combination of cottonwood and willow trees. This plant community is found below the upper terrace of the floodplain. In active streams, this habitat is found along the bank of the active stream bed. In ephemeral streams, this habitat is found along the boundary of where the two-year flood level would extend out from the middle of the channel.

Cultural resource
Places or objects important for scientific, historical, and religious reasons to cultures, communities, and individuals.

Cumulative projects
Two or more projects which, when considered together, may result in environmental impacts which are significant or which compound or increase other impacts.

CWA
Clean Water Act

Cyclonic
An large air mass circulating counterclockwise, in northern hemisphere.

D_{50}
The scaling for particle sizes which references when 1/2 the volume of a stream bed sample is below and 1/2 is above the stated size

Decibel (dB)
A logarithmic unit which describes the wide range of sound intensities to which the human ear is sensitive.

Decibel-A Weighted (dBA)
Decibel unit scale that is modified to better represent the relative insensitivity of the human ear to low-pitched sounds.

Degradation (of a stream channel bed)
Lowering of stream bed elevation, caused by sediment-transport capacity in excess of the sediment supply. Degradation can be long-term (after the passage of many stream flows) or short-term (caused by a single stream flow).

DEIS
Draft Environmental Impact Statement (see EIS).

Diffusion model
A model, calculated by formula, graphs, or computer, that estimates the dilution of an air pollutant as it is carried downwind. The models are based on physical principles with various simplifications to aid solvability.

DOI
U.S. Department of the Interior; a federal agency responsible for administration of public lands not managed by other federal agencies.

DOT
U.S. Department of Transportation

DTSC
Department of Toxic Substance Control.

EA
Environmental Assessment.

Ecosystem
The complex of a community of organisms and its environment functioning as an ecological unit in nature.

Ecotonal
Biological term describing the geographic boundary between two ecological habitats.

Effluent
Something that flows out, such as waste material discharged into the environment (e.g., sewage).

EIS
Environmental Impact Statement; an environmental impact assessment document prepared in accordance with the National Environmental Policy Act (NEPA).

EMFAC7EP
Emission Factor Version 7EP.

Emission
Unwanted substances released by human activity into air or water.

Emission, primary
An emission that is treated as inert (non-reactive).

Emission, secondary
Unwanted substances that are chemical byproducts of reactive primary emissions.

Emission control device
Any piece of equipment that reduces the release of any air pollutant into the atmosphere; see BACT.

Emission limit
A regulatory standard that restricts the discharge of an air pollutant into atmosphere.

EPA
U.S. Environmental Protection Agency; a federal agency that works to protect the environment.

Estuary
Widening area at seaward end of river where its current is met and influenced by ocean tides.

Ethnohistoric
Ethnological information collected during historic times, for instance, that from the Spanish mission registers.

Fault
A fracture or zone of fractures in rock strata which have undergone movement that displaces the sides relative to each other, usually in a direction parallel to the fracture. Abrupt movement on faults is a cause of most earthquakes.

FEIS
Final Environmental Impact Statement; last version of document submitted to both state and federal governments.

FEMA
Federal Emergency Management Agency

FHWA
Federal Highway Administration.

FIRM
Federal Insurance Rate Maps.

Flora
Plants or plant life.

Forebay
The main area of recharge to a ground water basin.

Fugitive dust
Airborne pulverized soil particles.

g
(a) gram; (b) gravities, a unit of acceleration equal to that produced on free falling bodies at the earth's equator.

Geomorphology
The geographical study of the form of the earth. *Geomorphic* means of or pertaining to the shape of the earth or its topographic features.

Geophysical survey
General term for survey of land forms using geologic mapping, trenching, soil testing, percolation testing, echo sounding, or other techniques.

gpd
Gallons per day, a measure of flow rate.

gpm
Gallons per minute; a measure of flow rate.

HC
Hydrocarbons; a mixture of hydrocarbon compounds usually referred to in the vapor state.

HWIS
Hazardous Waste Information System.

HSWA
Hazardous Solid Waste Act.

Hydrocarbons
Compounds composed principally of carbon and hydrogen; they occur in petroleum, natural gas, coal, and bitumens.

Hydrocarbons, nonmethane
Mixture or concentration of hydrocarbons with the methane fraction ignored. One of many formulations for reactive hydrocarbons.

Hydrocarbons, reactive
Mixture or concentration of hydrocarbons with fraction assumed to be nonreactive removed from consideration. See VOC.

Igneous
Igneous refers to a type of rock which is formed from the cooling and solidification of molten rock. Molten rock (magma) is produced due to the high internal core temperature of the earth. Upon cooling, magma becomes igneous rock. Granite and basalt are two common forms of igneous rock.

Inselberg
An isolated hill of solid rock.

Intermittent stream
A stream with water flowing during only some seasons of the year (typically during rainy seasons or periods of snowmelt).

Inventory, emission
A list of daily or annual emissions, listed by pollution source category (e.g., trains, refineries, agriculture, etc.).

Inversion
A layer of air in the atmosphere in which the temperature increases with altitude at a rate greater than normal (adiabatic). Pollutants tend to be trapped below the inversion.

Invertebrate
Animals that lack a spinal column.

L_{10}
An average of noise levels that are exceeded 10 percent of the time during the measurement period.

L_{eq}
Average level of sound determined over a specific period of time.

L_{dn}
The average ambient noise level in dBA with levels between 10 p.m. and 7 a.m. increased by 10 dBA.

Liquefaction
The process of making or becoming liquid (soils).

LOS
Level of Service; a measure of roadway congestion, ranging from A (free flowing) to F (highly congested).

Local scour
Lowering of a channel bed as a result of a local disturbance to flow, such as bridge piers, a sudden drop or a sharp channel bend.

Low flow
Low rate of water flow due to scant rainfall and low runoff.

Low-flow incisement
Formation of a local, small channel inside a larger stream channel as a result of low-discharge flows.

LUST
Leaking underground storage tank

m
Meter, length equal to 30.48 inches.

Macroinvertebrate
Pertaining to invertebrates that are visible to the naked eye.

Macroalgae
Pertaining to large algae, such as kelp, as distinguished from microscopic algae.

Median
The mid-value is a series of values, with half having greater value and half lower value. To be distinguished from "average."

Metamorphic
Metamorphic refers to rocks that have been altered from their original form by heat and pressure.

Microclimate
Distinctive climate within a small geographic area.

Micron
One millionth of a meter.

Miocene
An epoch of geologic time of the Tertiary period and Cenozoic era, between 5 and 24 million years ago.

Mixing height
The distance from the ground to a daytime (temperature) inversion layer.

M_L
Richter magnitude.

MM
Modified Mercalli.

Monitoring station
A mobile or fixed site equipped to measure instantaneous or average ambient air pollutant concentrations.

MSL
Mean sea level.

NAAQS
National Ambient Air Quality Standards; see AAQS.

NED
National Economic Development.

NEPA
National Environmental Protection Act

NHPA
National Historic Preservation Act.

Nitrogen oxides
A gaseous mixture of nitric oxide (NO) and nitrogen dioxide (NO_2) and symbolically represented as NO_3).

NO
Nitric oxide. A molecule of one nitrogen and one oxygen atom. Results usually from combustion of organic substances containing nitrogen and from recombination of nitrogen decomposed in air during high temperature combustion.

NO_2
Nitrogen Dioxide. A molecule of one nitrogen and two oxygen atoms. Result usually from further oxidation of nitric oxide (NO) in the atmosphere. Ozone accelerates the conversion.

NO_x
Nitrogen Oxides; poisonous and highly reactive gases produced when fuel is burned at high temperatures, causing nitrogen in the air to combine with oxygen.

NOI
Notice of Intent.

Noise level, median
The level of noise exceeded 50 percent of the time. Usually specified as either the daytime or the nighttime median noise level. Also given the designation L_{50}.

NPDES
National Pollution Discharge Elimination System.

NPL
National Priorities List.

NPPA
Native Plant Protection Act.

NSR
New Source Review; see Air Quality.

O_3
Ozone; a colorless gas formed by a complex series of chemical and photochemical reaction of reactive organic gases, principally hydrocarbons, with the oxides of nitrogen, which is harmful to the public health, the biota and some materials.

Open Edges
This habitat type does not contain specific plant species. It does have habitat value, as wildlife would utilize these areas to travel to other more valuable habitats. Predator species and raptors use open edges for hunting. These areas are most valuable when they are interspersed with habitat types providing cover. This habitat can serve as a buffer between other habitats and non-habitat areas.

ORV
Off-Road Vehicles

OSHA
U.S. Occupational Safety and Health Administration, a federal agency regulating the health safety of the work place.

Overbanks
The areas above the banks on each side of a river or stream channel.

Oxidant
A mixture of chemically oxidizing compounds formed from ultraviolet stimulated reactions in the atmosphere, with ozone a principal fraction.

Ozone
A molecule of three oxygen atoms -- O_3. A principal component of "oxident" in photochemically polluted atmospheres.

Particulate matter (particulates)
Very fine sized solid matter or droplets, typically averaging one micron or smaller in diameter. Also called "aerosol."

Pediment
An erosional rock surface sloping away from a mountain front or cliff, typically veneered with sediment.

Perennial stream
A stream with water flowing during all seasons of the year.

Ph
A measure of acidity or alkalinity.

Photochemical pollutant
Reactive organic compounds (ROC) and nitrogen oxides (NOx), photochemical pollutants that absorb energy from the sun and react chemically to form ozone (O_3).

Phytoplankton
Microscopic plants that form the base of the marine/aquatic food chain.

PM_{10}
Particulate matter less than 10 micron in size, which is small enough to be inhaled deeply into the lungs and cause disease.

ppb
Parts per billion, a measure of the amount of one substance in a second, which is the carrier.

ppm
Parts per million, a measure of the amount of one substance found in a carrier.

ppt
Parts per thousand, a measure of the amount of one substance found in a carrier.

Precambrian
The earliest era of geologic history characterized by the appearance of single-celled organisms, ending approximately 570 million years ago.

psi
Pounds per square inch.

Preferred alternative
Alternative selected by the NEPA lead agency considering all environmental and economic information associated with the project and alternatives.

Quaternary
The most recent period of geologic time, between 2 million years ago and the present. A part of the Cenozoic era.

RCRA
Federal Resource Conservation and Recovery Act.

Riparian
Area along the banks of a river or lake supporting specialized plant and animal species.

Riprap
A foundation constructed of broken stones or boulders loosely placed or thrown together, as in deepwater, on a soft bottom, or as a seawall to protect against erosion.

ROC
Reactive Organic Compounds (see Air Quality) that are chemically sensitive to the ultraviolet light in sunlight.

ROD
Record of Decision.

ROW
Right of way; an area or strip of land to allow access or to allow a utility to pass through public or private lands.

Sand swimming
Burrowing in sand to escape predators or heat

SCS
Soil Conservation Service

SEA
Significant Ecological Area; an area containing an ecosystem of value and requiring government protection.

Sedimentary
Sedimentary refers to a type of rock which is formed by the consolidation of rock particles. These particles are usually transported from their source by forces of erosion, such as wind, water, and glaciers. Over time, the particles become cemented or consolidated into rock. Shale and sandstone are two forms of sedimentary rock.

Seedbank
The layer of topsoil containing native plant seed material, which is frequently used as a "seed bank" for revegetation of native plants.

Seismicity
The relative frequency and distribution of earthquakes.

Sensitive receptor
That segment of the population that because of age or weak health is more susceptible to the effects of air pollution, noise, oil spill, etc., than the population at large.

Shrink-swell potential
Is the expansion or contraction of primarily clay-rich soils during alternating wetting and drying cycles.

SHPO
State Historic Preservation Office

SIP
State Implementation Plan (see Air Quality); a document required periodically from each county by EPA that indicates the progress and the planning of the county for improving the quality of its air.

Slough
A place of deep mud or mire; bog. A stagnant swamp, backwater, bayou inlet, or pond in which water backs up.

SO_x
Sulfur oxides. The group of compounds formed during combustion or thereafter in the atmosphere of sulfur compounds in the fuel, each having various levels of oxidation, ranging from two oxygen atoms for each sulfur atom to four oxygen atoms.

SO_2
Sulfur Dioxide; a corrosive and poisonous gas produced from the complete combustion of sulfur in fuels.

Stream scour
Lowering of a stream bed during the passage of a single stream flow. Stream scour can be local in nature (see Local Scour) or more wide-spread (see General Scour).

Substrate
Geologic term describing soil or geologic layers underlying a project site or construction area.

Sulfates
Compounds in air or water that contain four oxygen atoms for each sulfur atom. See SO_x.

Sulfur oxides
A gaseous mixture of sulfur dioxide (SO_2) and sulfur trioxide (SO_3) and symbolically represented as SO_x. Can include particulate species such as sulfate compounds ($-SO_4$).

SWPPP
Storm Water Pollution Prevention Plan.

TAC
Toxic Air Contaminants.

TCM
Transportation Control Measures.

TDM
Transportation Demand Management; a system of analysis designed to reduce traffic levels and thereby reduce air pollution.

TDS
Total Dissolved Solids

Terrestrial
Related to or living on land. Terrestrial biology deals with upland areas as opposed to shorelines or coastal habitats.

Tertiary
A period of geologic time between 2 and 66 million years ago. A part of the Cenozoic era.

THC
Total Hydrocarbon.

tpd
Tons per day.

Tributary
A stream feeding a larger stream or river.

TSCP
Toxic Substance Control Program.

TSP
Total Suspended Particulates; solid or liquid particles small enough to remain suspended in air. PM_{10} is the portion of TSP that can be inhaled.

Tsunami
A long gravity oceanic wave generated by sudden movements of the ocean bottom during submarine earthquakes, landslides, or volcanic activity.

Turbidity
Cloudiness or muddiness of water or ocean, resulting from suspended or stirred up particles.

UCB
Uniform Building Code.

ug/m^3
Millionths of a gram per cubic meter, a unit of concentration in liquids or gases.

Upland Mesquite Habitat
This habitat is dominated primarily by honey, velvet, or screw bean mesquite trees. They are normally found on the upper terraces of the floodplain, above the active flood channel.

USACE
U.S. Army Corps of Engineers

USFS
U.S. Department of Agriculture, Forest Service.

USFWS
U.S. Fish and Wildlife Service.

USGS
U.S. Geological Survey (an agency of the U.S. Department of the Interior).

Utility corridor
A strip of land, or an easement, on which utility or pipelines are constructed.

Vapor recovery
Air pollution control methods, which reduce emissions by capturing vapors to avoid their release into the atmosphere.

Vapor transfer
An emission control device, which recovers volatile pollutants, such as hydrocarbons, and relocates them to a location for recovery or destruction.

V/C
Volume to Capacity ratio; a measure of the capacity of a roadway. When V/C is 100 percent, no more traffic can be accommodated.

Visual sensitivity
Consideration of people's uses of various environments and their concerns for maintenance of scenic quality and open-space values; examples of areas of high visual sensitivity would be areas visible from scenic highways, wilderness areas, parks, recreational water bodies, etc.

VMT
Vehicle miles traveled, usually per day.

VOC
Volatile organic compounds.

vpd
Vehicles per day; see Transportation.

Wetland
Lands transitional between obviously upland and aquatic environments. Wetlands are generally highly productive environments with abundant fish, wildlife, aesthetic, and natural resource values. For this reason, coupled with the alarming rate of their destruction, they are considered valuable resources, and several regulations and laws have been implemented to protect them.

Wetland-Marsh Habitat
This habitat consists primarily of cattails, bulrushes, and water cress. This community is located at the lowest elevations of the stream bed. In active streams, this habitat is found along the slowest moving poritons of the water course or in backwater areas. In ephemeral streams, this habitat is found in shallow ponds or heavily saturated soils.

Zooplankton
Microscopic marine/aquatic animals generally carried within a water mass.

INDEX

APPENDIX A

Biological Technical Report

APPENDIX A. BIOLOGICAL TECHNICAL REPORT

1. PURPOSE OF REPORT

The U. S. Army Corps of Engineers (USACE), in conjunction with the Cities of Tempe and Phoenix, proposes to restore habitat within two segments of the Salt River (also referred to as the Rio Salado) system, in Maricopa County, Arizona. A characterization of the vegetation, wildlife, and sensitive species and resources present within the channel and adjacent to the two restoration segments (designated the Phoenix and Tempe Reaches) was required for inclusion in the Environmental Impact Statement (EIS) for the proposed environmental restoration project. Existing project-related literature was reviewed and served as the basis for the existing conditions presented in the this report and for subsequent inclusion in the EIS. A project site visit was required to substantiate and update the conditions depicted in the literature.

2. STUDY SITE LOCATION

The project study area is located within two portions of the Salt River system within the cities of Phoenix and Tempe, Maricopa County, Arizona. The Proposed Project consists of approximately 6.3 miles of channel habitat within the Indian Bend Wash and the Salt River main river channel.

The western segment of the Proposed Project is referred to as the Phoenix Reach and consists of approximately 5 miles of the Salt River channel in south Phoenix. The reach begins on the east side of 19th Avenue and extends east to the western side of Interstate 10.

The eastern portion of the Proposed Project is referred to as the Tempe Reach and consists of portions of the Indian Bend Wash and the Salt River channel within the City of Tempe. The Indian Bend Wash portion of the Tempe Reach is approximately 1.3 miles, and begins at McKellips Road south to confluence of the wash with the Salt River, at the crossing of the 202 Freeway (the proposed site for Town Lake). Two small segments of the Tempe Reach occur on the west and east end of the proposed Town Lake within Salt River. The eastern segment (approximately 1,800 feet) occupies the area between the existing grade control structure just west of McClintock Road/Hayden Road and the eastern border of Town Lake (proposed). The western (or downstream) segment begins at the existing grade control structure (approximately 2,000 feet west of the east-bound Mill Avenue Bridge) and runs west approximately 2,000 feet.

3. METHODOLOGY

A review of all project-related literature was conducted for the characterization of the past and existing biological conditions within the Proposed Project. The documents reviewed include: Rio Salado, Salt River, Arizona General Investigations F3 Package (USACE, 1997), Rio Salado, Salt River, AZ Reconnaissance Report (USACE, 1995), Final Tempe Rio Salado Wildlife Habitat Master Plan, Tempe AZ (Howard et al., 1990), Final Environmental Impact Statement Sky Harbor International Airport Master

Plan Update Improvements, Phoenix, Maricopa County, AZ (Department of Transportation Federal Aviation Administration, 1993). In addition to a literature review, project area aerial photographs and USACE site maps were utilized.

For the purposes of verifying the existing conditions presented in the literature with conditions as of spring of 1997, a project site visit was conducted by Jane Mallory (Biological Resources) with Aspen Environmental Group (Aspen) on May 5 and 6, 1997. Also present from Aspen were Jon Davidson (Project Manager), Negar Vahidi (Social Sciences), and Thomas Murphy (Physical Sciences). All accessible areas of both reaches were visited. Although the majority of the river channel is fenced, direct access to the south bank of the Phoenix Reach was obtained at the following locations: at Pioneer Street between Central Avenue and 3rd Street, at Rio Salado Park located between 9th and 12th Street, and at the corner of Elwood Street 28th Street just west of Interstate 10. No direct access to north bank of the channel was found. Views of the channel were also available (although no direct access to the channel was possible) at the 19th Avenue, 7th Avenue, 16th Street, and 24th Street bridges. On the Tempe Reach, direct access was available for the majority of the Salt River segments off of Rio Salado Parkway. Direct Access to the eastern segment was from a trail located between Karsten Golf Course and McClintock Drive/Hayden Drive. The entire Indian Bend Wash segment was accessible via existing bike trails accessed by numerous streets crossing the wash. Notes were made of the habitat present and the general condition of the habitat at each visited area.

The following results are a synthesis of the existing biological data from the literature reviewed and the observations made during the site visit.

4. RESULTS

Historic Conditions - Salt River System

Vegetation. Table 1 lists the species known to occur within the proposed project site prior to development (USACE, 1995). Prior to dam construction in the early 1900s, the Salt River was a perennial stream fed by snowmelt from the New River and Hieroglyphic Mountains and highlands in the northeast. The river supported a dense riparian community dominated by Fremont cottonwoods (*Populus fremontii*), Goodding's willows (*Salix gooddingii*), arroyo willow (*S. lasiolepis*), coyote willow (*S. exigua*), and Arizona alder (*Alnus oblongifolia*) on the banks of the river, with desert scrub communities comprised of screwbean and honey mesquites (*Prosopis pubescens* and *P. juliflora*), grease-wood (*Sarcobatus vermiculatus*), little leaf and blue palo verde (*Cercidium microphyllum* and *C. floridum*), sagebrush (*Artemisia* sp.), creosote bush (*Larrea tridentata*), and saltbush (*Atriplex* sps.) on the lower terraces. Dense mesquite bosques occurred within the river floodplain on higher alluvial terraces than the stream-side terraces supporting cottonwood-willow riparian communities. Mesquite bosques consisted of open to fairly dense, drought-deciduous stream-side forests dominated by honey or screwbean mesquite, with an understory of elderberry (*Sambucus mexicana*), greythorn (*Zizyphus obtusifolia* var. *canescens*), wolfberry (*Lyceum fremontii*), and annual and perennial grasses. Characteristic species included burro-weed (*Ambrosia dumosa*), saltbush (*Atriplex canescens*, *A. polycarpa*, and *A. lentiformis*), Palmer's coldenia (*Coldenia palmeri*), and iodine weed (*Suaeda torreyana*) (Holland, 1988 and AGFD, 1997). The bosques had open interiors that were maintained by frequent flooding and/or fire (Holland, 1986).

Table 1. Plant Species Known to Occur at The Salt River Prior to Disturbance

SCIENTIFIC NAME	COMMON NAME
ANGIOSPERMS-DICOTS	
AMARANTHACEAE	**AMARANTH FAMILY**
Amaranthus sp.	Amaranth
ASTERACEAE	**SUNFLOWER FAMILY**
Ambrosia dumosa	Burro-Weed
Aplopappus heterophyllus	Rayless Goldenrod
Artemisia sp.	Sagebrush
Baccharis salicifolia (= B. glutinosa)	Mulefat/ Seep Willow/ Water-Wally
Baccharis sarathroides	Broom Baccharis
Chrysothamnus nauseosus	Rubber Rabbit Brush
Cirsium neomexicana	Desert Thistle
Encelia farinosa	Incienso/ Brittlebush
Ericameria larcifolia (=Haplopappus l.)	Turpentine Bush
Geraea canescens	Desert Sunflower/ Hairy-headed Sunflower
Heterotheca psammophila (=H. subaxillaris)	Camphor Weed
Hymenoclea monogyra	Winged Ragweed
Hymenoclea salsola	Cheese Bush/ Burrobrush
Pluchea sericea	Arrow Weed
*Sonchus oleraceus**	Common Sow-thistle
*Xanthium saccharatum**	Weedy Cocklebur
BETULACEAE	**BIRCH FAMILY**
Alnus oblongifolia	Arizona Alder
BIGNONIACEAE	**BIGNONIA FAMILY**
Chilopsis linearis ssp. arcuata	Desert-willow
BORAGINACEAE	**BORAGE FAMILY**
Amsinckia menziesii ssp. intermedia (= A. intermedia)	Rancher's Fireweed/ Fiddleneck
Cryptantha circumscissa	Capped Forget-me-not
Tiquilia palmeri (=Coldenia p.)	Palmer's Tiquila
BRASSICACEAE	**MUSTARD FAMILY**
*Brassica tournefortii**	Wild Turnip
*Capsella bursa-pastoris**	Shepherd's Purse
Dithyrea wislizenii	Spectacle Pod
Lepidium lasiocarpum	Sand Pepper-grass
*Sisymbrium irio**	London Rocket
CACTACEAE	**CACTUS FAMILY**
Carnegiea gigantea (sensitive)	Saguaro
Ferocactus sp.	Barrel Cactus
Mammillaria sp.	Fishhook Cactus
Opuntia sp.	Prickly Pear
CAPRIFOLIACEAE	**HONEYSUCKLE FAMILY**
Sambucus mexicana (=S. caerulea)	Blue Elderberry
CHENOPODIACEAE	**GOOSEFOOT FAMILY**

SCIENTIFIC NAME	COMMON NAME
Atriplex canescens ssp. canescens	Four-winged Saltbush/ Shad-scale
Atriplex lentiformis ssp. lentiformis (= A. l. ssp. breweri)	Quailbush/ Big Saltbush
Atriplex polycarpa	Cattle Spinach/ Allscale
Salsola tragus (= S. iberica, S. australis, S. kali)*	Russian Thistle/ Tumbleweed
Sarcobatus vermiculatus	Greasewood
Suaeda moquinii (=S. fruticosa, S. torreyana)	Bush Seep Weed/ Torrey Inkweed/ Iodine Weed
CUCURBITACEAE	**GOURD FAMILY**
Cucurbita foetidissima	Calabazilla/ Buffalo Gourd
EUPHORBIACEAE	**SPURGE FAMILY**
Euphorbia sp.	Spurge
FABACEAE	**LEGUME FAMILY**
Acacia greggii	Catclaw Acacia
Cercidium floridum var. floridum	Blue Palo Verde
Cercidium microphyllum	Foothill Palo Verde/ Palo Verde
*Parkinsonia aculeata**	Mexican Palo Verde
Prosopis glandulosa var. torreyana (= P. juliflora var. t.)	Mesquite/ Honey Mesquite
Prosopis pubescens	Screw Bean/ Tornillo
Prosopis velutina	Velvet Mesquite
GERANIACEAE	**GERANIUM FAMILY**
*Erodium cicutarium**	Red-stemmed Filaree/ Heron Bill
LAMIACEAE	**MINT FAMILY**
Salvia carnosa	Desert Sage
LOASACEAE	**LOASA FAMILY**
Mentzelia pumila	Stick-leaf
MALVACEAE	**MALLOW FAMILY**
*Malva parviflora**	Cheeseweed/ Little Mallow
Sphaeralcea ambigua	Desert Hollyhock/ Apricot Mallow/ Desert Mallow
NYCTAGINACEAE	**FOUR O'CLOCK FAMILY**
Abronia sp.	Sand Verbena
ONAGRACEAE	**EVENING PRIMROSE FAMILY**
Oenothera sp.	Oenothera
PLANTAGINACEAE	**PLANTAIN FAMILY**
Plantago ovata (=P. insularis)	Woolly Plantain
POLYGONACEAE	**BUCKWHEAT FAMILY**
Eriogonum deflexum ssp. deflexum	Skeleton Weed/ Flat-topped Buckwheat
PORTULACACEAE	**PURSLANE FAMILY**
Portulaca suffrutescens	Purslane
RHAMNACEAE	**BUCKTHORN FAMILY**
Ziziphus obtusifolia var. canescens	Graythorn
SALICACEAE	**WILLOW FAMILY**
Populus fremontii ssp. fremontii	Alamo Cottonwood/ Fremont Cottonwood
Salix exigua (=S. hindsiana)	Narrow-leaf Willow
Salix gooddingii	Goodding's Black Willow
Salix lasiolepis	Arroyo Willow
SCROPHULARIACEAE	**FIGWORT FAMILY**

SCIENTIFIC NAME	COMMON NAME
*Veronica polita**	Speedwell
SIMAROUBACEAE	**QUASSIA OR SIMAROUBA FAMILY**
Castela emoryi (sensitive)	Crucifixion Thorn
SOLANACEAE	**NIGHTSHADE FAMILY**
Datura wrightii (= D. meteloides)	Jimson Weed/ Thorn-apple
Lycium sp.	Lycium
Lycium exsertum	Wolfberry
Lycium fremontii	Fremont Wolfberry
Lycium torreyi	Desert Thorn
*Nicotiana glauca**	Tree Tobacco
*Solanum elaeagnifolium**	White Horse-nettle
Solanum xanti	Purple Nightshade/ Chaparral Nightshade
TAMARICACEAE	**TAMARISK FAMILY**
*Tamarix chinensis**	China Salt Cedar
Tamarix gallica (=T. pentandra)*	Salt Cedar
VERBENACEAE	**VERVAIN FAMILY**
Verbena gooddingii	Goodding's Sand Verbena
ZYGOPHYLLACEAE	**CALTROP FAMILY**
Larrea tridentata	Creosote Bush
ANGIOSPERMS-MONOCOTS	
ARECACEAE	**PALM FAMILY**
Washingtonia filifera	California Fan Palm
CYPERACEAE	**SEDGE FAMILY**
Cyperus sp.	Flat Sedge
LILIACEAE	**LILY FAMILY**
Yucca elata	Soap Tree
POACEAE	**GRASS FAMILY**
*Bromus sp.**	Brome Grass
*Cynodon dactylon**	Bermuda Grass
*Digitaria sanguinalis**	Crab Grass
Distichilis spicata	Salt Grass
Festuca myuros	Fescue
Hordeum jubatum	Common Foxtail Barley
*Pennisetum setaceum**	African Fountaingrass
Pleurophis rigida (=Hilaria r.)	Big Galleta Grass
*Schismus sp.**	Schismus
*Setaria lutescens**	Bristle Grass
*Sorghum halspense**	Johnsongrass
Sporobolus airoides	Alkali Sacaton
Sporobolus cryptandrus	Sand Dropseed
Sporobolus pulvinatus	Sporobolus

* indicates non-native species

Nomenclature as per Hickman, 1993 and Kearney and Peebles, 1951.

List based on information in:

Rio Salado, Salt River AZ Reconnaissance Report, USACE, 1995

Wildlife Habitat Masterplan, Tempe Rio Salado Howard, et al., 1990

and Aspen Site Visit, 1997

Wildlife. Table 2 list the wildlife species known to occur in the project site prior to disturbance. The plant communities and perennial water flow supported a variety of wildlife characteristic of Sonoran Desert riparian communities. Fish species such as desert and Sonoran sucker (*Catostomus clarki* and *C. insignis*), roundtail chub (*Gila robusta*), and long-finned dace (*Agosia chrysogaster*) occupied the waters of The Salt River (USACE, 1995). A variety of reptile and amphibian species occupied the waters and alluvial terraces including western spadefoot toad (*Scaphiopus hammondii*), Colorado River toad (*Bufo alvarius*), desert tortoise (*Gopherus agassizii*), Gila monster (*Heloderma suspectum*), chuckwalla (*Sauromalus obesus*), side-blotch lizard (*Uta stansburiana*), desert horned lizard (*Phrynosoma platyrhinos*), coachwhips (*Masticophis flagellum*), gopher snake (*Pituophis catenifer*), western diamond-backed rattlesnake (*Crotalus atrox*), and sidewinder (*Crotalus cerastes*) (USACE, 1995).

A wide variety of resident and migratory bird species typical of the Sonoran Desert occupied the area prior to the clearing of the riparian vegetation and the alteration of the stream flow. The vegetation once present provided shade, protection from predators, and foraging, nesting and breeding habitat for resident and migratory birds. Species utilizing the habitat included raptors such as Cooper's hawk (*Accipiter cooperii*), peregrine falcon (*Falco peregrinus*), and prairie falcon (*Falco mexicanus*). Also present were species of quail, dove, flickers, flycatchers, wrens, warblers, sparrows, humming birds, waterfowl, and towhees.

Mammals known to occur in the proposed project site prior to development include beaver (*Castor canadensis*), big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), desert pocket mouse (*Perognathus pencillatus*), raccoon (*Procyon lotor*), and larger mammals such as coyote (*Canus latrans*), and jaguar (*Felis onca*).

Table 2. Wildlife Species Known to Occur at The Salt River Prior to Disturbance

SCIENTIFIC NAME	COMMON NAME
FISHES	
CLUPEIDAE	**HERRINGS & SHADS**
Dorosoma petenense	Threadfin Shad
CYPRINIDAE	**MINNOWS**
Cyprinus carpio	Common Carp
Notropis lutrensis	Red Shiner
ICTALURIDAE	**BULLHEAD CATFISHES**
Ictalurus punctatus	Channel Catfish
CATOSTOMIDAE	**SUCKERS**
Ameiurus natalis	Yellow Bullhead
CENTRARCHIDAE	**SUNFISHES & BASSES**
Micropterus salmoides	Largemouth Bass
Lepomis cyanellus *	Green Sunfish
CICHLIDAE	**CICHLIDS**
Oreochromis aureus	Blue Tilapia
AMPHIBIANS	
PELOBATIDAE	**SPADEFOOT TOADS**
Scaphiopus couchi	Couch's Spadefoot
Scaphiopus hammondii	Western Spadefoot
BUFONIDAE	**TRUE TOADS**

SCIENTIFIC NAME	COMMON NAME
Bufo alvarius	Colorado River Toad
Bufo woodhousei	Woodhouse's Toad
Bufo cognatus	Great Plains Toad
RANIDAE	**TRUE FROGS**
Rana yavapaiensis *	Lowland Leopard Frog
Rana catesbeiana *	Bullfrog
REPTILES	
KINOSTERNIDAE	**MUSK & MUD TURTLES**
Kinosternon sonoriense	Sonoran Mud Turtle
TRIONYCHIDAE	**SOFTSHELL TURTLES**
Trionyx spiniferus *	Spiny Softshell
GEKKONIDAE	**GECKOS**
Coleonyx variegatus	Banded Gecko
IGUANIDAE	**IGUANID LIZARDS**
Sauromalus obesus	Chuckwalla
Holbrookia maculata	Lesser Earless Lizard
Holbrookia texana	Greater Earless Lizard
Callisaurus draconoides	Zebra-tailed Lizard
Crotaphytus collaris	Common Collared Lizard
Gambelia wislizenii	Long-nosed Leopard Lizard
Sceloporus magister	Desert Spiny Lizard
Uta stansburiana	Side-blotched Lizard
Urosaurus graciosus	Long-tailed Brush Lizard
Urosaurus ornatus	Tree Lizard
Phrynosoma platyrhinos	Desert Horned Lizard
Phrynosoma solare	Regal Horned Lizard
TEIIDAE	**WHIPTAIL LIZARDS**
Cnemidophorus tigris	Western Whiptail
LEPTOTYPHLOPIDAE	**SLENDER BLIND SNAKES**
Leptotyphlops humilis	Western Blind Snake
HELODERMATIDAE	**VENOMOUS LIZARDS**
Heloderma suspectum	Gila Monster
COLUBRIDAE	**COLUBRID SNAKES**
Masticophis flagellum	Coachwhip
Salvadora hexalepis hexalepis	Desert Patch-nosed Snake
Arizona elegans	Glossy Snake
Pituophis melanoleucus	Gopher Snake
Lampropeltis getulus	Common Kingsnake
Thamnophis cyrtopsis	Black-necked Garter Snake
Thamnophis marcianus	Checkered Garter Snake
Trimorphodon bsicutatus lambda	Southwestern Lyre Snake
Hypsiglena torquata	Night Snake
ELAPIDAE	**CORAL SNAKES**
Micruroides euryxantus	Arizona Coral Snake
VIPERIDAE	**VIPERS**
Crotalus atrox	Western Diamondback Rattlesnake
Crotalus cerastes	Sidewinder Rattlesnake
Crotalus scutulatus	Mojave Rattlesnake

SCIENTIFIC NAME	COMMON NAME
BIRDS	
PODICIPEDIDAE	**GREBES**
Podilymbus podiceps	Pied-billed Grebe
Podiceps nigricollis	Eared Grebe
ARDEIDAE	**HERONS**
Nycticorax nycticorax	Black-crowned Night-heron
Butorides striatus	Green-backed Heron
Bubulcus ibis	Cattle Egret
Casmerodius albus	Great Egret
Ardea herodias	Great Blue Heron
ANATIDAE	**WATERFOWL**
Anas platyrhynchos	Mallard
Anas strepera	Gadwall
Anas crecca	Green-winged Teal
Anas americana	American Wigeon
Anas acuta	Northern Pintail
Anas cyanoptera	Cinnamon Teal
Aythya collaris	Ring-necked Duck
Melanitta fusca	White-winged Scoter
Mergus merganser	Common Merganser
RECURVIROSTRIDAE	**STILTS & AVOCETS**
Recurvirostra americana	American Avocet
CHARADRIIDAE	**PLOVERS**
Charadrius vociferus	Killdeer
SCOLOPACIDAE	**SANDPIPERS**
Tringa melanoleuca	Greater Yellowlegs
Actitis macularia	Spotted Sandpiper
Calidris minutilla	Least Sandpiper
CATHARTIDAE	**NEW WORLD VULTURES**
Cathartes aura	Turkey Vulture
ACCIPITRIDAE	**KITES, HAWKS, EAGLES**
Accipiter striatus	Sharp-shinned Hawk
Accipiter cooperii	Cooper's Hawk
Buteo jamaicensis	Red-tailed Hawk
Parabuteo unicinctus	Harris' Hawk
Pandion haliaetus	Osprey
FALCONIDAE	**FALCONS**
Falco sparverius	American Kestrel
Falco columbarius	Merlin/ Pigeon Hawk
Falco mexicanus	Prairie Falcon
Falco peregrinus	Pergrine Falcon
PHASIANIDAE	**PHEASANTS & QUAILS**
Callipepla gambelii	Gambel's Quail
COLUMBIDAE	**PIGEONS & DOVES**
Zenaida macroura	Mourning Dove
Zenaida asiatica	White-winged Dove
Columbina passerina	Common Ground-dove
Columba livia	Rock Dove
Columbina inca	Inca Dove

SCIENTIFIC NAME	COMMON NAME
CUCULIDAE	**CUCKOOS & ROADRUNNERS**
Coccyzus americanus	Yellow-billed Cuckoo
Geococcyx californianus	Greater Roadrunner
TYTONIDAE	**BARN OWLS**
Tyto alba	Barn Owl
STRIGIDAE	**TRUE OWLS**
Asio flammeus	Short-eared Owl
Bubo virginianus	Great Horned Owl
Otus asio	Screech Owl
Otus kennicottii	Western Screech-owl
Micrathene whitneyi	Elf Owl
Athene cunicularia	Burrowing Owl
CAPRIMULGIDAE	**GOATSUCKERS & NIGHTJARS**
Caprimulgus vociferus	Whip-porr-will
Phalaenoptilus nuttallii	Common Poorwill
Chordeiles acutipennis	Lesser Nighthawk
TROCHILIDAE	**HUMMINGBIRDS**
Cynanthus latirostris	Broad-billed Hummingbird
Archilochus alexandri	Black-chinned Hummingbird
Calypte costae	Costa's Hummingbird
Calypte anna	Anna's Hummingbird
PICIDAE	**WOODPECKERS**
Melanerpes uropygialis	Gila Woodpecker
Colaptes auratus	Northern Flicker
Picoides scalaris	Ladder-backed Woodpecker
TYRANNIDAE	**TYRANT FLYCATCHERS**
Tyrannus verticalis	Western Kingbird
Myiarchus cinerascens	Ash-throated Flycatcher
Sayornis nigricans	Black Phoebe
Sayornis saya	Say's Phoebe
Pyrocephalus rubinus	Vermilion Flycatcher
Empidonax hammondii	Hammond's Flycatcher
Empidonax difficilis	Pacific-slope Flycatcher
ALAUDIDAE	**LARKS**
Eremophila alpestris	Horned Lark
HIRUNDINIDAE	**SWALLOWS**
Stelgidopteryx serripennis	Northern Rough-winged Swallow
Hirundo pyrrhonota	Cliff Swallow
CORVIDAE	**JAYS, CROWS & MAGPIES**
Corvus corax	Common Raven
PARIDAE	**TITMICE & CHICKADEES**
Parus wollweberi	Bridled Titmouse
REMIZIDAE	**VERDINS**
Auriparus flaviceps	Verdin
SITTIDAE	**NUTHATCHES**
Sitta carolinensis	White-breasted Nuthatch
TROGLODYTIDAE	**WRENS**
Troglodytes aedon	House Wren
Thryomanes bewickii	Bewick's Wren

SCIENTIFIC NAME	COMMON NAME
Salpinctes obsoletus	Rock Wren
Campylorhynchus brunneicapillus	Cactus Wren
MUSCICAPIDAE	**KINGLETS, GNATCATCHERS, THRUSHES & BABBLERS**
Regulus calendula	Ruby-crowned Kinglet
Polioptila caerulea	Blue-gray Gnatcatcher
Polioptila melanura	Black-tailed Gnatcatcher
Sialia mexicana	Western Bluebird
Sialia currucoides	Mountain Bluebird
MIMIDAE	**THRASHERS & MIMIC THRUSHES**
Mimus polyglottos	Northern Mockingbird
Toxostoma curvirostre	Curve-billed Thrasher
Toxostoma bendirei	Bendire's Thrasher
Toxostoma crissale	Crissal's Thrasher
BOMBYCILLIDAE	**WAXWINGS**
Bombycilla cedrorum	Cedar Waxwing
PTILOGONATIDAE	**SILKY-FLYCATCHERS**
Phainopepla nitens	Phainopepla
LANIIDAE	**SHRIKES**
Lanius ludovicianus	Loggerhead Shrike
STURNIDAE	**STARLINGS**
Sturnus vulgaris *	European Starling
VIREONIDAE	**VIREOS**
Vireo bellii	Bell's Vireo
EMBERIZIDAE	**WOOD WARBLERS, TANAGERS, BUNTINGS & BLACKBIRDS**
Cardinalis cardinalis	Northern Cardinal
Cardinalis sinuatus	Pyrrhuloxia
Guiraca caerulea	Blue Grosbeak
Vermivora celata	Orange-crowned Warbler
Vermivora luciae	Lucy's Warbler
Dendroica coronata	Yellow-rumped Warbler
Dendroica petechia	Yellow Warbler
Oporornis tolmiei	MacGillivray's Warbler
Wilsonia pusilla	Wilson's Warbler
Geothlypis trichas	Common Yellowthroat
Pheucticus melanocephalus	Black-headed Grosbeak
Pipilo chlorurus	Green-tailed Towhee
Pipilo alberti	Albert's Towhee
Pooecetes gramineus	Vesper Sparrow
Melospiza lincolnii	Lincoln's Sparrow
Melospiza melodia	Song Sparrow
Chondestes grammacus	Lark Sparrow
Amphispiza bilineata	Black-throated Sparrow
Amphispiza belli	Sage Sparrow
Spizella passerina	Chipping Sparrow
Spizella breweri	Brewer's Sparrow
Junco hyemalis	Dark-eyed Junco
Zonotrichia leucophrys	White-crowned Sparrow
Melospiza lincolnii	Lincoln's Sparrow
Calamospiza melanocorys	Lark Bunting

SCIENTIFIC NAME	COMMON NAME
Sturnella neglecta	Western Meadowlark
Agelaius phoeniceus	Red-winged Blackbird
Molothrus ater	Brown-headed Cowbird
Euphagus cyanocephalus	Brewer's Blackbird
Icterus galbula	Northern Oriole
Icterus cucullatus	Hooded Oriole
Piranga rubra	Summer Tânager
FRINGILLIDAE	**FINCHES**
Carduelis psaltria	Lesser Goldfinch
Carpodacus mexicanus	House Finch
PASSERIDAE	**OLD WORLD SPARROWS**
Passer domesticus *	House Sparrow
MAMMALS	
VESPERTILIONIDAE	**EVENING BATS & PLAIN-NOSE BATS**
Eptesicus fuscus	Big Brown Bat
Lasionycteris noctivagans	Silver-haired Bat
Pipistrellus hesperus	Western Pipistrelle
LEPORIDAE	**HARES & RABBITS**
Sylvilagus auduboni	Desert Cottontail
Lepus californicus	Black-tailed Jackrabbit
HETEROMYIDAE	**HETEROMYIDS**
Perognathus pencillatus	Desert Pocket Mouse
MURIDAE	**MICE, RATS, & VOLES**
Peromyscus eremicus	Cactus Mouse
Peromyscus maniculatus	Deer Mouse
Onychomys torridus	Southern Grasshopper Mouse
Neotoma albigula	White-throated Woodrat
CANIDAE	**WOLVES & FOXES**
Canis latrans	Coyote
Urocyon cinereoargenteus	Gray Fox
PROCYONIDAE	**RACCOONS**
Procyon lotor	Common Raccoon
MUSTELIDAE	**WEASELS, SKUNKS & OTTERS**
Mephitis mephitis	Striped Skunk
FELIDAE	**CATS**
Felis catus *	Domestic Cat
Felis onca	Jaguar

* indicates non-native species
List based on information in:
Rio Salado, Salt River AZ Reconnaissance Report, USACE, 1995
Wildlife Habitat Masterplan, Tempe Rio Salado Howard, et al., 1990
and Aspen Site Visit, 1997.

Sensitive Species. Table 3 list the sensitive species known to occur in the project site prior to disturbance. Sensitive species (species either listed as endangered, threatened, or rare by the Federal or State government) that may have been present prior to development include Maricopa tiger beetle (*Cicindela oregona maricopa*), a variety of fish amphibian, reptile, bird, and mammal species (USACE, 1995).

Table 3. Sensitive Species Known to Occur in The Salt River Prior to Disturbance

SCIENTIFIC NAME	COMMON NAME
INVERTEBRATES	
BEETLES	
CICINDELIDAE	**TIGER BEETLES**
Cicindela oregona maricopa	Maricopa Tiger Beetle
VERTEBRATES	
FISHES	
CYPRINIDAE	**MINNOWS**
Ptychocheilus lucius	Colorado Squawfish
Gila robusta	Roundtail Chub
Meda fulgida	Spikedace
Plagopterus argentissimus	Woundfin
Rhinichthys cobitis	Loach Minnow
CATOSTOMIDAE	**SUCKERS**
Xyrauchen taxanus	Razorback Sucker
POECILIIDAE	**LIVEBEARERS**
Poeciliopsis occidentalis	Gila Topminnow
AMPHIBIANS	
RANIDAE	**TRUE FROGS**
Rana yavapaiensis	Lowland Leopard Frog
REPTILES	
TESTUDINIDAE	**TRUE LAND TORTOISES**
Gopherus agassizii	Desert Tortoise
BIRDS	
PELECANIDAE	**PELICANS**
Pelecanus occidentalis	Brown Pelican
ARDEIDAE	**HERONS**
Ixobrychus exilis	Least Bittern
Botaurus lentiginosus	American Bittern
Nycticorax nycticorax	Black-crowned Night-heron
Egretta thula	Snowy Egret
THRESKIORNITHIDAE	**IBISES**
Plegadis chihi	White-faced Ibis
RALLIDAE	**RAILS & GALLINULES**
Rallus longirostris yumanensis	Yuma Clapper Rail
RECURVIROSTRIDAE	**STILTS & AVOCETS**
Himantopus mexicanus	Black-necked Stilt
ACCIPITRIDAE	**KITES, HAWKS, EAGLES**
Haliaeetus leucocephalus	Bald Eagle
Pandion haliaetus	Osprey
FALCONIDAE	**FALCONS**
Falco peregrinus anatum	American Peregrin Falcon
STRIGIDAE	**TRUE OWLS**
Glaucidium brasilianum cactorum	Cactus Ferruginous Pygmy-owl
ALCEDINIDAE	**KINGFISHERS**
Ceryle alcyon	Belted Kingfisher

SCIENTIFIC NAME	COMMON NAME
TYRANNIDAE	**TYRANT FLYCATCHERS**
Empidonax traillii extimus	Southwestern Willow Flycatcher
Empidonax fulvifrons pygmaeus	Northern Buff-breasted Flycatcher
MAMMALS	
PHYLLOSTOMIDAE	**LEAF-NOSED BATS**
Leptonycteris curasoae yerbabuenae	Lesser Long-nosed Bat
VESPERTILIONIDAE	**EVENING BATS & PLAIN-NOSE BATS**
Euderma maculatum	Spotted Bat
MOLOSSIDAE	**FREETAIL BATS**
Eumops perotis californicus	Greater Western Mastiff Bat

List based on information in:
Rio Salado, Salt River AZ Reconnaissance Report, USACE, 1995
Wildlife Habitat Masterplan, Tempe Rio Salado Howard, et al., 1990

Habitat Alteration History. In the early 1900s, the U.S. Bureau of Reclamation constructed a series of dams in the Salt and Verde River watersheds that eliminated the perennial water flow within the Salt River. Water flow was limited to summer or fall rains and related flood events which diminished the native vegetation and created open disturbed habitat suitable for the invasive, non-native tamarisk (*Tamarix* sp.) as early as the 1920s. From its introduction into the southwest, tamarisk (a Eurasian native tree species) spread throughout the southwestern river systems at a rate of almost 15 miles per year. By the 1940s, tamarisk dominated the channel in dense extensive communities, to the exclusion of most native riparian species. Post-dam riparian vegetation along the Salt River diminished further as vegetation removal programs started in the early 1950s and ground pumping (which reduced the ground water table) were implemented. Historic photographs indicate that vegetation removal during this period included the removal of both non-native and native species. Non-native vegetation within the channel continued to increase until vegetation clearing programs were enacted in the 1980s. The further depletion of ground water from pumping within the Indian Bend Wash and Tempe portion of the Salt River reduced the ground water level below the critical depth required to support even the non-native tamarisk (between 15 to 30 feet) limiting the species to areas with surface water from effluent or in selected areas where the ground water is closer to the surface.

Present Conditions within Proposed Project Site

At present only disturbed desert scrub, a small cottonwood/willow riparian woodland, tamarisk stands and ruderal communities are present in the Phoenix Reach and Tempe Reach.

Phoenix Reach

Currently, the Salt River is characterized as an effluent-dominated water course where highly disturbed marginal riparian habitat only occurs at locations where wastewater effluent and nuisance water runoff are discharged into the channel. The remainder of the habitat is so disturbed that most of the channel is devoid of vegetation and consists of a barren cobbly wash. Slow-flowing water occurs at the western most end of this reach from Central Avenue to 7th Avenue. The remainder of the reach contains only unconnected scattered puddles of water.

Vegetation. The majority of the habitat within the Phoenix Reach can be characterized as highly disturbed, sparsely vegetated cobbly wash with banks that are either devoid of vegetation or thinly vegetated with ruderal herbs and non-native grasses. The most vegetation within the reach occurs on the south bank from the east side of 7th Street west to 7th Avenue. Disturbed desert scrub occupies the lower stream-side terraces. Species present include creosote bush, brittlebush (*Encelia farinosa*), buckwheat (*Eriogonum* sp.), desert sage (*Salvia carnosa*), mesquite, palo verde, tamarisk, and non-native grasses including fountain grass (*Pennisetum setaceum*), crabgrass (*Digitaria sanguinalis*), and fescue (*Festuca myuros*). The area is highly disturbed by the presence of concrete and asphalt rubble, trash, and construction waste dumping.

On the south bank of the river just west of the Interstate 10 bridge, a disturbed cottonwood-willow community is established. Fremont cottonwood, tamarisk, mulefat (*Baccharis salicifolia*) and several willow species (*Salix* sps.), some exceeding 20 feet in height, occupy an area of less than 2 acres. The margins of this riparian community are occupied by a community of rushes and sedges.

The remainder of the channel within the Phoenix Reach is only sparsely and sporadically vegetated by tamarisk, desert broom (*Baccharis sarothroides*), and rabbitbrush (*Chrysothamnus nauseosus*).

Fish and Wildlife. Wildlife within the river channel wash consists of mostly avian and small mammal species that frequent those portions of the channel with vegetation and/or water with only a few reptile and aquatic species noted. Birds visiting the wash and channel area consist of urban and desert avian species including hawks (*Accipiter* sps.), greater roadrunner (*Geococcyx californianus*), great blue heron (*Ardea herodias*), common dove (*Columbina passerina*), mourning dove (*Zenaida macroura*), Inca dove (*Columbina inca*), grackle (*Quiscalus quiscula*), house sparrow (*Passer domesticus*), verdin (*Auriparus flaviceps*), black-chinned hummingbird (*Archilochus alexandri*), Gambel's quail (*Callipepla gambelii*), house finch (*Carpodacus mexicanus*), northern mockingbird (*Mimus polygottos*), European starling (*Sturnus vulgaris*), goldfinch (*Carduelis psaltria*), and killdeer (*Charadrius vociferus*) (Howard et al., 1990). Mammals are limited to cottontail rabbit (*Sylvilagus auduboni*), domestic cat (*Felis cattus*), and domestic dog (*Canis domesticus*). Lizards present are limited to coachwhip (*Masticophis flagellum*), gopher snake (*Pituophis melanoleucus*), and unidentified toads and lizards (Howard et al., 1990). No fish species are present within the channel due to the lack of any permanent water source. Fish may be transported into the channel during floods but soon expire when water dries up (Howard et al., 1990). During flow periods, a variety of aquatic organisms inhabit the channel but because flows are often brief and drought conditions usually prevail, few organisms are capable of surviving the long periods of dessication. Species that could realistically survive the harsh conditions within the channel and the wash include flatworms, nematodes, isopods, crayfish, eliminthid beetles, and small crustaceans (Howard et al., 1990). Aquatic insects present in areas with captured effluent water include damsel flies, dragon flies, and skimmers.

Sensitive Species and Potential Habitat for Sensitive Species. Because of the lack of any permanent water and vegetation in and near the channel and due to the high level of disturbance of those few areas with even temporary water and disturbed vegetation, no suitable habitat for sensitive plant or wildlife species occurs within the Phoenix Reach to date.

Adjacent Habitat. Much of the adjacent area on either side of the channel has been developed and is occupied by commercial and industrial buildings, sand and gravel mining operations, or has been cleared of vegetation and lays vacant. Further out from the channel, the area is occupied by urban and suburban development with no natural habitat in the immediate vicinity of this reach of the river.

Tempe Reach

The Tempe Reach is almost completely without vegetation within the channel and consists mostly of barren cobbly wash with rock rip rap reinforced banks or banks sparsely vegetated by small ruderal species. No surface water is present in this reach.

Vegetation. The Indian Bend Wash portion of the Tempe Reach is unvegetated except for the northern most portion that contains a golf course upstream of Curry Road which is planted with turf grass, eucalyptus trees, and other ornamental non-native tree and shrub species. The center of the golf course contains a shallow, narrow stream (approximately 2 to 4 feet wide) which drains out before reaching the southern portion of Indian Bend Wash. The remainder of the wash to and including the Salt River portion of the reach is essentially unvegetated except for a very sparse scattering of small rabbitbrush and small desert broom.

Fish and Wildlife. Wildlife within the river channel consists of mostly avian and small mammal species that frequent those portions of the channel with vegetation, such as the golf course. The species expected to visit this area is mostly limited to urban wildlife species as those identified in the Phoenix Reach.

Sensitive Species and Potential Habitat for Sensitive Species. Due to the lack of vegetation and the development adjacent to the reach, little or no potential for sensitive species exists within the Tempe Reach in its present state.

Adjacent Habitat. Most of the area immediately adjacent to the wash consists of commercial and residential development. A public park with a small lake exists in Indian Bend Wash immediately north of McKellips Road and would likely support migratory birds, waterfowl, and small mammals. The park is vegetated with ornamental tree and shrub species and lawn grasses with a permanent lake for recreational purposes. Karsten Golf Course occupies the area just south of the Salt River portion of the Tempe Reach and may also serve as marginal foraging habitat for visiting birds and small mammals.

5. REFERENCES

Arizona Native Plant Society. 1993. *Desert Grasses*. Arizona Native Plant Society Urban Landscape Committee, Tucson, AZ.

_____. 1991. *Desert Ground Cover and Vines*. Arizona Native Plant Society Urban Landscape Committee, Tucson, AZ.

_____. 1990. *Desert Shrubs*. Arizona Native Plant Society Urban Landscape Committee, Tucson, AZ.

_____. 1990. *Desert Trees*. Arizona Native Plant Society Urban Landscape Committee, Tucson, AZ.

Bowers, J.E. 1993. *Shrubs and Trees of the Southwest Deserts*. Southwest Parks and Monuments Association, Tucson, AZ.

_____. 1987. *100 Roadside Wildflowers of the Southwest*. Southwest Parks and Monuments Association, Tucson, AZ.

_____. 1989. *100 Desert Wildflowers of the Southwest*. Southwest Parks and Monuments Association, Tucson, AZ.

Brown, D. E. 1994. *Biotic Communities, Southwestern United States and Northwestern Mexico*. University of Utah Press, Salt Lake City, UT.

Burt, W.H. and R.P. Grossenheider. 1980. *Peterson Field Guide to Mammals of North America and Mexico*. Houghton Mifflin Company, New York, NY.

Cunningham, R.L. 1990. *50 Common Birds of the Southwest*. Southwest Parks and Monuments Association, Tucson, AZ.

Davis, B. 1997 *A Field Guide to Birds of the Desert Southwest*. Gulf Publishing Company, Houston, TX.

Department of Transportation Federal Aviation Administration. 1993. *Final Environmental Impact Statement Sky Harbor International Airport Master Plan Update Improvements, Phoenix, Maricopa County, AZ.*

Dodge, N.N. 1985. *Flowers of the Southwest Deserts*. Southwest Parks and Monuments Association, Tucson, AZ.

Elmore, F.H. 1976. *Shrubs and Trees of the Southwest Uplands*. Southwest Parks and Monuments Association, Tucson, AZ.

Epple, A. O. 1995. *A Field Guide to the Plants of Arizona*. LewAnn Publishing Company, Mesa, AZ.

Gould, F.W. 1988. *Grasses of the Southwestern United States*. University of Arizona Press, Tucson, AZ.

Howard, Needles, Tammen and Bergendoff 1990. *Final Tempe Rio Salado Wildlife Habitat Master Plan, Tempe AZ.*

Kearney, T.H. and R.H. Peebles 1951. *Arizona Flora*. University of California Press, Berkeley, CA.

Page, L.M. and B. M. Brooks. 1991. *Peterson Field Guide Freshwater Fishes*. Houghton Company, New York, NY.

Parker, K.F. 1990. *An Illustrated Guide to Arizona Weeds*. University of Arizona Press, Tucson, AZ.

Powell, J.A. and C.L. Hogue. 1979. *California Insects*. University of California Press, Berkeley, CA.

Scott, S.L. (editor). 1994. *National Geographic Society Field Guide to the Birds of North America, 2nd Edition*. The National Geographic Society, Washington, D.C.

Stebbins, R.C. 1985. *A Field Guide to Western Reptiles and Amphibians*. Houghton Mifflin Company, Boston, MA.

USACE (Army Corps of Engineers), Phoenix, Az. 1997. *Rio Salado, Salt River, Arizona, General Investigations, F3 Package*.

USACE (Army Corps of Engineers), Los Angeles CA. 1995. *Rio Salado, Salt River, Arizona, Reconnaissance Report*.

APPENDIX B

Air Quality Emission Calculations

TABLE 1 RIO SALADO PROJECT - PHOENIX REACH ONSITE CONSTRUCTION EMISSIONS (lbs/yr)

Equipment	Fuel Use (gallon/hour)	Number	Days	Hours Per Day	Total Hours	Usage Factor (%)	Adjusted Hours	Total Fuel Usage (gal.)
Diesel:								
Dozer, D-7 (Task 1)	10	2	210	10	4200	70	2940	29400
Dozer, D-8 (Task 2)	12	2	200	10	4000	70	2800	33600
Dozer, D-8 (Task 4)	12	2	40	10	800	70	560	6720
Dozer, D-8 (Task 5)	12	2	30	10	600	70	420	5040
Grader (Task 2)	10	4	150	10	6000	70	4200	42000
Grader (Task 6)	10	3	30	10	900	80	720	7200
Grader (Task 7)	10	3	30	10	900	80	720	7200
Soil Cement Truck (Task 3)	8	4	45	2	360	60	216	1728
Dump Truck (Task 1)	8	2	80	10	1600	40	640	5120
Dump Truck (Task 2)	8	2	80	10	1600	40	640	5120
Fuel Truck (P-Reach)	5	1	310	10	3100	20	620	3100
Water Truck (P-Reach)	8	2	310	10	6200	50	3100	24800
Gasoline:								
Pickup Truck (P-Reach)	2	4	310	10	12400	20	2480	4960

	Emission Factors (lbs/1000 Gallons of Fuel)						
	THC	ROC	NOx	SO2	CO	TSP	PM10
Diesel:							
Dozer, D-7 (Task 1)	33.82	32.44	284.92	31.10	78.50	25.30	24.30
Dozer, D-8 (Task 2)	33.82	32.44	284.92	31.10	78.50	25.30	24.30
Dozer, D-8 (Task 4)	33.82	32.44	284.92	31.10	78.50	25.30	24.30
Dozer, D-8 (Task 5)	33.82	32.44	284.92	31.10	78.50	25.30	24.30
Grader (Task 2)	17.04	16.36	253.80	31.10	54.60	22.20	21.31
Grader (Task 6)	17.04	16.36	253.80	31.10	54.60	22.20	21.31
Grader (Task 7)	17.04	16.36	253.80	31.10	54.60	22.20	21.31
Soil Cement Truck (Task 3)	20.90	19.86	286.10	31.20	123.50	17.70	16.99
Dump Truck (Task 1)	20.90	20.24	286.10	31.20	123.50	17.70	17.00
Dump Truck (Task 2)	20.90	20.24	286.10	31.20	123.50	17.70	17.00
Fuel Truck (P-Reach)	20.90	20.24	286.10	31.20	123.50	17.70	17.00
Water Truck (P-Reach)	20.90	20.24	286.10	31.20	123.50	17.70	17.00
Gasoline:							
Pickup Truck (P-Reach)	134.60	122.40	95.80	5.30	3960.00	6.06	6.06

	Total Emissions (lbs)						
	THC	ROC	NOx	SO2	CO	TSP	PM10
Diesel:							
Dozer, D-7 (Task 1)	994.31	953.74	8376.65	914.34	2307.90	743.82	714.42
Dozer, D-8 (Task 2)	1136.35	1089.98	9573.31	1044.96	2637.60	850.08	816.48
Dozer, D-8 (Task 4)	227.27	218.00	1914.66	208.99	527.52	170.02	163.30
Dozer, D-8 (Task 5)	170.45	163.50	1436.00	156.74	395.64	127.51	122.47
Grader (Task 2)	715.68	687.05	10659.60	1306.20	2293.20	932.40	895.10
Grader (Task 6)	122.69	117.78	1827.36	223.92	393.12	159.84	153.45
Grader (Task 7)	122.69	117.78	1827.36	223.92	393.12	159.84	153.45
Soil Cement Truck (Task 3)	36.12	34.31	494.38	53.91	213.41	30.59	29.36
Dump Truck (Task 1)	107.01	103.63	1464.83	159.74	632.32	90.62	87.04
Dump Truck (Task 2)	107.01	103.63	1464.83	159.74	632.32	90.62	87.04
Fuel Truck (P-Reach)	64.79	62.74	886.91	96.72	382.85	54.87	52.70
Water Truck (P-Reach)	518.32	501.95	7095.28	773.76	3062.80	438.96	421.60
Gasoline:							
Pickup Truck (P-Reach)	667.62	607.10	475.17	26.29	19641.60	30.06	30.06
Total (lbs)	4990.30	4761.20	47496.34	5349.25	33513.40	3879.23	3726.46
Total (tons)	2.50	2.38	23.75	2.67	16.76	1.94	1.86

Sources:

U.S. EPA, 1994. Compilation of Air Pollutant Emission Factors, Volume II: Mobile Sources

U.S. EPA, 1995. Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources.

CARB, 1988. Method Used to Develop a Size-Segregated Particulate Matter Inventory (Draft). PM10 Fractions from Profiles 118, 117, 391.

TABLE 2 RIO SALADO PROJECT - TEMPE REACH ONSITE CONSTRUCTION EMISSIONS (lbs/yr)

Equipment	Fuel Use (gallon/hour)	Number	Days	Hours Per Day	Total Hours	Usage Factor (%)	Adjusted Hours	Total Fuel Usage (gal.)
Diesel:								
Dozer, D-8 (Task 2)	12	2	40	10	800	70	560	6720
Dozer, D-8 (Task 10)	12	1	40	10	400	70	280	3360
Dozer, D-6 (Task 10)	6	2	60	10	1200	70	840	5040
Grader (Task 2)	10	2	40	10	800	70	560	5600
Grader (Task 6)	10	1	30	10	300	80	240	2400
Grader (Task 7)	10	2	40	10	800	80	640	6400
Backhoe (Task 10)	6	1	40	10	400	60	240	1440
Dump Truck (Task 2)	8	2	40	10	800	40	320	2560
Fuel Truck (T-Reach)	5	1	150	10	1500	20	300	1500
Water Truck (T-Reach)	8	2	310	10	6200	50	3100	24800
Gasoline:								
Pickup Truck (T-Reach)	2	2	310	10	6200	20	1240	2480

	Emission Factors (lbs/1000 Gallons of Fuel)						
	THC	ROC	NOx	SO2	CO	TSP	PM10
Diesel:							
Dozer, D-8 (Task 2)	33.82	32.44	284.92	31.10	78.50	25.30	24.30
Dozer, D-8 (Task 10)	33.82	32.44	284.92	31.10	78.50	25.30	24.30
Dozer, D-6 (Task 10)	33.82	32.44	284.92	31.10	78.50	25.30	24.30
Grader (Task 2)	17.04	16.36	253.80	31.10	54.60	22.20	21.31
Grader (Task 6)	17.04	16.36	253.80	31.10	54.60	22.20	21.31
Grader (Task 7)	17.04	16.36	253.80	31.10	54.60	22.20	21.31
Backhoe (Task 10)	33.82	32.44	284.92	31.10	78.50	25.30	24.30
Dump Truck (Task 2)	20.90	20.24	286.10	31.20	123.50	17.70	17.00
Fuel Truck (T-Reach)	20.90	20.24	286.10	31.20	123.50	17.70	17.00
Water Truck (P-Reach)	20.90	20.24	286.10	31.20	123.50	17.70	17.00
Gasoline:							
Pickup Truck (T-Reach)	134.60	122.40	95.80	5.30	3960.00	6.06	6.06

	Total Emissions (lbs)						
	THC	ROC	NOx	SO2	CO	TSP	PM10
Diesel:							
Dozer, D-8 (Task 2)	227.27	218.00	1914.66	208.99	527.52	170.02	163.30
Dozer, D-8 (Task 10)	113.64	109.00	957.33	104.50	263.76	85.01	81.65
Dozer, D-6 (Task 10)	170.45	163.50	1436.00	156.74	395.64	127.51	122.47
Grader (Task 2)	95.42	91.61	1421.28	174.16	305.76	124.32	119.35
Grader (Task 6)	40.90	39.26	609.12	74.64	131.04	53.28	51.15
Grader (Task 7)	109.06	104.69	1624.32	199.04	349.44	142.08	136.40
Backhoe (Task 10)	48.70	46.71	410.28	44.78	113.04	36.43	34.99
Dump Truck (Task 2)	53.50	51.81	732.42	79.87	316.16	45.31	43.52
Fuel Truck (T-Reach)	31.35	30.36	429.15	46.80	185.25	26.55	25.50
Water Truck (P-Reach)	518.32	501.95	7095.28	773.76	3062.80	438.96	421.60
Gasoline:							
Pickup Truck (T-Reach)	333.81	303.55	237.58	13.14	9820.80	15.03	15.03
Total (lbs)	1742.42	1660.45	16867.43	1876.43	15471.21	1264.50	1214.95
Total (tons)	0.87	0.83	8.43	0.94	7.74	0.63	0.61

Sources:

U.S. EPA, 1994. Compilation of Air Pollutant Emission Factors, Volume II: Mobile Sources

U.S. EPA, 1995. Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources.

CARB, 1988. Method Used to Develop a Size-Segregated Particulate Matter Inventory (Draft). PM10 Fractions from Profiles 118, 117, 391.

TABLE 3 RIO SALADO PROJECT - PHOENIX REACH
ANNUAL OFFSITE CONSTRUCTION EMISSIONS

	Parameters						NOx (1997)				CO (1997)				ROC (1997)						SO2		PM10 (1997)	
Source	Daily Trips	Number of Days	Dist. (mi)	Speed (mph)	% Hot Start	% Cold Start	Exhaust Emission Factor (g/mile)	Cold Start Factor (g/trip)	Hot Start Factor (g/trip)	Total Emission (b) (lbs)	Exhaust Emission Factor (g/mile)	Cold Start Factor (g/trip)	Hot Start Factor (g/trip)	Total Emission (b) (lbs)	Exhaust Emission Factor (g/mile)	Cold Start Factor (g/trip)	Hot Start Factor (g/trip)	Hot Soak Factor (g/trip)	Diurnal Factor (g/trk/day)	Total Emission (c) & (d) (lbs)	Emission Factor (g/mile)	Emission (lbs) (d)	Emission Factor (a) (g/mile)	Emission (lbs) (d)
Workers Commuting	14	310	15	45	5	95	0.48	2.12	1.16	88.64	3.08	44.33	8.70	848.39	0.21	4.02	1.07	0.95	2.63	101.35	0.06	8.60	0.11	15.77
Workers Commuting	20	200	15	45	5	95	0.48	2.12	1.16	81.69	3.08	44.33	8.70	781.93	0.21	4.02	1.07	0.95	2.63	93.41	0.06	7.93	0.11	14.54
Workers Commuting	36	60	15	45	5	95	0.48	2.12	1.16	44.11	3.08	44.33	8.70	422.24	0.21	4.02	1.07	0.95	2.63	50.44	0.06	4.28	0.11	7.85
Cement Delivery	20	60	20	45	50	50	5.69	0.00	0.00	300.79	7.87	0.00	0.00	416.04	0.94	0.00	0.00	0.00	0.00	49.69	0.06	3.17	0.51	26.96
Material Transport (e)	200	210	5	25	50	50	5.49	0.00	0.00	2539.43	12.66	0.00	0.00	5855.95	1.75	0.00	0.00	0.00	0.00	809.47	0.06	27.75	0.51	235.90
Equipment Delivery	20	5	20	45	50	50	5.69	0.00	0.00	25.07	7.87	0.00	0.00	34.67	0.94	0.00	0.00	0.00	0.00	4.14	0.06	0.26	0.51	2.25
	Total Emissions (lbs)									3079.73				8359.21						1108.52		52.00		303.27

(a) Emissions factor includes PM10 emissions from exhaust and tire wear

(b) Emissions (lb/day) = (daily trip x dist. x days x exhaust emission factor 454 grams/lb)+(cold start factor x daily trip x days x % cold starts / 454 grams/lb)
+(hot start x daily trip x days x % hot starts x / 454 grams/lb)

(c) Emissions (lb/day) = (daily trip x dist. x days x exhaust emission factor / 454 grams/lbs)+(cold start factor x daily trip x days x % cold starts/ 454 grams/lbs)
+(hot start factor x daily trip x days x % hot starts / 454 grams/lb)+(hot soak factor x daily trips x days / 454 grams/ lb)+(diurnal factor x daily trips x days / 454 grams/lb)

(d) Emissions (lb/day) = (daily trips x dist. x days x emission factor / 454 grams/lbs)

References: SCAQMD's CEQA Air Quality Handbook
User Guide for Mobile Assessment for Air Quality Impacts (MAAQI)

TABLE 4 RIO SALADO PROJECT - TEMPE REACH
ANNUAL OFFSITE CONSTRUCTION EMISSIONS

	Parameters						NOx (1997)				CO (1997)				ROC (1997)						SO2		PM10 (1997)	
Source	Daily Trips	Number of Days	Dist. (mi)	Speed (mph)	% Hot Start	% Cold Start	Exhaust Emission Factor (g/mile)	Cold Start Factor (g/trip)	Hot Start Factor (g/trip)	Total Emission (b) (lbs)	Exhaust Emission Factor (g/mile)	Cold Start Factor (g/trip)	Hot Start Factor (g/trip)	Total Emission (b) (lbs)	Exhaust Emission Factor (g/mile)	Cold Start Factor (g/trip)	Hot Start Factor (g/trip)	Hot Soak Factor (g/trip)	Diurnal Factor (g/trk/day)	Total Emission (c) & (d) (lbs)	Emission Factor (g/mile)	Emission (lbs) (d)	Emission Factor (a) (g/mile)	Emission (lbs) (d)
Workers Commuting	10	300	15	45	5	95	0.48	2.12	1.16	61.27	3.08	44.33	8.70	586.44	0.21	4.02	1.07	0.95	2.63	70.06	0.06	5.95	0.11	10.90
Workers Commuting	26	50	15	45	5	95	0.48	2.12	1.16	26.55	3.08	44.33	8.70	254.13	0.21	4.02	1.07	0.95	2.63	30.36	0.06	2.58	0.11	4.72
Equipment Delivery	20	5	20	45	50	50	5.69	0.00	0.00	25.07	7.87	0.00	0.00	34.67	0.94	0.00	0.00	0.00	0.00	4.14	0.06	0.26	0.51	2.25
	Total Emissions (lbs)									112.88				875.24						104.56		8.79		17.87

(a) Emissions factor includes PM10 emissions from exhaust and tire wear

(b) Emissions (lb/day) = (daily trip x dist. x days x exhaust emission factor 454 grams/lb)+(cold start factor x daily trip x days x % cold starts / 454 grams/lb) +(hot start x daily trip x days x % hot starts x / 454 grams/lb)

(c) Emissions (lb/day) = (daily trip x dist. x days x exhaust emission factor / 454 grams/lbs)+(cold start factor x daily trip x days x % cold starts/ 454 grams/lbs) +(hot start factor x daily trip x days x % hot starts / 454 grams/lb)+(hot soak factor x daily trips x days / 454 grams/ lb)+(diurnal factor x daily trips x days / 454 grams/lb)

(d) Emissions (lb/day) = (daily trips x dist. x days x emission factor / 454 grams/lbs)

References: SCAQMD's CEQA Air Quality Handbook
User Guide for Mobile Assessment for Air Quality Impacts (MAAQI)

TABLE 5 RIO SALADO PROJECT - PHOENIX REACH
ANNUAL FUGITIVE EMISSIONS

Disturbed area = 1100 feet length x 300 feet in width

Construction Activity = 12 months

Activity	Disturbed Area (acres)	Time (months)	TSP Emission Factor (tons/acre-month)	PM10 Emission Factor (tons/acre-month)	Total Fugitive Dust From Constructio TSP (tons)	PM10 (tons)
Construction	7.6	12.0	1.2	0.8	109.4	35.0

TSP 1.2 tons per acre per month (2400 lbs), (USEPA, 1995)
PM10 64% of the TSP is PM10, (CARB, 1992)

Emission Reduction Efficiency of 50% by watering the site at least twice a day (scaqmd, 1993).

TABLE 6 RIO SALADO PROJECT - TEMPE REACH
ANNUAL FUGITIVE EMISSIONS

Disturbed area = 440 feet length x 300 feet in width

Construction Activity = 12 months

Activity	Disturbed Area (acres)	Time (months)	TSP Emission Factor (tons/acre-month)	PM10 Emission Factor (tons/acre-month)	Total Fugitive Dust From Constructio TSP (tons)	PM10 (tons)
Construction	3.0	12.0	1.2	0.8	43.2	13.8

TSP 1.2 tons per acre per month (2400 lbs), (USEPA, 1995)

PM10 64% of the TSP is PM10, (CARB, 1992)

PM10 emission reduction efficiency of 50% by watering the site at least twice a day (SCAQMD, 1993).

TABLE 7 RIO SALADO PROJECT - PHOENIX REACH
ONSITE OPERATIONAL EMISSIONS (lbs/yr)

Equipment	Fuel Use (gallon/hour)	Number	Days	Hours Per Day	Total Hours	Usage Factor (%)	Adjusted Hours	Total Fuel Usage (gal.)
Diesel:								
Dozer, D-8 (Task 2)	12	2	50	10	1000	70	700	8400
Grader (Task 2)	10	2	50	10	1000	70	700	7000
Dump Truck (Task 2)	8	2	50	10	1000	40	400	3200
Fuel Truck (Task 2)	5	1	50	10	500	20	100	500
Water Truck (Task 2)	8	2	50	10	1000	50	500	4000
Gasoline:								
Pickup Truck (Task 1)	2	2	150	10	3000	20	600	1200
Pickup Truck (Task 2)	2	2	50	10	1000	20	200	400
Pickup Truck (Task 3)	2	2	50	10	1000	20	200	400
Pickup Truck (Task 4)	2	2	10	10	200	20	40	80

	Emission Factors (lbs/1000 Gallons of Fuel)						
	THC	ROC	NOx	SO2	CO	TSP	PM10
Diesel:							
Dozer, D-8 (Task 2)	33.82	32.44	284.92	31.10	78.50	25.30	24.30
Grader (Task 2)	17.04	16.36	253.80	31.10	54.60	22.20	21.31
Dump Truck (Task 2)	20.90	20.24	286.10	31.20	123.50	17.70	17.00
Fuel Truck (Task 2)	20.90	20.24	286.10	31.20	123.50	17.70	17.00
Water Truck (Task 2)	20.90	20.24	286.10	31.20	123.50	17.70	17.00
Gasoline:							
Pickup Truck (Task 1)	134.60	122.40	95.80	5.30	3960.00	6.06	6.06
Pickup Truck (Task 2)	134.60	122.40	95.80	5.30	3960.00	6.06	6.06
Pickup Truck (Task 3)	134.60	122.40	95.80	5.30	3960.00	6.06	6.06
Pickup Truck (Task 4)	134.60	122.40	95.80	5.30	3960.00	6.06	6.06

	Total Emissions (lbs)						
	THC	ROC	NOx	SO2	CO	TSP	PM10
Diesel:							
Dozer, D-8 (Task 2)	284.09	272.50	2393.33	261.24	659.40	212.52	204.12
Grader (Task 2)	119.28	114.51	1776.60	217.70	382.20	155.40	149.18
Dump Truck (Task 2)	66.88	64.77	915.52	99.84	395.20	56.64	54.40
Fuel Truck (Task 2)	10.45	10.12	143.05	15.60	61.75	8.85	8.50
Water Truck (Task 2)	83.60	80.96	1144.40	124.80	494.00	70.80	68.00
Gasoline:							
Pickup Truck (Task 1)	161.52	146.88	114.96	6.36	4752.00	7.27	7.27
Pickup Truck (Task 2)	53.84	48.96	38.32	2.12	1584.00	2.42	2.42
Pickup Truck (Task 3)	53.84	48.96	38.32	2.12	1584.00	2.42	2.42
Pickup Truck (Task 4)	10.77	9.79	7.66	0.42	316.80	0.48	0.48
Total (lbs)	844.27	797.44	6572.16	730.20	10229.35	516.81	496.81
Total (tons)	0.42	0.40	3.29	0.37	5.11	0.26	0.25

Sources:

U.S. EPA, 1994. Compilation of Air Pollutant Emission Factors, Volume II: Mobile Sources

U.S. EPA, 1995. Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources.

CARB, 1988. Method Used to Develop a Size-Segregated Particulate Matter Inventory (Draft). PM10 Fractions from Profiles 118, 117, 391.

TABLE 8 RIO SALADO PROJECT - TEMPE REACH
ONSITE OPERATIONAL EMISSIONS (lbs/yr)

Equipment	Fuel Use (gallon/hour)	Number	Days	Hours Per Day	Total Hours	Usage Factor (%)	Adjusted Hours	Total Fuel Usage (gal.)
Diesel:								
Dozer, D-8 (Task 2)	12	2	25	10	500	70	350	4200
Grader (Task 2)	10	2	25	10	500	70	350	3500
Dump Truck (Task 2)	8	2	25	10	500	40	200	1600
Fuel Truck (Task 2)	5	1	25	10	250	20	50	250
Water Truck (Task 2)	8	2	25	10	500	50	250	2000
Gasoline:								
Pickup Truck (Task 1)	2	2	100	10	2000	20	400	800
Pickup Truck (Task 2)	2	2	25	10	500	20	100	200
Pickup Truck (Task 3)	2	2	25	10	500	20	100	200
Pickup Truck (Task 4)	2	2	10	10	200	20	40	80

	Emission Factors (lbs/1000 Gallons of Fuel)						
	THC	ROC	NOx	SO2	CO	TSP	PM10
Diesel:							
Dozer, D-8 (Task 2)	33.82	32.44	284.92	31.10	78.50	25.30	24.30
Grader (Task 2)	17.04	16.36	253.80	31.10	54.60	22.20	21.31
Dump Truck (Task 2)	20.90	20.24	286.10	31.20	123.50	17.70	17.00
Fuel Truck (Task 2)	20.90	20.24	286.10	31.20	123.50	17.70	17.00
Water Truck (Task 2)	20.90	20.24	286.10	31.20	123.50	17.70	17.00
Gasoline:							
Pickup Truck (Task 1)	134.60	122.40	95.80	5.30	3960.00	6.06	6.06
Pickup Truck (Task 2)	134.60	122.40	95.80	5.30	3960.00	6.06	6.06
Pickup Truck (Task 3)	134.60	122.40	95.80	5.30	3960.00	6.06	6.06
Pickup Truck (Task 4)	134.60	122.40	95.80	5.30	3960.00	6.06	6.06

	Total Emissions (lbs)						
	THC	ROC	NOx	SO2	CO	TSP	PM10
Diesel:							
Dozer, D-8 (Task 2)	142.04	136.25	1196.66	130.62	329.70	106.26	102.06
Grader (Task 2)	59.64	57.25	888.30	108.85	191.10	77.70	74.59
Dump Truck (Task 2)	33.44	32.38	457.76	49.92	197.60	28.32	27.20
Fuel Truck (Task 2)	5.23	5.06	71.53	7.80	30.88	4.43	4.25
Water Truck (Task 2)	41.80	40.48	572.20	62.40	247.00	35.40	34.00
Gasoline:							
Pickup Truck (Task 1)	107.68	97.92	76.64	4.24	3168.00	4.85	4.85
Pickup Truck (Task 2)	26.92	24.48	19.16	1.06	792.00	1.21	1.21
Pickup Truck (Task 3)	26.92	24.48	19.16	1.06	792.00	1.21	1.21
Pickup Truck (Task 4)	10.77	9.79	7.66	0.42	316.80	0.48	0.48
Total (lbs)	454.44	428.10	3309.07	366.37	6065.08	259.86	249.86
Total (tons)	0.23	0.21	1.65	0.18	3.03	0.13	0.12

Sources:

U.S. EPA, 1994. Compilation of Air Pollutant Emission Factors, Volume II: Mobile Sources

U.S. EPA, 1995. Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources.

CARB, 1988. Method Used to Develop a Size-Segregated Particulate Matter Inventory (Draft). PM10 Fractions from Profiles 118, 117, 391.

TABLE 9 RIO SALADO PROJECT - PHOENIX REACH
ANNUAL OFFSITE OPERATIONAL EMISSIONS

	Parameters						NOx (1997)				CO (1997)				ROC (1997)						SO2		PM10 (1997)	
Source	Daily Trips	Number of Days	Dist. (mi)	Speed (mph)	% Hot Start	% Cold Start	Exhaust Emission Factor (g/mile)	Cold Start Factor (g/trip)	Hot Start Factor (g/trip)	Total Emission (b) (lbs)	Exhaust Emission Factor (g/mile)	Cold Start Factor (g/trip)	Hot Start Factor (g/trip)	Total Emission (b) (lbs)	Exhaust Emission Factor (g/mile)	Cold Start Factor (g/trip)	Hot Start Factor (g/trip)	Hot Soak Factor (g/trip)	Diurnal Factor (g/trk/day)	Total Emission (c) & (d) (lbs)	Emission Factor (g/mile)	Emission (lbs) (d)	Emission Factor (a) (g/mile)	Emission (lbs) (d)
Workers Commuting (T-1)	4	150	15	45	5	95	0.48	2.12	1.16	12.25	3.08	44.33	8.70	117.29	0.21	4.02	1.07	0.95	2.63	14.01	0.06	1.19	0.11	2.18
Workers Commuting (T-2)	22	50	15	45	5	95	0.48	2.12	1.16	22.47	3.08	44.33	8.70	215.03	0.21	4.02	1.07	0.95	2.63	25.69	0.06	2.18	0.11	4.00
Workers Commuting (T-3)	4	50	15	45	5	95	0.48	2.12	1.16	4.08	3.08	44.33	8.70	39.10	0.21	4.02	1.07	0.95	2.63	4.67	0.06	0.40	0.11	0.73
Workers Commuting (T-4)	4	10	15	45	5	95	0.48	2.12	1.16	0.82	3.08	44.33	8.70	7.82	0.21	4.02	1.07	0.95	2.63	0.93	0.06	0.08	0.11	0.15
Material Transport (T-2)	10	50	5	25	50	50	5.49	0.00	0.00	30.23	12.66	0.00	0.00	69.71	1.75	0.00	0.00	0.00	0.00	9.64	0.06	0.33	0.51	2.81
Equipment Delivery (T-2)	4	2	20	45	50	50	5.69	0.00	0.00	2.01	7.87	0.00	0.00	2.77	0.94	0.00	0.00	0.00	0.00	0.33	0.06	0.02	0.51	0.18
	Total Emissions (lbs)									71.86				451.72						55.27		4.20		10.04

(a) Emissions factor includes PM10 emissions from exhaust and tire wear

(b) Emissions (lb/day) = (daily trip x dist. x days x exhaust emission factor 454 grams/lb)+(cold start factor x daily trip x days x % cold starts / 454 grams/lb)
+(hot start x daily trip x days x % hot starts x / 454 grams/lb)

(c) Emissions (lb/day) = (daily trip x dist. x days x exhaust emission factor / 454 grams/lbs)+(cold start factor x daily trip x days x % cold starts/ 454 grams/lbs)
+(hot start factor x daily trip x days x % hot starts / 454 grams/lb)+(hot soak factor x daily trips x days / 454 grams/ lb)+(diurnal factor x daily trips x days / 454 grams/lb)

(d) Emissions (lb/day) = (daily trips x dist. x days x emission factor / 454 grams/lbs)

References: SCAQMD's CEQA Air Quality Handbook
User Guide for Mobile Assessment for Air Quality Impacts (MAAQI)

TABLE 10 RIO SALADO PROJECT - TEMPE REACH
ANNUAL OFFSITE OPERATIONAL EMISSIONS

	Parameters						NOx (1997)				CO (1997)				ROC (1997)						SO2		PM10 (1997)	
Source	Daily Trips	Number of Days	Dist. (mi)	Speed (mph)	% Hot Start	% Cold Start	Exhaust Emission Factor (g/mile)	Cold Start Factor (g/trip)	Hot Start Factor (g/trip)	Total Emission (b) (lbs)	Exhaust Emission Factor (g/mile)	Cold Start Factor (g/trip)	Hot Start Factor (g/trip)	Total Emission (b) (lbs)	Exhaust Emission Factor (g/mile)	Cold Start Factor (g/trip)	Hot Start Factor (g/trip)	Hot Soak Factor (g/trip)	Diurnal Factor (g/trk/day)	Total Emission (c) & (d) (lbs)	Emission Factor (g/mile)	Emission (lbs) (d)	Emission Factor (a) (g/mile)	Emission (lbs) (d)
Workers Commuting (T-1)	4	100	15	45	5	95	0.48	2.12	1.16	8.17	3.08	44.33	8.70	78.19	0.21	4.02	1.07	0.95	2.63	9.34	0.06	0.79	0.11	1.45
Workers Commuting (T-2)	22	25	15	45	5	95	0.48	2.12	1.16	11.23	3.08	44.33	8.70	107.51	0.21	4.02	1.07	0.95	2.63	12.84	0.06	1.09	0.11	2.00
Workers Commuting (T-3)	4	25	15	45	5	95	0.48	2.12	1.16	2.04	3.08	44.33	8.70	19.55	0.21	4.02	1.07	0.95	2.63	2.34	0.06	0.20	0.11	0.36
Workers Commuting (T-4)	4	10	15	45	5	95	0.48	2.12	1.16	0.82	3.08	44.33	8.70	7.82	0.21	4.02	1.07	0.95	2.63	0.93	0.06	0.08	0.11	0.15
Material Transport (T-2)	10	25	5	25	50	50	5.49	0.00	0.00	15.12	12.66	0.00	0.00	34.86	1.75	0.00	0.00	0.00	0.00	4.82	0.06	0.17	0.51	1.40
Equipment Delivery (T-2)	4	2	20	45	50	50	5.69	0.00	0.00	2.01	7.87	0.00	0.00	2.77	0.94	0.00	0.00	0.00	0.00	0.33	0.06	0.02	0.51	0.18
	Total Emissions (lbs)									39.38				250.70						30.60		2.35		5.55

(a) Emissions factor includes PM10 emissions from exhaust and tire wear

(b) Emissions (lb/day) = (daily trip x dist. x days x exhaust emission factor 454 grams/lb)+(cold start factor x daily trip x days x % cold starts / 454 grams/lb)
+(hot start x daily trip x days x % hot starts x / 454 grams/lb)

(c) Emissions (lb/day) = (daily trip x dist. x days x exhaust emission factor / 454 grams/lbs)+(cold start factor x daily trip x days x % cold starts/ 454 grams/lbs)
+(hot start factor x daily trip x days x % hot starts / 454 grams/lb)+(hot soak factor x daily trips x days / 454 grams/ lb)+(diurnal factor x daily trips x days / 454 grams/lb)

(d) Emissions (lb/day) = (daily trips x dist. x days x emission factor / 454 grams/lbs)

References: SCAQMD's CEQA Air Quality Handbook
User Guide for Mobile Assessment for Air Quality Impacts (MAAQI)

TABLE 11 RIO SALADO PROJECT - PHOENIX REACH
ANNUAL FUGITIVE EMISSIONS (OPERATIONS)

Disturbed area = 10 Acres

Construction Activity = 2 months

Activity	Disturbed Area (acres)	Time (months)	TSP Emission Factor (tons/acre-month)	PM10 Emission Factor (tons/acre-month)	Total Fugitive Dust From Constructio TSP (tons)	PM10 (tons)
Construction	10.0	2.0	1.2	0.8	24.0	7.7

TSP 1.2 tons per acre per month (2400 lbs), (USEPA, 1995)

PM10 64% of the TSP is PM10, (CARB, 1992)

Emission Reduction Efficiency of 50% by watering the site at least twice a day (scaqmd, 1993).

TABLE 12 RIO SALADO PROJECT - TEMPE REACH
ANNUAL FUGITIVE EMISSIONS (OPERATIONS)

Disturbed area = 5 Acres

Construction Activity = 2 months

Activity	Disturbed Area (acres)	Time (months)	TSP Emission Factor (tons/acre-month)	PM10 Emission Factor (tons/acre-month)	Total Fugitive Dust From Constructio TSP (tons)	PM10 (tons)
Construction	5.0	2.0	1.2	0.8	12.0	3.8

TSP 1.2 tons per acre per month (2400 lbs), (USEPA, 1995)

PM10 64% of the TSP is PM10, (CARB, 1992)

PM10 emission reduction efficiency of 50% by watering the site at least twice a day (SCAQMD, 1993).

APPENDIX C

Habitat Valuation Analysis

Habitat Valuation Analysis
For Environmental Restoration
Rio Salado Project

I. INTRODUCTION AND PURPOSE

The purpose of this Appendix is to provide information supporting the plan recommended in the Main Report and the Environmental Impact Statement for the Rio Salado Feasibility Study.

The Corps' guidance for ecosystem restoration in the Civil Works Program is provided in Engineer Circular (EC) 1005-2-210. The purpose of the guidance is to assure that civil work investments in ecosystem restoration have the intended beneficial effects, are consistent with Administration policy, and will be conducted in the most cost effective manner.

This guidance (EC 1105-2-210:13.b.(1) and (20)) requires that the ecosystem outputs of proposed alternatives of a feasibility study be subjected to a detailed cost effectiveness and incremental cost analysis. The primary purpose being to allow explicit comparison of the additional cost and additional outputs associated with the alternatives. To perform this type of analysis, it is necessary that the environmental outputs be based on some quantifiable unit (e.g., Habitat Units, fisherman-days, visitor use days). This allows determination of the most cost-effective restoration option or combination of options that best meet the restoration goals.

The following analysis uses a habitat-based method to quantitatively characterize biological values of fish and wildlife habitat in the study area.

II. EXISTING ENVIRONMENTAL DEGRADATION AND RESTORATION OPPORTUNITIES

A. Habitat degradation.

Destruction of riparian habitat in the southwest has been widely reported (see Bahre 1991; Busch and Smith 1995; Rea 1983). A historical perspective of the Salt River appears in Haughley (1994) and Ohmart (1979). These reports and studies are incorporated by reference as per 40 CFR 1502.21.

Dam construction throughout the Salt River's upper watershed in the early 1900's changed the original character of the river and by the 1940's the river ceased to flow. The Salt River in the Feasibility Study Area (i.e., in the urbanized areas of Tempe and Phoenix) is essentially an expansive dry river bed dominated by large expanses of cobble and rubble and devoid of riparian vegetation.

Recent channelization projects by the Arizona Department of

Transportation and the new Priest Drive bridge constructed by Maricopa County have physically altered the natural character of the western portion of the river.

B. Restoration goals. As stated in the "Planning Objectives" of the Plan Formulation of this Study, one objective is to restore the study area to a more natural condition by supplying water to the channel and revegetating with native plant species. As such, the HEP team (see Section III, below) reached a consensus that the goal of this restoration effort should be to restore the channel to conditions that are as close to natural as possible. It was agreed that a natural channel would meander and naturally be dominated with freshwater aquatic strand-type vegetation (see Minckley and Brown [1982:265]). The first terrace or bench (i.e., the immediate floodplain) would naturally be dominated by willows and cottonwoods; the upper terraces or "secondary" floodplain is, under natural conditions, dominated by the mesquite "*bosque*" (or woodland) (see Minckley and Brown [1982:249 and 269]).

III. EVALUATION METHOD USED

A. Background. A reconnaissance field survey was conducted for the Reconnaissance Study to determine habitat values of existing riparian vegetation in the Rio Salado area (see USACE 1995: Appendix A, pg. 53). A total of 29 existing riparian sites along the Salt River were visited and evaluated using a modified Habitat Evaluations Procedure (HEP) (hereafter called a HEP-like analysis). This analysis was conducted to quantitatively assess the value of existing habitat and the potential value of restored habitat (i.e., under future with Project Conditions) on the Salt River.

(Note that HEP is a habitat-based evaluation procedure; it is used to give a quantitative, numerical value to biological resources of concern. HEP, developed by the USFWS [USFWS 1980], is a formal process whereby tested habitat suitability models for certain species are used which directs the measurement of certain habitat variables for the selected species (e.g., percent of canopy cover, number of snag trees, stream temperature, percent ground cover, etc . . .) to obtain a Habitat Suitability Index (HSI). This is then used to obtain a numerical rating of habitat units for the selected species.)

In the Reconnaissance Study (as well as in this evaluation), a numerical rating or value between 0.0 and 1.0 was assigned to the habitat as its value (i.e., Habitat Value [HV]). The HV was then multiplied by the area of the habitat to obtain the Habitat Units (HUs) for each habitat type.

For the Reconnaissance Study an average habitat value was determined for each of the 29 existing riparian sites by averaging rating criteria that were agreed on by a consensus of

HEP team members (see USACE 1995; Appendix A, pgs. 55-57).

(Note that the values generated for the rating criteria were based on actual field-collected data at existing riparian sites on the Salt River. Rating criteria used were: the presence of threatened or endangered species, presence of permanent water, the amount of existing disturbance and a determination of the "Anderson-Ohmart" value [cf. Anderson and Ohmart 1993] [also see USACE 1995, Appendix A:55].)

A future with-project condition evaluation was also conducted for the Reconnaissance Study (see USACE 1995, Appendix A: 65). This analysis predicted what habitat units might be achieved through environmental restoration.

B. Habitat Evaluation.

The habitat evaluation used in the Reconnaissance Study formed the basis for the habitat valuation for this Feasibility Study. Personnel from USFWS and Arizona Game and Fish Department (AG&FD) who were involved in the Reconnaissance Study HEP-like analysis provided input into the determination of habitat value for the HEP-like analysis for this Feasibility Study.

Since there is essentially no existing habitat (or habitat value) in the Feasibility Study Area (i.e., no habitat value for without project conditions), the HEP-like analysis for this Feasibility Study was essentially a future with-project analysis (i.e., a projection of what the value of new, restored habitats might be).

Habitat Values for each habitat type under the various proposed restoration alternatives were determined primarily by a consensus of the best professional judgement of resource agency biologist that performed the HEP-like analysis for the Reconnaissance Study. The team's collective background knowledge of existing riparian habitat on the Salt River and their participation in the Reconnaissance Study HEP-like evaluation (which determined a value of existing Salt River riparian habitat) allowed for an objective projection of the potential habitat value of restoration alternatives.

(It should be noted that the consensus determination of Habitat Values for the habitat types were largely influenced by the amount of water available under the various alternatives for native vegetation and the proximity of the habitat to areas of human disturbance.)

The Average Annual Habitat Units (AAHUs)for habitat expected to be restored under the Proposed Action and restoration alternatives are presented in the Appendices of this analysis (see Tables 1-41 in Appendix A, B, and C and sumarized values in Table 32). Habitat values projected for the proposed action and alternatives are consistent with values estimated in the

Reconnaissance Study (see USACE 1995, Appendix A:65-68).

Note that the AAHUs over the 50 year life of the project were calculated as described in USFWS (1980:A-5-1) and Stiehl (1993: Chapter 3) using HEP's "Form C". Table 43 displays Habitat Units with the habitat value "straight lined", that is, not annualized over time as average annual units.

IV. RESTORATION ALTERNATIVES

Section 2 of the Draft EIS provides a detailed description of the Proposed Action and proposed restoration alternatives being considered. As mentioned in Section 2, restoration involve the "Phoenix Reach" and the "Tempe Reach" (see Section 2.1.1 for detailed descriptions; also see Table 43 of this Appendix).

Alternatives to the Proposed Action includes 4 alternatives for the "Phoenix Reach" and 4 alternatives for the "Tempe Reach" (see Section 2.3 and 2.4 of the DEIS; also Table 43 of this Appendix).

V. HABITAT VALUE COMPARISON OF RESTORATION ALTERNATIVES

Table 42 summarized the Average Annual Habitat Units determined for the Proposed Action and each alternative for the Phoenix and Tempe reaches.

Phoenix Reach Alternatives. A simple comparison of the total Average Annual Habitat Units (AAHUs) associated with alternatives shows that the most AAHUs are derived from the alternative that provides for the most water and most acreage devoted to wildlife habitat. As would be expected, the alternative that provides for a 5-mile perennial stream, more wetland associated plants, and vegetating existing gravel pits in the study area yields the most AAHUs. As would be expected, the low water alternative has the least AAHUs.

Tempe Reach Alternatives. As would be expected, the same relationship exist for the Tempe Reach. The alternative that provides for the most available water and most acreage for restoration yields the highest AAHUs.

VI. RECOMMENDED RESTORATION PLAN

Under the recommended plan (Proposed Action) a total of 201.1 AAHUs are expected in the Phoenix Reach and 44.9 AAHUs are expected for the Tempe Reach. The recommended plan meets the restoration goal (see Section II.B) of providing the diverse habitat types that naturally occur in a Sonoran desert riparian system.

VII. LITERATURE CITED

Anderson, B. and R. Ohmart. 1993. The development of an Arizona riparian habitat evaluation model with wildlife values. Prepared for Arizona Game and Fish Department. Contract # G30025-B.

Bahre, C.J. 1991. A legacy of change: historic human impact on vegetation in the Arizona borderlands. Univ. of Arizona Press. Tucson.

Haughey, R.A. 1994. History of the Salt and Gila: an historical perspective. Internal report of the Arizona Game and Fish Department. Mesa, AZ.

Minckley, W.L. and D.E. Brown. 1982. Part 6. Wetlands. *In*. Brown, D.E. (ed.) Biotic Communities of the American Southwest - United States and Mexico. Special Issue of Desert Plants. Volume 4. Published by the Univ. of Arizona for the Boyce Thompson Southwestern Arboretum.

Ohmart, R.D. 1979. Past and present biotic communities of the lower Colorado River mainstem and selected tributaries. Vol.IV. Report for the Bureau of Reclamation. Contract # 7-07-30-V0009.

Rea, A.M. 1983. Once a river: bird life and habitat change along the Middle Gila. univ. of Arizona Press. Tucson, AZ.

Stiehl, R.B. (ed.) 1993. Habitat evaluation procedures workbook. National Ecology Research Center. Fort Collins, CO. USFWS.

U.S. Army Corps of Engineers (USACOE). 1995. Reconnaissance Report. Rio Salado, Salt River, AZ. Prepared by the U.S. Army Corps of Engineers. L.A. District. March 1995.

U.S. Fish & Wildlife Service. (USFWS). 1980. Habitat Evaluation Procedures (HEP). ESM (Ecological Service Manual) 102. Div. of Ecological Services, USFWS, Wash., D.C. March 31, 1980.

APPENDIX D

Evaluation of the Effects of the Discharge of Dredged or Fill Materials into the Waters of the United States

APPENDIX D. THE EVALUATION OF THE EFFECTS OF THE DISCHARGE OF DREDGED OR FILL MATERIALS INTO THE WATERS OF THE UNITED STATES

I. INTRODUCTION

The following is provided in accordance with Section 404 (b)(1) of the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500) as amended by the Clean Water Act of 1977 (CWA) (Public Law 95-217). Its intent is to succinctly state and evaluate information regarding the effects of discharge of dredged or fill material into the waters of the United States. As such, it is not meant to stand alone and relies heavily upon information provided in the environmental document to which it is attached. Use of the "Documentation" category is for expansion of discussions only when necessary or for references and citation.

It should be noted that there is currently no Corps authorization for this project. In the event no Corps involvement will occur, the Local Sponsor will be required to meet full requirements under Section 404 and 401.

II. PROJECT DESCRIPTION

A. **Location.** The project area consists of two sites, referred to as the Phoenix Reach and the Tempe Reach. The Phoenix Reach consists of a five-mile portion of the Salt River channel in the City of Phoenix, Maricopa County, Arizona. The Phoenix Reach extends from the Interstate 10 bridge on the east to the 19th Avenue bridge on the west. The Tempe Reach consists of three river segments in the City of Tempe, Maricopa County, Arizona. The Tempe Reach includes: 1) a segment of the Salt River channel from the downstream dam of Town Lake to approximately Priest Drive; 2) a segment of the Salt River channel from approximately McClintock Road to the upstream dam of Town Lake; and 3) Indian Bend Wash from McKellips Road to the confluence with the Salt River. Maps of the project area are presented in Section 2 of the EIS.

B. **General Description.** The Proposed Action involves the environmental restoration of the Phoenix and Tempe Reaches. Environmental restoration will be accomplished by introducing water flows into the river channel and planting native vegetation to create a variety of habitat types, including freshwater marsh, cottonwood/willow riparian forest, upland mesquite, and aquatic strand. Portions of the river channel will need to be re-configured and various improvements constructed, including a low-flow channel and grade control structures along the Phoenix Reach and a piping/pumping system on the Tempe Reach. Well water drawn from shallow aquifers will the water source for both reaches. Incidental recreational improvements, including a system of walking/biking trails, will also be constructed.

C. **Authority and Purpose.** The U.S. Army Corps of Engineers is conducting a feasibility study for the environmental restoration of those portions of the Salt River described above. The primary purpose of the project is to restore natural habitat historically associated with the Salt River flood plain. The feasibility study is being conducted under the authority of the Flood Control Act of 1938 (Public Law 761) to investigate water resource problems and opportunities along the "Gila River and tributaries." In addition, House Resolution 2425 (May 1994) requested the Corps to review prior reports pertaining to flooding and environmental restoration in the State of Arizona. The Senate Energy and Water Development Appropriations Bill of 1994 directed the Corps "to conduct a reconnaissance study to investigate flooding and water quality problems in the Rio Salado area of the Salt River in Tempe and Phoenix. The study should consider water quality, recreation, and restoration of riparian habitat benefits as well as benefits traditionally displayed."

D. General Description of Dredged or Fill Material. One of the improvements proposed for the Phoenix Reach is a low-flow channel in the river bottom to convey low-level flows. This channel will help avoid damage to the habitat areas during minor flood events. The low-flow channel will extend along the entire five-mile length of the Phoenix Reach. The low-flow channel will vary in width between 200' and 350' (maximum width will occur at bridge crossings) and will be approximately 8-10' deep. The channel will have soil cement embankments at a slope of 1:2 (1 vertical, 2 horizontal), except under each bridge crossing where the embankments will have a 1:3 slope. At each of the five bridge crossings, a gravel island will be constructed in the low-flow channel, as well as two collector levees, and an outlet structure. There will also be four concrete drop structures constructed within the low-flow channel. As part of the habitat system, a 2.5-mile length of the low-flow channel will include a low-discharge perennial stream (5 cfs) connecting four shallow pools.

Construction of the low-flow channel will require excavation of the channel bottom. Some of this excavated material may be used for fill within the channel, for soil cement, or as a source of sand and aggregate for use in constructing various project improvements. The predominant surface materials consist of Quaternary-age river sediment deposited as alluvium and terraces, and, to a lesser extent, alluvium deposited by sheet wash and slope-deposited colluvium. Quaternary sediments of Salt River Valley alluvium and terraces consist of unconsolidated to well-cemented gravel and boulders, interbedded with irregular silt, sand, gravel lenses. Any material which cannot be utilized in construction of the project will need to be hauled from the site for disposal.

E. Description of the Proposed Discharge Site. Along the Phoenix Reach, the project site consists of a dry river channel with a soft bottom comprised largely of cobbles. The banks of the channel are largely earthen and unreinforced; however, portions of the channel banks are reinforced with gabions. The channel is devoid of any significant vegetation. Similar to the Phoenix Reach, the Salt River portions of the Tempe Reach consist of a dry river channel with a soft bottom; however, both banks of the channel have been reinforced with gabions. The river bottom consists of cobbles and some sparse herbaceous vegetation. Indian Bend Wash has a low-flow channel in the center of the wash. A golf course is located on the benches of the wash between McKellips and Curry Roads. South of Curry Road, the was consists primarily of bare earth and cobbles, with a few scattered mesquite trees. In order to construct the proposed project, excavation is only anticipated within the Phoenix Reach (for construction of the low-flow channel).

F. Description of Disposal Method. There are several possible opportunity uses for the excavated material from construction of the low-flow channel in the Phoenix Reach. Theses possible uses include direct utilization of the material by existing sand and gravel mining operations adjacent to the river channel at 18th Street and 19th Avenue, or backfilling of existing gravel pits adjacent to the river as stockpile locations for later use. The excavated material is considered to be valuable as a mineral resource for sand, gravel, and aggregate materials. The only other material anticipated to be removed from the site is rubble (e.g., broken concrete) and debris that has been dumped in the river channel in the past. These materials will be transported by truck to nearby disposal sites.

III. FACTUAL DETERMINATION

A. Disposal Site Physical Substrate Determinations

1. ***Substrate Elevation and Slope***. The existing substrate is the bed of the Salt River channel. Excavation of the low-flow channel along the Phoenix Reach will lower the ground level in the center of the channel by 8-10'. No significant vegetation will need to be removed.

2. ***Sediment Type.*** The excavated material consists of unconsolidated to well-cemented gravel and boulders, interbedded with irregular silt, sand, gravel lenses. Some of this excavated material may be used for fill within the channel.

3. ***Dredged/Fill Material Movement.*** During periods of heavy flows in the river channel, some material in the river bed will be transported downstream through fluvial processes. These same transport processes occur in the river channel under current conditions.

4. ***Physical Effects on Benthos (burial, changes in sediment type, composition, etc.).*** The majority of the river bottom will be disturbed by project construction activities (e.g., excavation, grading). Although the river bottom only contains flows on an intermittent basis and, therefore, is not high quality habitat for benthos, it is possible that certain types of benthic organisms inhabit the river channel. Therefore, benthic organisms could be destroyed by project construction activities. However, the habitat created by the proposed project (including streams, pools, and marshes) will provide more suitable conditions for survival of a variety of benthic organisms, eventually resulting in a net benefit for benthos and other aquatic organisms.

5. ***Other Effects.*** The will be recurring disturbance of the channel bottom and banks to repair damage to habitat areas caused by large flood events. These effects will be similar to those of project construction, but on a reduced scale, and will result in the restoration of habitat integrity.

6. ***Action Taken to Minimize Impacts.*** A comprehensive erosion control plan will be prepared for project construction. The plan will limit construction activities during periods of heavy precipitation and will include measures for minimizing ground disturbance and controlling erosion and sedimentation.

B. Effect on Water Circulation, Fluctuation and Salinity Determinations

1. ***Effect on Water.*** The project will restore perennial water flows to portions of the river channel. The water source will be ground water pumped from local shallow aquifers. This water will be treated to drinking water standards before being released into the channel.

2. ***Effect on Current Drainage Patterns and Circulation.*** The project will not change overall storm and flood flows in the river channel. Low-level flows will be contained within the low-flow channel to be constructed along the Phoenix Reach, rather than flowing without restriction across the river bed. Larger floods will continue to inundate the entire river bed, including both the low-flow channel and adjacent benches.

3. *Effect on Normal Water Level Fluctuations.* The project will not affect normal water level fluctuations.

4. *Action Taken to Minimize Effects.* No measures will be required.

C. Suspended Particulate/Turbidity Determinations at Disposal Site

1. *Expected Change in Suspended Particulate and Turbidity Levels in the Vicinity of Disposal Site.* By limiting construction to periods when the river channel is dry (or contains very low-flows), effects on turbidity levels should minimal or non-existent. Erosion control measures for project construction will limit sedimentation impacts. After construction, the project should have no adverse effect on suspended particulate and turbidity levels.

2. *Effects (degree and duration) on Chemical Physical Properties of the Water Column.* No changes in the chemical and physical properties of the water column are anticipated. Normal cycles of flood flows through the river channel should prevent a build-up of salinity levels.

3. *Effects of Turbidity on Biota.* By restricting project construction to dry (or very low-flow) periods and implementing comprehensive erosion control measures, no significant impacts on biota from turbidity should occur.

4. *Actions Taken to Minimize Impacts.* A comprehensive erosion control plan will be prepared for project construction. The plan will limit construction activities during periods of heavy precipitation and will include measures for minimizing ground disturbance and controlling erosion and sedimentation.

D. Contamination Determination. The information on soils and local landfills presented in the appendices of the Rio Salado Feasibility Study (August 1997) does not present evidence indicating that soils in the river bottom may be contaminated. However, because portions of the Phoenix Reach display evidence of past dumping of soils and miscellaneous, it is possible that previously undetected contamination may exist from these sources. Environmental commitments presented in the EIS include a Phase I environmental site assessment of the project site with recommendations for testing where possible contamination is suspected.

E. Effect on Aquatic Ecosystem and Organism Determination. The project will have an overall beneficial effect on aquatic organisms by establishing water-based habitats in the river channel, including freshwater marsh, cottonwood/willow riparian forest, and aquatic strand. Because the river channel does not currently contain any perennial flow of water, aquatic habitat is limited to a few small areas near drain outlets. The amount and quality of aquatic habitat in the river channel will increase substantially with the implementation of the proposed project.

F. Proposed Disposal Site Determinations. Is the mixing zone for each disposal site confined to the smallest practicable zone?

__X__ Yes ______ No

G. Determination of Cumulative Effects of Disposal of Fill on the Aquatic Ecosystem. With implementation of mitigation measures, no significant cumulative effect on the aquatic ecosystem is anticipated. The project will provide a substantial net benefit to the degraded aquatic ecosystem of the river.

H. Determination of Indirect Effects of Disposal of Fill on the Aquatic Ecosystem. Mitigation measures should adequately reduce any adverse sedimentation or turbidity impacts on the degraded aquatic ecosystem which currently exists.

IV. FINDING OF COMPLIANCE

A review of the proposed project indicates that:

1. The discharge represents the least environmentally damaging practicable alternative, and if in a special aquatic site, the activity associated with the discharge must have direct access or proximity to, or be located in the aquatic ecosystem.

   __X__ Yes ______ No

2. The activity does not appear to 1) violate applicable state water quality standards or effluent standards prohibited under Section 307 of the CWA, or 2) jeopardize the existence of federally listed endangered or threatened species or designated marine sanctuary.

   __X__ Yes ______ No

3. The activity will not cause or contribute to significant degradation of waters of the U.S., including adverse effects on human health; life stages of organisms dependent on the aquatic ecosystem; ecosystem diversity; productivity and stability; and recreational, aesthetic, and economic values.

   __X__ Yes ______ No

4. Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem.

   __X__ Yes ______ No

Note: *A negative response indicates that the proposed project does not comply with the guidelines.*

APPENDIX E

Coordination Letters
Arizona State Historic Preservation Officer

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, CORPS OF ENGINEERS
P.O. BOX 532711
LOS ANGELES, CALIFORNIA 90053-2325

November 12, 1997

Office of the Chief
Environmental Resources Branch

Mr. James Garrison
State Historic Preservation Officer
Arizona State Parks
1300 West Washington
Phoenix, Arizona 85007

Dear Mr. Garrison:

This letter is in regard to the Los Angeles District, U.S. Army Corps of Engineers' (Corps) proposed Rio Salado (Salt River) Project in Phoenix, Maricopa County, Arizona. The Corps proposes to implement an ecosystem restoration plan along portions of the Salt River. Ecosystem restoration is proposed at two city locations (reaches [enclosure 1]).

The Phoenix Reach involves a five mile stretch of river from the 19th Avenue Bridge to the Interstate 10 bridge, within the City of Phoenix. The Tempe Reach includes two short sections within the Salt River and one section within Indian Bend Wash for a total length of approximately 2.3 miles within the City of Tempe. The two sections along the Salt River are located between Priest Drive and Hardy Drive, and between Rural Road and McClintock Drive. The Indian Bend Wash section is located from its confluence with the Salt River, north to McKellips Road.

The proposed restoration plan would involve the construction of a low flow channel in the river bottom and the establishment of open-water, marsh, cottonwood-willow, riparian, and mesquite habitat in the river bottom, on the banks, and on the over banks of the Salt River. The project as planned is limited to 50 feet from the river edge on both banks. The plan includes the construction of operation and maintenance roads on the benches, banks, and over banks (within 50 feet of river edge) of the Salt River. The roads will also serve initially as access to the project area for construction. Construction staging will be in the river bed. In addition, three public parking areas are planned. Year round water will be supplied by water wells and water conveyance features, currently located within 50 feet of the river edge. A copy of the draft environmental impact statement is enclosed (enclosure 2). The document provides a project description and location maps in addition to an environmental section.

A literature search of the proposed project area of potential effects (APE) was conducted with the records located at your office, the office of the Archaeologist for City of Phoenix (Mr. Bostwick), and the Office of Cultural Resource Management at Arizona State University. The search indicated that the APE for the Phoenix portion of the project had never been surveyed by archeologists for cultural resources. The Tempe portion however, had been the subject of several studies. There were two archeological sites potentially located in the APE. Site S-54/18PG in the Phoenix portion, and site AZ U:9:45 (ASM) in the Tempe portion. Site AZ U:9:45 (ASM) has been the subject of evaluation studies and was determined ineligible for the National Register of Historic Places (NRHP [enclosure 3]). In addition, two archeological sites were previously recorded in the vicinity of the APE. These are AZ U:9:78 (ASM) and an unnumbered site. The potential for unrecorded segments of prehistoric Hohokam canals within the APE was established in consultation with the Archaeologist for the City Phoenix.

The north and south banks of the Phoenix Reach of the Salt River were walked by staff archeologists from the Corps in September, 1997. No cultural resources of any significance were observed. Approximately 90 per cent of the Phoenix Reach APE has been disturbed by gravel mining and landfill construction. Our survey did locate two areas of material dating from circa 1940s (temporarily designated COE 1 and COE 2). The site on the south bank is a surface scatter of historic artifacts (refuse) and is probably the result of sporadic dumping of domestic refuse along the river bank. The site on the north bank is much larger in size in both surface area and depth. The site has the appearance of an extensive landfill setting. Consultation with the City of Phoenix Planning Department and the Phoenix Public Works Department indicates that undocumented, unregulated deposition has been taking place along the river for most of this century. There are no records before 1980 on the existing landfills. Neither site will provide important information. Both sites represent highly disturbed, undocumented deposition of 50 year old domestic waste. Therefore, the Corps has determined that sites COE 1 and COE 2 are not eligible for listing in the NRHP.

Efforts to relocate previously recorded site S-54/18PG were unsuccessful. The recorded location of the site has been destroyed by landfill and business park construction. Portions of the site may be buried under buildings, but the buildings in question are located several hundred feet outside the APE.

The Tempe portion of the project has been studied previously as part of the Red Mountain Freeway, the Indian Bend Wash, and the Papago Park projects. As mentioned before, the solitary recorded site with the APE of this portion of the project, AZ U:9:45 (ASM), was determined ineligible for the NRHP. Based on the records search, the only area of the Tempe portion, that may have never been surveyed was along the south bank of the river between Priest Drive and Hardy Drive. Corps archeologists surveyed this area in September 1997 and determined that the south bank of the river has been moved approximately 500 hundred feet north via the deposition of fill material. In addition, bank stabilization had been constructed in many areas. The two previously recorded sites supposedly located near the APE, AZ U:9:78 (ASM) and an unnumbered site, are now farther away from the APE (over 500 feet) with relocation of the south river bank to the north.

The project is proposing the construction of three parking areas. They would be located at Central Ave (north and south bank), 7th Ave (south bank), 16th Street (south bank). These areas were also surveyed. No cultural resources of any significance were observed. Refer again to enclosure 2 for locations.

A portion of the project's water supply will be achieved via six wells placed along side of the river channel. Water would then be fed into open ditches connected with the wetlands. Associated with each well will be a pump station for the supplemental irrigation system. The exact location of the wells, pump stations, and ditches have yet to be determined, however they are to be located within the current APE as surveyed. If, at a later date the well, pump and ditch locations are moved outside the APE (more than 50 feet from the current river edge), additional surveys will be conducted in consultation with your office.

If cultural resources are discovered during construction and cannot be avoided, work will be suspended in that area until the properties are evaluated for eligibility for listing in the NRHP in consultation with the Arizona State Historic Preservation Officer (SHPO). If the properties are determined to be eligible for the NRHP, the effects of the proposed construction will be taken into consideration in consultation with the SHPO; and the Advisory Council on Historic Preservation will be provided an opportunity to comment in accordance with 36 CFR 800.11.

Based on this information, the Corps has determined that the project as planned will have no effect on National Register listed or eligible properties. We have enclosed a copy of the survey report pursuant to 36 CFR 800.4(d) (enclosure 4). We would appreciate a response at your earliest convenience. If you have any questions, please contact Mr. Roderic McLean, Staff Archeologist, at (213) 452-3865.

Sincerely,

Robert S. Joe
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, CORPS OF ENGINEERS
P.O. BOX 532711
LOS ANGELES, CALIFORNIA 90053-2325

RECEIVED
DEC - 5 1997
CH 9465
12/8/97
ARIZONA STATE PARKS BOARD

November 12, 1997

FAXED
1/7/98

Office of the Chief
Environmental Resources Branch

Mr. James Garrison
State Historic Preservation Officer
Arizona State Parks
1300 West Washington
Phoenix, Arizona 85007

Dear Mr. Garrison:

This letter is in regard to the Los Angeles District, U.S. Army Corps of Engineers' (Corps) proposed Rio Salado (Salt River) Project in Phoenix, Maricopa County, Arizona. The Corps proposes to implement an ecosystem restoration plan along portions of the Salt River. Ecosystem restoration is proposed at two city locations (reaches [enclosure 1]).

The Phoenix Reach involves a five mile stretch of river from the 19th Avenue Bridge to the Interstate 10 bridge, within the City of Phoenix. The Tempe Reach includes two short sections within the Salt River and one section within Indian Bend Wash for a total length of approximately 2.3 miles within the City of Tempe. The two sections along the Salt River are located between Priest Drive and Hardy Drive, and between Rural Road and McClintock Drive. The Indian Bend Wash section is located from its confluence with the Salt River, north to McKellips Road.

The proposed restoration plan would involve the construction of a low flow channel in the river bottom and the establishment of open-water, marsh, cottonwood-willow, riparian, and mesquite habitat in the river bottom, on the banks, and on the over banks of the Salt River. The project as planned is limited to 50 feet from the river edge on both banks. The plan includes the construction of operation and maintenance roads on the benches, banks, and over banks (within 50 feet of river edge) of the Salt River. The roads will also serve initially as access to the project area for construction. Construction staging will be in the river bed. In addition, three public parking areas are planned. Year round water will be supplied by water wells and water conveyance features, currently located within 50 feet of the river edge. A copy of the draft environmental impact statement is enclosed (enclosure 2). The document provides a project description and location maps in addition to an environmental section.

A literature search of the proposed project area of potential effects (APE) was conducted with the records located at your office, the office of the Archaeologist for City of Phoenix (Mr. Bostwick), and the Office of Cultural Resource Management at Arizona State University. The search indicated that the APE for the Phoenix portion of the project had never been surveyed by archeologists for cultural resources. The Tempe portion however, had been the subject of several studies. There were two archeological sites potentially located in the APE. Site S-54/18PG in the Phoenix portion, and site AZ U:9:45 (ASM) in the Tempe portion. Site AZ U:9:45 (ASM) has been the subject of evaluation studies and was determined ineligible for the National Register of Historic Places (NRHP [enclosure 3]). In addition, two archeological sites were previously recorded in the vicinity of the APE. These are AZ U:9:78 (ASM) and an unnumbered site. The potential for unrecorded segments of prehistoric Hohokam canals within the APE was established in consultation with the Archaeologist for the City Phoenix.

The north and south banks of the Phoenix Reach of the Salt River were walked by staff archeologists from the Corps in September, 1997. No cultural resources of any significance were observed. Approximately 90 per cent of the Phoenix Reach APE has been disturbed by gravel mining and landfill construction. Our survey did locate two areas of material dating from circa 1940s (temporarily designated COE 1 and COE 2). The site on the south bank is a surface scatter of historic artifacts (refuse) and is probably the result of sporadic dumping of domestic refuse along the river bank. The site on the north bank is much larger in size in both surface area and depth. The site has the appearance of an extensive landfill setting. Consultation with the City of Phoenix Planning Department and the Phoenix Public Works Department indicates that undocumented, unregulated deposition has been taking place along the river for most of this century. There are no records before 1980 on the existing landfills. Neither site will provide important information. Both sites represent highly disturbed, undocumented deposition of 50 year old domestic waste. Therefore, the Corps has determined that sites COE 1 and COE 2 are not eligible for listing in the NRHP.

Efforts to relocate previously recorded site S-54/18PG were unsuccessful. The recorded location of the site has been destroyed by landfill and business park construction. Portions of the site may be buried under buildings, but the buildings in question are located several hundred feet outside the APE.

The Tempe portion of the project has been studied previously as part of the Red Mountain Freeway, the Indian Bend Wash, and the Papago Park projects. As mentioned before, the solitary recorded site with the APE of this portion of the project, AZ U:9:45 (ASM), was determined ineligible for the NRHP. Based on the records search, the only area of the Tempe portion, that may have never been surveyed was along the south bank of the river between Priest Drive and Hardy Drive. Corps archeologists surveyed this area in September 1997 and determined that the south bank of the river has been moved approximately 500 hundred feet north via the deposition of fill material. In addition, bank stabilization had been constructed in many areas. The two previously recorded sites supposedly located near the APE, AZ U:9:78 (ASM) and an unnumbered site, are now farther away from the APE (over 500 feet) with relocation of the south river bank to the north.

The project is proposing the construction of three parking areas. They would be located at Central Ave (north and south bank), 7th Ave (south bank), 16th Street (south bank). These areas were also surveyed. No cultural resources of any significance were observed. Refer again to enclosure 2 for locations.

A portion of the project's water supply will be achieved via six wells placed along side of the river channel. Water would then be fed into open ditches connected with the wetlands. Associated with each well will be a pump station for the supplemental irrigation system. The exact location of the wells, pump stations, and ditches have yet to be determined, however they are to be located within the current APE as surveyed. If, at a later date the well, pump and ditch locations are moved outside the APE (more than 50 feet from the current river edge), additional surveys will be conducted in consultation with your office.

If cultural resources are discovered during construction and cannot be avoided, work will be suspended in that area until the properties are evaluated for eligibility for listing in the NRHP in consultation with the Arizona State Historic Preservation Officer (SHPO). If the properties are determined to be eligible for the NRHP, the effects of the proposed construction will be taken into consideration in consultation with the SHPO; and the Advisory Council on Historic Preservation will be provided an opportunity to comment in accordance with 36 CFR 800.11.

Based on this information, the Corps has determined that the project as planned will have no effect on National Register listed or eligible properties. We have enclosed a copy of the survey report pursuant to 36 CFR 800.4(d) (enclosure 4). We would appreciate a response at your earliest convenience. If you have any questions, please contact Mr. Roderic McLean, Staff Archeologist, at (213) 452-3865.

Sincerely,

Robert S. Joe
Chief, Planning Division

Enclosures

CONCUR

for [illegible] 1/7/[illegible]

APPENDIX F

Planning Aid Letter and Coordination Act Report
U.S. Fish and Wildlife Service

United States Department of the Interior
Fish and Wildlife Service
Arizona Ecological Services Field Office
2321 W. Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
(602) 640-2720 Fax (602) 640-2730

In Reply Refer To:
AESO/FA

November 6, 1997

Colonel Robert L. Davis
District Engineer
Army Corps of Engineers
P.O. Box 532711
Los Angeles, California 90053-2325

Attn: CESPL-PD-RQ (Farve)

Dear Colonel Davis:

This Planning Aid Letter on the Rio Salado Feasibility Study (Study) addresses problems and opportunities for fish and wildlife resources in the project area. It is being provided pursuant to the Fish and Wildlife Coordination Act (FWCA)(48 stat. 401, as amended; 16 U.S.C. 661 et seq.) and has been developed in coordination with the Arizona Game and Fish Department (AGFD). It does not constitute the Fish and Wildlife Service (Service) report under Section 2(B) of the FWCA.

DESCRIPTION OF PROJECT

The Rio Salado Environmental Restoration project would be located along the Salt River in Maricopa County, Arizona. The Phoenix Reach would consist of a 5-mile portion of the Salt River in the City of Phoenix and run from the Interstate-10 bridge downstream to the 19th Avenue bridge. The Tempe Reach would be located in the City of Tempe on portions of the Salt River and Indian Bend Wash. Town Lake, an artificial water body to be constructed by the City of Tempe, would be immediately adjacent to the project in the Salt River.

The proposed project would include the Phoenix Reach within the City of Phoenix and the Tempe Reach within the City of Tempe. The project would be constructed under authority of Senate Appropriations Bill H.R. 2445 and would undertake the environmental restoration of the two sites along the Salt River in the State of Arizona. The restoration would include reestablishment of flows and habitats within the two sites. Both cities plan to support these areas with water from groundwater aquifers.

Both reaches could provide opportunities for the restoration and enhancement of habitat for numerous fish and wildlife species including the endangered Yuma clapper rail and southwestern willow flycatcher. Riparian and wetland areas could be restored or enhanced by the creation of open water areas, selective clearing of exotic saltcedar, and the planting of cottonwood and willow and other riparian plant species.

ALTERNATIVES

This section discusses project alternatives as described in the Preliminary Draft Environmental Impact Statement for Rio Salado Environmental Restoration Project (1997).

Phoenix Reach Proposed Action

The restoration of the Phoenix reach would involve construction of a 200-foot wide low-flow channel in the river bottom. Riparian habitat would be established in the river bottom and on the banks and overbanks of the river channel. Maintenance roads would be constructed on the benches and banks and also serve as recreational trails. Three park areas are planned for the overbank areas. Restoration of the Phoenix reach would include the creation of shallow pools in the low-flow channel connected by a perennial stream discharging at 5 cubic feet per second. This system of four pools and stream reach would cover a total length of about 2.5 miles from east of 16th street to west of 7th avenue. Total restored area would be 550 acres.

Phoenix Reach Alternative 1

This alternative would be similar to the proposed action except that it would incorporate the restoration of gravel pits and extend the perennial low-flow stream to length of 5 miles. This action would restore more riparian habitat on the river channel. However, no pools would be constructed along the streams length. Three gravel pits along the rivers edge are currently separated from the river channel by levees. These pits are excavated below the water table and the bottoms are filled with standing water. Under this alternative the levees would be lowered, the bank angles reduced, and riparian habitat would be restored along the edge of water. This alternative would demand more water than the proposed action.

Phoenix Reach Alternative 2

This alternative would incorporate restoration of the gravel pits, but would not include a stream reach or pools within the low-flow channel. This alternative would entail the restoration of mesquite habitat, freshwater marsh, and cottonwood/willow forest along the river bottom, banks, and overbanks. This would be the least water demanding alternative.

Tempe Reach Proposed Action

The restoration of the Tempe reach would consist of three areas: Indian Bend Wash between McKellips Road bridge and the confluence with the Salt River (1.3 mile), upstream Salt River between the upstream dam of Town Lake and grade control structure downstream of McClintock Road bridge (1,800 feet), and downstream Salt River immediately below downstream dam of Town Lake (2,000 feet). Indian Bend Wash would receive 80 acres of restoration including aquatic strand, mesquite habitat, and open space. The upstream Salt River area would have 30 acres restored with cottonwood/willow habitat, wetland marsh, and open space. The downstream Salt River area would receive restoration similar to the upstream Salt River area.

Tempe Reach Alternative 1
This alternative would include restoration of Indian Bend Wash, upstream Salt River, and downstream Salt River utilizing a habitat mix that would consume less water than the proposed action. This alternative would not include any cottonwood/willow, wetland marsh, or aquatic strand. All areas would either be restored with mesquite upland or left as open space.

Tempe Reach Alternative 2
This alternative would exclude restoration of the upstream Salt River segment. Indian Bend Wash and the downstream Salt River segment would be restored as described in the proposed action. This is considered to be a high water consumptive alternative.

Tempe Reach Alternative 3
This alternative would include only the restoration of Indian Bend Wash and exclude both reaches within the Salt River. This alternative would use a habitat mix that would be less water consumptive than the proposed action.

EXISTING ENVIRONMENT

The present surface flow of the Salt River within the project area is attributed to releases from upstream impoundments, effluent from water treatment facilities, agricultural return flows, and local storm events. This surface flow supports some riparian habitat and water obligate species. The river within the project area is essentially an ephemeral waterway that is dry most of the year, with the exception of periodic flows. The study area is characterized by three distinct habitat types: desert upland, riparian forest, and marsh.

The upland community is the predominant habitat on the higher bench areas within the flood plain. This community is characterized primarily by shrubs, annual and perennial herbs, and grasses. Shrubs include creosote, catclaw, bursage, desert broom, saltbush, brittle bush, and saltcedar. Wildlife species that can be found in the uplands include coyote, various rodents, a variety of reptiles, and avian species such as the red-tailed hawk, cactus wren, Gambel's quail, and curve-billed thrasher.

Reaches of the Salt River that receive perennial flows support a narrow riparian community. Within the Phoenix reach a 2-acre riparian area occurs just west of the I-10 bridge and is dominated by saltcedar, and desert broom. Although saltcedar is an invader and has formed dense groves covering extensive areas, it does provide wildlife habitat, especially for nesting doves. Riparian forests support a variety of wildlife species such as bats, skunks, raccoons, amphibians and reptiles; and a host of birds including hooded orioles, Abert's towhees, yellow and yellow-rumped warblers, red-winged blackbirds, Cooper's hawks, and various flycatchers. Many of the bird species are neotropical migrants and depend extensively on riparian communities for feeding and nesting needs.

Marsh areas exist where surface water and suitable soil conditions are present. Vegetation includes cattails, bulrush, sedges, rushes and other emergent vegetation. A variety of amphibian and fish species and a host of avifauna such as rails, egrets, herons, shorebirds, and waterfowl are dependant upon this habitat type.

SPECIAL STATUS SPECIES

The Service is aware of five federally listed species that have been known to occur in the project area. These are the Yuma clapper rail, bald eagle, peregrine falcon, brown pelican, and southwestern willow flycatcher.

The Yuma clapper rail is presently found west of 91st Avenue below the project area, and the population is stable. Primary habitat for the Yuma clapper rail consists of mature cattail/bulrush stands situated in shallow water near high ground. They use marsh habitat for foraging, nesting, roosting, and loafing. Establishment of this habitat is essential for these rails to successfully breed and to exist in the area.

The bald eagle and peregrine falcon are migrants that are occasionally seen in the project area; there are no known nest sites in the project area. The brown pelican is occasionally "blown" up river from the coast by storm events but is not a permanent resident of the project area.

The southwestern willow flycatcher is considered a rare migrant into the lower Salt River. Existing vegetative conditions does not provide suitable habitat for this species.

State sensitive species which may occur in the project area include lowland leopard frog, belted kingfisher, great egret, snowy egret, osprey, American bittern, least bittern, ferruginous pygmy owl, black-necked stilt, black-crowned night heron, and white-faced ibis.

FUTURE WITHOUT PROJECT

The without project condition assumes that agricultural land will continue to be converted to urban development. Periodic releases from upstream reservoirs will likely continue to scour the Salt River and associated vegetation. However, these releases can create high soil moisture resulting in seed germination of desirable riparian species. Under these conditions it is likely that riparian habitat will return to pre-flood conditions. The loss of marsh habitat due to the scouring affects of the 1993 floods will affect those species dependant on and associated with those habitats. However, it is expected that new wetlands will develop over time in those areas where high soil moisture is maintained.

The City of Phoenix is presently investigating alternative methods of disposing effluent wastewater from the treatment plants at 23rd and 91st Avenues. One of the options is to suspend releases into the Salt River. This would adversely impact wetland and riparian habitats maintained by the flows. The cottonwood and willow would be more severely affected than saltcedar by the reduction in water flows.

The construction of Tempe Town Lake would provide open water habitat and could benefit fish and wildlife resources. If the lake was designed to promote the establishment of marsh vegetation, restoration may provide habitat for waterfowl, shorebirds, and wading birds, including the Yuma clapper rail. The construction of open water at the lake could provide opportunities for the creation of an urban fishery. Most urban lakes are managed on a put-and-take basis, rainbow trout are stocked during the cooler months (November through March) and channel catfish are stocked during the warmer months (April through October). The lakes must exceed nine feet in depth and have acceptable water quality.

FUTURE WITH PROJECT

Prior to modification of flows in the Salt River, a variety of native fish were likely common in what is now the metropolitan area. Sonora sucker, desert sucker, roundtail chub, longfin dace, and speckled dace were likely common. Also, federally listed species that were probably found in the lower Salt River include: razorback sucker, Colorado squawfish, spikedace, woundfin, loach minnow, and Gila topminnow. Creating open water areas in abandoned gravel pits outside the flood channel could provide opportunities for native fish species. It may be possible to look at reintroduction of native fish in the project area in refugia, growout ponds, and/or experimental sites.

Riparian habitat restoration and the removal of invader plant species could improve wildlife habitat by providing suitable conditions for desirable native plant species. Cottonwood/willow habitat is more valuable to wildlife than most other species of riparian habitat. With the establishment of this habitat type, migratory neotropical birds along with many other species of resident birds, mammals, reptiles and amphibians would be benefited. Data from riparian habitats and from revegetation experiments on the lower Colorado River indicated that if saltcedar habitats were cleared, they could be replaced with smaller numbers of honey mesquite, cottonwoods, and willows and still enhance the area for wildlife. The primary constraint for the existence of cottonwood/willow is the availability of water.

Restored habitat would most likely occur in the following proportions: 130 acres of mesquite upland, 99 acres of cottonwood/willow, 58 acres of wetland marsh, and 15 acres of aquatic strand. An additional 223 acres would remain as open space.

The construction of open water areas and the restoration of riparian habitat could result in significant recreational benefits by providing an increase in angling, nature photography, birdwatching, and other water-based activities.

DISCUSSION

Riparian and wetland ecosystems are important resources nationwide. They provide functions such as wildlife habitat and travel corridors for terrestrial and aquatic species including endangered species, neotropical migratory birds, shorebirds, herons and egrets, and waterfowl. They also provide water quality functions such as filtering and removal of nutrients or toxins, groundwater recharge, attenuation of flood flows, and sediment and streambank stabilization.

However, riparian and wetland ecosystems have been significantly degraded or destroyed by human activity and are reduced in extent and disappearing at an alarming rate. According to most estimates, over 90 percent of the native riparian areas along Arizona's major desert watercourses have been lost, altered or degraded as a result of man's activities. Riparian areas are now Arizona's most threatened natural communities. Nationally, 64 wildlife species presently listed as endangered and an additional 47 species being considered for listing are dependent on riparian habitats. AGFD estimates that 75 percent or more of all Arizona's native wildlife species depend on healthy riparian systems during some portion of their life cycle. In addition, riparian areas are critical to the survival of approximately 60 percent of the fish and wildlife species currently in jeopardy of extirpation from the State of Arizona. All of Arizona's 29 remaining native freshwater fish species depend entirely on streams, riparian areas and wetlands for their survival. Also, as many as 50 percent of bird species in Arizona are found primarily in riparian vegetation and may be dependent on those habitats. Portions of the Salt River that contain perennial flows provide important aquatic habitat and supports a diversity of wildlife, including federally listed endangered species. Riparian habitat should be afforded a high priority status in any land planning or management effort because of its importance to fish and wildlife for biological diversity and recreational activities.

The current operating schedule of upstream reservoirs in the study area are subject to periods of inundation and flood flows as well as periods without flows. Variations in flow rates, duration, and frequency of occurrence can have significant impacts on riparian and wetland habitats. Large releases have a scouring effect, leaving only vegetation that can withstand inundation and water erosional force. This oscillating flow regime also affects sediment load and channel configuration. A release schedule that closely mimics natural flow events could be beneficial for many riparian plant species. The establishment of a minimum instream flow would be especially beneficial in that it would serve as a constant source of water.

The Service considers the riparian and wetland ecosystem located along the Salt River to be unique within this ecoregion. Aggressive wildlife and vegetation management techniques designed to reverse past damage and minimize future degradation are necessary if these areas are expected to function as habitat for wildlife and as corridors for wildlife migration.

PRELIMINARY RECOMMENDATION

In order to ensure equal consideration for fish and wildlife resources, the Service recommends that alternatives which would maximize the preservation, enhancement, and development of wetland and riparian habitat be implemented.

The Service is available to assist you by providing more detailed information and recommendations as this study becomes more defined. We appreciate the opportunity to provide planning assistance in this study. If we can be of further assistance or you have any questions, please contact Ron McKinstry, or Don Metz.

Sincerely,

Frank M Baucom

Sam F. Spiller
for Acting Field Supervisor

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM (ES)
Director, Arizona Game and Fish Department, Phoenix, AZ
Chief, Planning Section, Corps of Engineers, Phoenix, AZ

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, CORPS OF ENGINEERS
P.O. BOX 532711
LOS ANGELES, CALIFORNIA 90053-2325

December 9, 1997

Office of the Chief
Environmental Resources Branch

Mr. Sam Spiller
U.S. Fish and Wildlife Service
Arizona Ecological Services Field Office
2321 West Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951

Dear Mr. Spiller:

This letter request concurrence from your office of our determination that our Rio Salado Ecosystem Project is "not likely to adversely affect" certain listed threatened and endangered species that potentially could occur in the study area. Our intent is to satisfy our requirements for Section 7 Consultation of the Endangered Species Act through the informal consultation process, as provided in 50 CFR 402.13.

On October 31, 1997, we requested a list of threatened, endangered or proposed species which may potentially occur in our Rio Salado Study Area. Your office responded in a letter dated November 14, 1997, with a list of species that could potentially occur in Maricopa County (your project no. 2-21-98-I-029). Also, you are probably well aware that we have been coordinating extensively with Mr. Ron McKinstry of your staff relative to Fish and Wildlife Coordination Act activities. We have recently received a Planning Aid Letter (PAL) (dated November 6, 1997) from your office on this project.

We intend that the enclosed Draft Environmental Impact Statement (DEIS) serve as a Biological Assessment to support our determination that this proposed project is "not likely to adversely affect" listed threatened or endangered species that could potentially occur in the area.

The boundaries of the study area were described in our October 31, 1997 letter; a detailed description of the proposed restoration action is provided in the DEIS (Section 2.1). As an ecosystem restoration project, the proposed action is to restore native riparian and wetland vegetation at two locations: the Phoenix Reach, a 5-mile-long reach of the Salt River within the City of Phoenix; and the Tempe Reach, which includes two small sections within the Salt River and one reach within Indian Bend Wash for a total length of approximately 2.5 miles within the City of Tempe. The proposed restoration action is expected to have significant beneficial impacts to native wildlife species and intended to provide some benefit to riparian- and wetland-dependant threatened, endangered and proposed species.

The species list provided in your November 14, 1997, letter listall threatened or endangered species that could occur in Maricopa County. Your PAL (provided as Appendix F of the DEIS), however, more correctly identifies species that are likely to be present in the Phoenix and Tempe Reaches identified as our study area (see Page 4 of the PAL). They are: the Yuma clapper rail (*Rallus longirostris yumanensis*), southwestern willow flycatcher (*Empidonax trillii extimus*), bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus anatum*), and the brown pelican (*Pelecanus occidentalis californicus*) (not identified in the species list letter).

As identified in the DEIS, the Phoenix and Tempe Reaches are essentially cobbly washes. The Phoenix Reach is an effluent-dominated water course with highly disturbed riparian vegetation occurring only at locations where wastewater effluent and nuisance water runoff are discharged into the channel. The Tempe Reach has no surface water and completely devoid of vegetation. Your PAL, we feel, correctly mentions that no habitat exist for clapper rails or willow flycatchers in the study area. As such, we feel (as stated in you PAL) that only the bald eagle, peregrine falcon, and the brown pelican have any reasonable possibility of occurring in the study area.

At best, however, the peregrine falcon or bald eagle may occasionally migrate or pass through the study area; the brown pelican may occasionally be forced up river by storm events. No habitat or nest sites for falcons or eagles occur in the study area (also see PAL page 4). Since these species may only occasionally migrate through the project area, we feel that they are "not likely to be adversely affected" by the proposed restoration action identified for the Phoenix and Tempe Reaches of the study area.

We have appreciated your continued assistance throughout the planning process relative to this project. We would appreciate a response from your office relative to our "not likely to adversely affect" determination as soon as possible. If you have any questions regarding this request or need any of the documents referenced, please contact Rey Farve of my staff at 213-452-3864.

Sincerely,

Robert S. Joe
Chief, Planning Division

Enclosure

United States Department of the Interior
Fish and Wildlife Service
Arizona Ecological Services Field Office
2321 W. Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
(602) 640-2720 Fax (602) 640-2730

In Reply Refer To:
AESO/SE
2-21-98-I-029
CCN 980285

January 6, 1998

Colonel Robert L. Davis
District Engineer
Army Corps of Engineers
P.O. Box 532711
Los Angeles, California 90053-2325

Dear Colonel Davis:

This letter responds to your December 9, 1997, request for our concurrence that the Rio Salado Ecosystem Project is "not likely to adversely affect" certain listed threatened and endangered species that potentially could occur in the study area. The Service provided the Corps with planning and technical assistance for this proposed project in a Planning Aid Letter on November 6, 1997.

The proposed project would be located on portions of the Salt River and Indian Bend Wash in the cities of Tempe and Phoenix, Maricopa County, Arizona. The project area is urbanized providing limited habitat for wildlife species. The lower Salt River is highly modified and receives flows only when upstream impoundments release flood water. Restoration efforts would include excavation of low flow channels, grading and reconfiguration of the river banks, removal of existing vegetation, soil preparation, and revegetation with native plant species. Water would be provided to the restored areas from underground wells.

The Corps has made a determination that the proposed project is not likely to adversely affect the Yuma clapper rail (*Rallus longirostris yumanensis*), southwestern willow flycatcher (*Empidonax traillii extimus*), bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus anatum*), and the brown pelican (*Pelecanus occidentalis californicus*).

A population of Yuma clapper rails occurs west of 91st Avenue below the proposed project area. No clapper rails are currently known to inhabit the proposed project area. The southwestern willow flycatcher is considered a rare migrant into the lower Salt River and suitable habitat for this species does not currently exist in the proposed project area. The bald eagle and peregrine falcon are not known to nest in the proposed project area and occur only as occasional migrants. The brown pelican is not a resident and is only seen in the project area when major storm events carry them to Arizona from the coast.

Potential effects to threatened and endangered species from the proposed project would either be insignificant or discountable and would not likely result in a take. The Service concurs with your determination that the proposed project is not likely to adversely affect listed species.

We appreciate your efforts to manage for threatened and endangered species. If you have any questions, please contact Mike Martinez.

Sincerely,

Sam F. Spiller
Field Supervisor

cc: Director, Arizona Game and Fish Department, Phoenix, AZ
Regional Director, Fish and Wildlife Service, Albuquerque, NM (ES)

United States Department of the Interior
Fish and Wildlife Service
Arizona Ecological Services Field Office
2321 W. Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
(602) 640-2720 Fax (602) 640-2730

In Reply Refer To:

AESO/FA

February 5, 1998

Colonel Robert L. Davis
District Engineer
Army Corps of Engineers
P.O. Box 532711
Los Angeles, California 90053-2325

Dear Colonel Davis:

Enclosed is our draft Fish and Wildlife Coordination Act report for the U.S. Army Corps of Engineer's Rio Salado Environmental Restoration Project located in Phoenix and Tempe, Maricopa County, Arizona. We would appreciate any comments you may have by February 23, 1998.

If you have any questions, please contact Ron McKinstry.

Sincerely,

Sam F. Spiller
Field Supervisor

Enclosure

United States Department of the Interior
Fish and Wildlife Service
Arizona Ecological Services Field Office
2321 W. Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
(602) 640-2720 Fax (602) 640-2730

In Reply Refer To:
AESO/FA

March 5, 1998

Colonel Robert L. Davis
District Engineer
Army Corps of Engineers
P.O. Box 532711
Los Angeles, California 90053-2325

Attn: CESPL-PD-RQ (Farve)

Dear Colonel Davis:

This report on the Rio Salado Feasibility Study (Study) addresses problems and opportunities for fish and wildlife resources in the project area. It was prepared under the authority of and in accordance with Section 2(b) of the Fish and Wildlife Coordination Act (FWCA)(48 stat. 401, as amended; 16 U.S.C. 661 et seq.). This report has been developed in coordination with the Arizona Game and Fish Department (AGFD).

DESCRIPTION OF PROJECT

The Rio Salado Environmental Restoration project would be located along the Salt River in Maricopa County, Arizona. The Phoenix Reach would consist of a 5 mile portion of the Salt River in the City of Phoenix and run from the Interstate-10 bridge downstream to the 19th Avenue bridge. The Tempe Reach would be located in the City of Tempe on portions of the Salt River and Indian Bend Wash. Town Lake, an artificial water body to be constructed by the City of Tempe as a separate project, would be immediately adjacent to the project in the Salt River.

The proposed project would include the Phoenix Reach within the City of Phoenix, and the Tempe Reach within the City of Tempe. The project would be constructed under authority of Senate Appropriations Bill H.R. 2445 and would undertake the environmental restoration of the two sites along the Salt River in the State of Arizona. The restoration would include reestablishment of flows and habitats within the two sites. Both cities plan to support these areas with water from groundwater aquifers.

Both reaches could provide opportunities for the restoration and enhancement of habitat for numerous fish and wildlife species including the endangered Yuma clapper rail and Southwestern willow flycatcher. Riparian and wetland areas could be restored or enhanced by the creation of open water areas, selective clearing of exotic saltcedar, and the planting of cottonwood and willow and other riparian plant species.

ALTERNATIVES

This section discusses project alternatives as described in the Preliminary Draft Environmental Impact Statement for Rio Salado Environmental Restoration Project (1997).

Phoenix Reach Proposed Action

The restoration of the Phoenix reach would involve construction of a 200 foot wide low-flow channel in the river bottom. Riparian habitat would be established in the river bottom and on the banks and overbanks of the river channel. Maintenance roads would be constructed on the benches and banks and also serve as recreational trails. Three park areas are planned for the overbank areas. Restoration of the Phoenix reach would include the creation of shallow pools in the low-flow channel connected by a perennial stream discharging at 5 cubic feet per second. This system of four pools and stream reach would cover a total length of about 2.5 miles from east of 16th street to west of 7th avenue. Total restored area would be 550 acres.

Phoenix Reach Alternative 1

This alternative would be similar to the proposed action except that it would incorporate the restoration of gravel pits and extend the perennial low-flow stream to length of 5 miles. This action would restore more riparian habitat on the river channel. However, no pools would be constructed along the streams length. Three gravel pits along the rivers edge are currently separated from the river channel by levees. These pits are excavated below the water table and the bottoms are filled with standing water. Under this alternative the levees would be lowered, the bank angles reduced, and riparian habitat would be restored along the edge of water. This alternative would demand more water than the proposed action.

Phoenix Reach Alternative 2

This alternative would incorporate restoration of the gravel pits, but would not include a stream reach or pools within the low-flow channel. This alternative would entail the restoration of mesquite habitat, freshwater marsh, and cottonwood/willow forest along the river bottom, banks, and overbanks. This would be the least water demanding alternative.

Tempe Reach Proposed Action

The restoration of the Tempe reach would consist of three areas: Indian Bend Wash between McKellips Road bridge and the confluence with the Salt River (1.3 mile), upstream Salt River between the upstream dam of Town Lake and grade control structure downstream of McClintock Road bridge (1,800 feet), and downstream Salt River immediately below the downstream dam of Town Lake (2,000 feet). This portion would be contingent on the construction of Town Lake. Indian Bend Wash would receive 80 acres of restoration including aquatic strand, mesquite habitat, and open space. The upstream Salt River area would have 30 acres restored with cottonwood/willow habitat, wetland marsh, and open space. The downstream Salt River area would receive restoration similar to the upstream Salt River area.

Tempe Reach Alternative 1
This alternative would include restoration of Indian Bend Wash, upstream Salt River, and downstream Salt River utilizing a habitat mix that would consume less water than the proposed action. This alternative would not include any cottonwood/willow, wetland marsh, or aquatic strand. All areas would either be restored with mesquite upland or left as open space.

Tempe Reach Alternative 2
This alternative would exclude restoration of the upstream Salt River segment. Indian Bend Wash and the downstream Salt River segment would be restored as described in the proposed action. This is considered to be a high water consumptive alternative.

Tempe Reach Alternative 3
This alternative would include only the restoration of Indian Bend Wash and exclude both reaches within the Salt River. This alternative would use a habitat mix that would be less water consumptive than the proposed action.

EXISTING ENVIRONMENT

The present surface flow of the Salt River within the project area is attributed to releases from upstream impoundments, effluent from water treatment facilities, agricultural return flows, and local storm events. This surface flow supports some riparian habitat and water obligate species. The river within the project area is essentially an ephemeral waterway that is dry most of the year, with the exception of periodic flows. The study area is characterized by three distinct habitat types: desert upland, riparian forest, and marsh.

The upland community is the predominant habitat on the higher bench areas within the flood plain. This community is characterized primarily by shrubs, annual and perennial herbs, and grasses. Shrubs include creosote, catclaw, bursage, desert broom, saltbush, brittle bush, and saltcedar. Wildlife species that can be found in the uplands include coyote, various rodents, a variety of reptiles, and avian species such as the red-tailed hawk, cactus wren, Gambel's quail, and curve-billed thrasher.

Reaches of the Salt River that receive perennial flows support a narrow riparian community. Within the Phoenix reach a 2-acre riparian area occurs just west of the I-10 bridge and is dominated by saltcedar, and desert broom. Although saltcedar is an invader and has formed dense groves covering extensive areas, it does provide wildlife habitat, especially for nesting doves. Riparian forests support a variety of wildlife species such as bats, skunks, raccoons, amphibians and reptiles; and a host of birds including hooded orioles, Abert's towhees, yellow and yellow-rumped warblers, red-winged blackbirds, Cooper's hawks, and various flycatchers.

Many of the bird species are neotropical migrants and depend extensively on riparian communities for feeding and nesting needs.

Marsh areas exist where surface water and suitable soil conditions are present. Vegetation includes cattails, bulrush, sedges, rushes and other emergent vegetation. A variety of amphibian and fish species and a host of avifauna such as rails, egrets, herons, shorebirds, and waterfowl are dependant upon this habitat type.

SPECIAL STATUS SPECIES

The Service is aware of five federally listed species that have been known to occur in the project area. These are the Yuma clapper rail (Rallus longirostris yumanensis), bald eagle (Haliaeetus leucocephalus), peregrine falcon (Falco peregrinus anatum), brown pelican (Pelecanus occidentalis), and Southwestern willow flycatcher (Empidonax traillii extimus).

The Yuma clapper rail is presently found west of 91st Avenue below the project area and the population is stable. Primary habitat for the Yuma clapper rail consists of mature cattail/bulrush stands situated in shallow water. They use marsh habitat for foraging, nesting, roosting, and loafing. Establishment of this habitat is essential for these rails to successfully breed and to exist in the area.

The bald eagle and peregrine falcon are migrants that are occasionally seen in the project area, there are no known nest sites in the project area. The brown pelican is occasionally "blown" up river from the coast by storm events but is not a permanent resident of the project area.

The Southwestern willow flycatcher is considered a rare migrant into the lower Salt River. Existing vegetative conditions does not provide suitable habitat for this species.

State sensitive species which may occur in the project area include lowland leopard frog (Rana yavapaiensis), belted kingfisher (Ceryle alcyon), great egret (Casmerodius albus), snowy egret (Egretta thula), osprey (Pandion haliaetus), American bittern (Botaurus lentiginosus), least bittern (Ixobrychus exilis), ferruginous pygmy owl (Glaucidium brasilianum), black-necked stilt (Himantopus mexicanus), black-crowned night heron (Nycticorax), and white-faced ibis (Plegadis chihi).

FUTURE WITHOUT PROJECT

The without project condition assumes that agricultural land will continue to be converted to urban development. Periodic releases from upstream reservoirs will likely continue to scour the Salt River and associated vegetation. However, these releases can create high soil moisture resulting in seed germination of desirable riparian species. Under these conditions it is likely that riparian habitat will return to pre-flood conditions. The loss of marsh habitat due to the scouring effects of the 1993 floods has affected those species dependent on and associated with those habitats. However, it is expected that new wetlands will develop over time in those areas where high soil moisture is maintained.

The City of Phoenix is presently investigating alternative methods of disposing effluent wastewater from the treatment plants at 23rd and 91st Avenues. One of the options is to suspend releases into the Salt River. This would adversely impact wetland and riparian habitats maintained by the flows. The cottonwood and willow would be more severely affected than saltcedar by the reduction in water flows.

The construction of Tempe Town Lake would provide open water habitat and could benefit fish and wildlife resources. If the lake was designed to promote the establishment of marsh vegetation, restoration may provide habitat for waterfowl, shorebirds, and wading birds, including the Yuma clapper rail. The construction of open water at the lake could provide opportunities for the creation of a fishery. Stocking of non-native fish species into the lake should consider potential impacts to special status native fish species.

FUTURE WITH PROJECT

Prior to modification of flows in the Salt River, a variety of native fish were likely common in what is now the metropolitan area. Sonora sucker, desert sucker, roundtail chub, longfin dace, and speckled dace were likely common. Also, federally listed species that were probably found in the lower Salt River include: razorback sucker, Colorado squawfish, spikedace, woundfin, loach minnow and Gila topminnow. Creating open water areas in abandoned gravel pits outside the flood channel could provide opportunities for native fish species. It may be possible to look at reintroduction of native fish in the project area in refugia, growout ponds, and/or experimental sites.

Riparian habitat restoration and the removal of invader plant species could improve wildlife habitat by providing suitable conditions for desirable native plant species. Cottonwood/willow habitat is more valuable to wildlife than most other species of riparian habitat. With the establishment of this habitat type, migratory neotropical birds along with many other species of resident birds, mammals, reptiles and amphibians would be benefited. Data from riparian habitats and from revegetation experiments on the lower Colorado River indicated that if saltcedar habitats were cleared, they could be replaced with smaller numbers of honey mesquite, cottonwoods, and willows and still enhance the area for wildlife. The primary constraint for the existence of cottonwood/willow is the availability of water.

Restored habitat would most likely occur in the following proportions: 130 acres of mesquite upland, 99 acres of cottonwood/willow, 58 acres of wetland marsh, and 15 acres of aquatic strand. An additional 223 acres would remain as open space.

The construction of open water areas and the restoration of riparian habitat could result in significant recreational benefits by providing an increase in nature photography, birdwatching, and other outdoor activities.

DISCUSSION

Riparian and wetland ecosystems are important resources nationwide. They provide functions such as wildlife habitat and travel corridors for terrestrial and aquatic species including endangered species, neotropical migratory birds, shorebirds, herons and egrets, and waterfowl. They also provide water quality functions such as filtering and removal of nutrients or toxins, groundwater recharge, attenuation of flood flows, and sediment and streambank stabilization. However, riparian and wetland ecosystems have been significantly degraded or destroyed by human activity and are reduced in extent and disappearing at an alarming rate. According to many estimates, over 90 percent of the native riparian areas along Arizona's major desert watercourses have been lost, altered or degraded as a result of man's activities (Lofgren et al 1990). Riparian areas are now Arizona's most threatened natural communities. Nationally 64 wildlife species presently listed as endangered and an additional 47 species being considered for listing are dependent on riparian habitats. AGFD estimates that 75 percent or more of all Arizona's native wildlife species depend on healthy riparian systems during some portion of their life cycle. In addition, riparian areas are critical to the survival of approximately 60 percent of the fish and wildlife species currently in jeopardy of extirpation from the state of Arizona. All of Arizona's 29 remaining native freshwater fish species depend entirely on streams, riparian areas and wetlands for their survival. Also, as many as 50 percent of bird species in Arizona are found primarily in riparian vegetation and may be dependent on those habitats. Portions of the Salt River that contain perennial flows provide important aquatic habitat and support a diversity of wildlife, including federally listed endangered species. Riparian habitat should be afforded a high priority status in any land planning or management effort because of its importance to fish and wildlife for biological diversity and recreational activities.

The current operating schedule of upstream reservoirs in the study area are subject to periods of inundation and flood flows as well as periods without flows. Variations in flow rates, duration, and frequency of occurrence can have significant impacts on riparian and wetland habitats. Large releases have a scouring effect, leaving only vegetation that can withstand inundation and water erosional force. This oscillating flow regime also affects sediment load and channel configuration. A release schedule that closely mimics natural flow events could be beneficial for many riparian plant species. The establishment of a minimum instream flow would be especially beneficial in that it would serve as a constant source of water.

The Service considers the riparian and wetland ecosystem located along the Salt River to be unique within this ecoregion. Aggressive wildlife and vegetation management techniques designed to reverse past damage and minimize future degradation are necessary if these areas are expected to function as habitat for wildlife and as corridors for wildlife migration.

RECOMMENDATIONS

In order to ensure equal consideration for fish and wildlife resources, the Service recommends that alternatives which would maximize the preservation, enhancement, and development of wetland and riparian habitat be implemented.

We appreciate the opportunity to provide planning assistance in this study. If we can be of further assistance or you have any questions, please contact Ron McKinstry, or Don Metz.

Sincerely,

Jennifer Fowler-Propst
Acting Field Supervisor

cc: Director, Arizona Game and Fish Department, Phoenix, AZ
Chief, Planning Section, Corps of Engineers, Phoenix, AZ
Rio Salado Senior Planner, City of Tempe, AZ
Deputy Planning Director, City of Phoenix, AZ

Literature Cited

Lofgren, Sue, D. Cline, J. Creedon, L.D. Fellows, M.J. Hassell, M.E. Leyva, N.W. Plummer, D.L. Shroufe, K.E Travous, R. Wood, and N. Evans. 1990. Final Report and Recommendations of the Governor's Riparian Habitat Task Force. Executive Order 89-16, Streams and Riparian Resources. Submitted to the Honorable Rose Mofford, Governor of the State of Arizona.

APPENDIX G

Monitoring and Adaptive Management Plan

APPENDIX G. RIO SALADO ENVIRONMENTAL RESTORATION MONITORING AND ADAPTIVE MANAGEMENT PLAN

1. INTRODUCTION

The purpose of this Monitoring and Adaptive Management Plan is to provide a mechanism to evaluate the effectiveness of the restoration measures implemented in this project and implement adaptive changes, if required to obtain project objectives. As outlined in EC 1105-2-210 (parag., 21.b.), the Monitoring Plan is intended to ascertain whether: 1) the project was designed and constructed in accordance with technical specifications; 2) the project is functioning as per project objectives; 3) adjustments for unforseen circumstances are needed; and 4) changes to structures or their operation or management techniques are required. (Also see Pastork et al. 1997; Thom and Wellman 1996; and Yozzo et al. 1996).

This Monitoring and Adaptive Management Plan provides a description of: the habitats to be restored, the density and composition of the plantings to restore habitat, surveys to monitor the expected, natural re-introduction of native fish and wildlife into the restore habitats, the performance criteria and monitoring protocol to evaluate success of the restoration effort, adaptive management actions (or maintenance activities) that may be performed to ensure a successful restoration effort, and reporting requirements.

This Monitoring and Adaptive Management Plan covers monitoring and adaptive management actions during the first 5 years after initial construction. The monitoring and adaptive management actions described herein, are intended to be cost-shared as an authorized project feature. After the first 5 years, monitoring and/or adaptive management becomes the responsibility of the non-Federal Sponsor at a 100% non-Federal cost.

(Note that during the preconstruction engineering and design [PED] phase, more specific monitoring details [e.g., exact monitoring transect locations, reference site locations, more specific performance/success criteria, more specific monitoring protocols, etc...] may be added to this Monitoring and Adaptive Management Plan.)

2. GOALS AND OBJECTIVES

As stated in the EIS (Section 1.1) the primary objective of the proposed project is to restore natural habitat that was historically associated with the Salt River floodplain. Through several meetings with the Arizona Department of Game & Fish and the U.S. Fish and Wildlife Service, a consensus was reached that the goal of this restoration effort should be to restore the project area with riparian vegetation that would naturally be expected to occur in a Sonoran desert riparian ecosystem. It was agreed that a natural channel would meander and naturally be dominated with freshwater aquatic strand-type vegetation (see Minckley and Brown [1982:265]); the first terrace or bench (i.e., the immediate floodplain) would naturally be dominated by willows and cottonwoods; the upper terraces or "secondary" floodplain would be, under natural conditions, dominated by the mesquite "*bosque*" (or woodland) (see Minckley and Brown [1982:249 and 269]). These habitat types, in the appropriate locations along the Salt River and Indian Bend Wash, constitute the restoration effort. The general distribution of habitat types appears on Plates 6-1 through 6-7 of the Main Report.

The goal of this effort is to restore riparian vegetation typical of the Sonoran desert to obtain habitat values for native fish and wildlife consistent with those predicted in the Habitat Valuation Analysis (Appendix C). It is expected that Mesquite Habitat will have a value similar to average quality mesquite habitat. The quality of restored Cottonwood/Willow Habitat and Wetland Marsh Habitat is expected to be of above-average quality. Open Edges and the seral, Aquatic Strand vegetation is expected to have only limited habitat value.

It is also expected that the restored habitat will be suitable for native wildlife. The quality of the habitats (i.e., low medium or high) is expected to dictate the abundance or density of wildlife.

3. RESTORED HABITATS

3.1 MESQUITE

To restore mesquite habitat, velvet mesquite trees (*Prosopis velutina*) will be planted on the upper terraces (overbank and bank - see Fig. 2-5 of DEIS) at a density of 100 plants/acre. Understory plants of the Mesquite Habitat will include elderberry (*Sambucus mexicana*), greythorn (*Zizphus obtusifolia* var. *canescens*), and wolfberry (*Lyceum fremontii*) in approximately equal composition and planted in distributions that the plants would occur in under natural conditions.

3.2 COTTONWOOD/WILLOW HABITAT

The cottonwood/willow habitat-type would be dominated by Fremont cottonwood (*Populus fremontii*) and Goodding willow (*Salix gooddingii*) and planted primarily on the first terrace (i.e., the benches and bank - Fig. 2-5) at densities of 50 plants/acre. The understory would consist of desert broom (*Baccharis sarothroides*), elderberry and other native understory plants. Desert broom is expected to make up at least 50% of the species composition.

3.3 WETLAND MARSH

The wetland marsh of the Phoenix Reach would be primarily on the first terrace (or bench) and consist of plantings of cattail (*Typha* sp.) and giant bulrush (*Scirpus californicus*). Also, 9 acres of wetland habitat is expected to be associated with a series of pools established in the low-flow channel. In the Tempe Reach, the wetland marsh would be in the channel upstream and downstream of Tempe Town Lake. A wide variety of submergent and emergent marshland vegetation is expected to become opportunistically established in and around the marsh.

3.4 AQUATIC STRAND

Aquatic strand vegetation is expected to develop opportunistically along the low-flow channel of the permanent stream. The vegetation of these harsh environments are made up of short-lived successional species that are adapted to periodic flooding, scouring, and soil deposition. Seedlings of cottonwood and willow, desert broom plants, and a variety of annuals, biennials, and short-lived perennials are expected to comprise this habitat type.

3.5 HABITATS DAMAGED BY FLOOD EVENTS

Since only the Mesquite Habitat is on the overbanks are located outside of the 100-year flood zone, and the low flow channel is designed to contain only the frequent (typically less than 5-year) events, most planted areas have the potential to be impacted by long periods of flood inundation and subject to be uprooted during significant high flows -- as would any natural riparian ecosystem. (Note that this restoration effort assumes that, annually, between 8-11 percent of the vegetation planted would be damaged (and need to be replaced) during the life of the project [see Main Report, Section VI, C]). Monitoring protocols defined below will assist in determining whether replanting of the various habitats are needed following flood events.

4. MONITORING FREQUENCY AND MAINTENANCE PROTOCOL

4.1 VEGETATION (HABITAT) MONITORING

4.1.1 Mesquite Habitat

For the first 6 months after planting the site, it would be monitored monthly; thereafter, the site would be monitored every other month for a year. The site will remain free of all non-native shrubs throughout this 18 month period. Should the survival rate of plantings indicate that the species composition is less than prescribed, replanting will be undertaken to ensure that the species composition is maintained.

All plantings shall have a minimum of 80% survival the first year and 100% survival the second and third years and/or attain 40% cover after 5 years. Ninety percent cover is expected of Mesquite Habitat in the overbanks after 10 years. There will be zero tolerance of exotic shrubs the first 5 years. If the survival and cover requirements are not met during the initial 5 years, the Corps is responsible for replacement planting to achieve these requirements. (Note that the replacement planting cost would be a cost-shared project cost for the first 5 years.)

After 5 years, the non-Federal Sponsors (City of Tempe and City of Phoenix, as appropriate) will be responsible for maintaining the restoration sites for the remaining life of the project. The species composition shall be maintained throughout the life of the project. Site monitoring would be performed yearly throughout the life of the project (also see Section 4, below).

Vegetation Damaged by Floods. The Mesquite Habitat on the overbank is outside of the 100-year flood event and not expected to be impacted by flood flows; Mesquite Habitat on the banks is only expected to be affected by the larger flood events (i.e., 20- and 50-year events). After the larger events, the Mesquite Habitat sites will be evaluated to determine the extent of the damage to the site and a determination would be made on the extent of the re-vegetation effort. (Note that under natural conditions, velvet mesquite woodlands depend on large floods to disperse seeds in the upper terraces, and late summer rains to inundate germination sites [cf. Stromberg et al. 1991]).

4.1.2 Cottonwood/Willow Habitat

The survival rate, percent cover, and monitoring frequency outlined for Mesquite Habitat (Section 4.1.1, above) would be used for monitoring riparian plantings. As with the Mesquite Habitat restoration site, the non-Federal Sponsors would take over monitoring responsibilities of the site after 5 years. Monitoring would be performed yearly on the site throughout the life of the project (see Section 4, below).

Vegetation Damaged by Floods. All but 20 acres of the 199 acres of Cottonwood/Willow Habitat will be planted in the flood-prone lower terraces. As such, it is expected to be regularly affected by flooding events (as typical of natural cottonwood/willow habitats). As with Mesquite Habitat sites, Cottonwood/Willow sites will be evaluated after large storm events to determine the need for revegetation.

4.1.3 Wetland Marsh

The monitoring frequency outlined for Mesquite Habitat and Cottonwood/Willow restoration sites would be followed for Wetland Marsh sites. Although some planting of marsh vegetation will occur, most wetland vegetation is expected to establish naturally around the permanent source of open water. Maintaining this constant source of open water will be crucial to the success of the restoration of this habitat type. As such, the conveyance system of ditches, canals, and pipes will be inspected during vegetation monitoring to ensure a consistent supply of water to the wetlands.

4.1.4 Aquatic Strand

As this habitat is expected to establish opportunistically near the permanent stream, no specific monitoring is planned. The condition of the low-flow channel and the system to convey water to the channel to establish the permanent stream, however, will be inspected (as proposed for the wetland habitat) to ensure the establishment of the stream. (If the stream can be maintained, aquatic strand vegetation is expected to be associated with it.)

4.2 Wildlife Monitoring

Restored habitats are expected to support native wildlife; the high quality wetland marsh and cottonwood/willow habitats are expected to support the diverse assemblage of wildlife that are associated with these habitat types. Monitoring of wildlife numbers is proposed to assess whether habitats actually attract and support native wildlife, as expected. Since open edges and aquatic strand habitat types are expected to provide only limited habitat value, no wildlife monitoring is proposed for these habitat types.

4.2.1 Water Quality and Aquatic Invertebrate Monitoring

Aquatic invertebrate surveys will be used primarily as indicators of the quality of the water in the permanent stream and the wetland marshes. (Note that data from groundwater well monitoring will also be used to document the quality of water being used for permanent stream and wetland marshes.)

Permanent Stream. Aquatic invertebrates will be sampled throughout the length of the permanent stream at various locations (in riffle/runs and in pools) during late spring and late summer for the first 5 years after initial construction. Water quality measurements (at least, Total Dissolved Solids, pH, turbidity, Oxygen and temperature) will also be taken at the time of sampling. The documented evidence of the abundance and diversity of aquatic insects will be used to verify quality of water in the permanent stream and the health of the stream environment.

Wetland Marsh. Aquatic insects surveys and water quality measurements of the wetland marshes will also be conducted during late spring and late summer for the first 5 years after initial construction. As with the permanent stream monitoring, aquatic surveys will be used to verify the quality of water in the marshes and the health of the marsh's aquatic environment.

4.2.2 Wildlife Monitoring

Riparian Birds. Bird surveys will be performed in both the restored cottonwood/willow and mesquite bosque habitat types during each of the four seasons for the first 5 years following construction. The abundance/ diversity of bird species will be used as an indicator of whether wildlife habitat has developed as predicted and supporting a diverse assemblage of native avifauna.

Small Mammals. Small mammal trapping (live or snap) will be conducted during the summer for the first five years to document the diverse species expected to re-colonize restored habitats.

Wetland Birds. Bird surveys will be preformed as described for riparian birds.

5. SUCCESS CRITERIA, REPORTING & ADAPTIVE MANAGEMENT

5.1 SUCCESS CRITERIA

The success or failure of the restoration effort will be measured against two parameters which should indicate whether the goal of this restoration effort is being achieved, they are: 1) whether the plant species compositions and/or percent cover requirements outlined for the various habitat types are met, and 2) whether native fish and wildlife re-colonize the restored habitats. (The ability of the restoration sites to naturally regenerate will also be considered as a key criterion indicating that the site has been successfully restored.)

Monitoring will occur as identified in Section 4, above; Monitoring Reports would be prepared at the end of the year by the Corps/non-Federal Sponsor for the first 5 years after initial construction. The need to make adjustments to the constructed project will be based on the results of the Monitoring Reports. If the restored habitats achieve the plant species composition identified and achieve the diversity of native wildlife expected, no modifications will be made.

5.2 Monitoring Reports and Adaptive Management

Technical Committee. The Corps and/or the non-Federal Sponsor will be responsible for collecting monitoring data and preparing annual Monitoring Reports. A Technical Committee consisting of, at least, U.S. Fish and Wildlife Service, Arizona Department of Game and Fish, and the local Audubon Society, may assist in collection of monitoring data, review monitoring data results, and providing recommendations of possible adaptive management measures.

The Technical Committee will recommend adaptive management measures to the existing project's design should either wildlife habitat or wildlife abundance/diversity not achieve the identified goal and objectives. If designed vegetation species composition are not achieved: replanting, additional irrigation, and/or removal of vegetation (especially exotics) may be necessary. (Note that the use of herbicides should only be used if more natural options are unsuccessful.)

Should aquatic invertebrate surveys indicate that the permanent stream or wetland marshes are providing poor aquatic habitat, adjustments to the water quantity and/or quality may need to be made. This could include a re-design or modification of the water delivery system, decrease or increase of watering frequency or duration, measures to improve water quality, or construction modifications of the stream channel or the wetland.

Should wildlife (bird and small mammal) surveys indicate that the restored habitats are not attracting or supporting the abundance and diversity of species expected, adjustments to the prescribed vegetation species composition or modification of the vegetative structure (i.e., overstory and understory layers) may be necessary. This could include vegetation manipulative measures mentioned earlier (e.g., removal, replanting, etc...) or include placing brush piles in the project area.

Executive Committee. Annual Monitoring Reports and any adaptive management measures recommended by the Technical Committee will be forwarded to an Executive Committee which will consist of, at least, a representative of the City of Phoenix, the City of Tempe, and the U.S. Army Corps of Engineers. The Executive Committee will decide how to implement adaptive management measures recommended by the Technical Committee.

6. REFERENCES

Minckley, W.L. and D.E. Brown. 1982. Part 6. Wetlands. *In.* Brown, D.E. (ed.) Biotic Communities of the American Southwest - United States and Mexico. Special Issue of Desert Plants. Volume 4. Published by the University of Arizona for the Boyce Thompson Southwestern Arboretum.

Pastorok, R.A., A. MacDonald, J.R. Sampson, P. Wilber, D.J. Yozoo, and J.P. Titre. 1997. An ecological decision framework for environmental restoration projects. Ecol. Engin. 9:89-107.

Stromberg, J.C., D.T. Patten, and B.D. Richter. 1991. Flood flows and dynamics of Sonoran riparian forest. Rivers 2:221-235.

Thom, R.M. and K.F. Wellman. 1996. Planning aquatic ecosystem restoration monitoring programs. Evaluation of Environmental Investments Research Program. IWR Report 96-R-23.

Yozzo, D., J. Titre, and J. Sexton. (eds.). 1996. Planning and evaluating restoration of aquatic habitats from an ecological perspective. IWR report 96-EL-4. WES, Prepared for Institute for Water Resources. USACE, Alexandria, Virginia, and WES, Vicksburg, Mississippi.

APPENDIX H

Comment Letters on the Draft Feasibility Report and Draft Environmental Impact Statement

Responses to Comment Letters

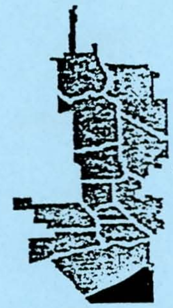
APPENDIX H. COMMENT LETTERS AND RESPONSES

COMMENT LETTERS ON THE RIO SALADO DRAFT FEASIBILITY REPORT AND DRAFT ENVIRONMENTAL IMPACT STATEMENT AND RESPONSES TO COMMENTS

The following agencies, organizations, and individuals submitted comment letters on the Rio Salado Draft Feasibility Report and Draft Environmental Impact Statement (EIS) during the public comment period. The comments within each letter have been numbered and responses have been prepared for each comment. The letters are presented in the order listed below, with responses following immediately after each letter.

Set No.	Commentor
1.	Ahwatukee Foothills Village Planning Committee
2.	Alhambra Village Planning Committee
3.	Arizona Department of Health Services, Bureau of Epidemiology and Disease Control Services
4.	Central City Village Planning Committee
5.	Congress of the United States, House of Representatives
6.	Desert View Village Planning Committee
7.	Don't Waste Arizona, Inc.
8.	Encanto Village Planning Committee
9.	Maricopa Audubon Society (Letter dated January 8, 1998)
10.	Maricopa Audubon Society (Letter dated January 25, 1998)
11.	Maricopa Audubon Society, Urban Habitat Committee
12.	Maricopa County Environmental Services Department, Vector Control Office
13.	Maricopa County Flood Control District
14.	Maryvale Village Planning Committee
15.	Janice Miano
16.	North Mountain Village Planning Committee
17.	Ed Pastor, Member of Congress
18.	City of Phoenix, Parks and Recreation Board
19.	City of Phoenix, Planning Commission
20.	Phoenix Enterprise Community Steering Committee
21.	Leo and Lu Rendon
22.	Matt Salmon, Member of Congress
23.	Salt River Project
24.	South Mountain Village Planning Committee
25.	Bob Stump, Member of Congress
26.	Donald R. Taylor
27.	Toxic Waste Investigative Group
28.	U.S. Department of the Interior, Bureau of Reclamation
29.	U.S. Department of the Interior, Office of the Secretary
30.	U.S. Environmental Protection Agency, Region IX

Ahwatukee Foothills
VILLAGE PLANNING COMMITTEE



Comment Set 1

January 7, 1998

Dear Mr. Atonna:

This letter is written in support of the Rio Salado Habitat Restoration Project presented at our Village Planning Committee meeting on October 27, 1997.

The committee voted its support for the project, which if approved, would remediate the area by restoring the unique desert riparian environment that was lost from the Salt River corridor through the Phoenix area. We understand that banks on the north and south sides of the river bed, would eventually be accessible to the public for hiking, biking, and equestrian activities. It is also our understanding that the riverbed will provide some flood capacity and stream flow.

The Ahwatukee Foothills Village Planning Committee voted to fully support this project. If the committee could be of any further assistance, please feel free to contact me.

Sincerely,

Don Keuth

Chairman of the Ahwatukee Foothills
Village Planning Committee

Comment Set 1: Ahwatukee Foothills Village Planning Committee (January 7, 1998)

Comment noted.

Alhambra

VILLAGE PLANNING COMMITTEE

December 31, 1997

Comment Set 2

Dear Mr. Atonna:

Re: Rio Salado Habitat Restoration Project

Please accept this letter as support for the above referenced project being submitted for implementation.

If this project is accepted, the Rio Salado area will turn into a greenbelt to preserving fish and wildlife habitat. The Alhambra Village sees this project as a great benefit to over a million people annually who will walk through Rio Salado area for recreation, cultural experiences, nature and wildlife explorations.

The Alhambra Village Planning Committee has voted to support the Rio Salado Habitat Restoration Project proposals and hopes for a positive response in the funding process. Please feel welcome to contact me if further comments are needed.

Sincerely,

Lyn Shipp

Lyn Shipp
Chairperson

c:\word5\crr\deshal1

Comment Set 2: Alhambra Village Planning Committee (December 31, 1997)

Comment noted.

Arizona Department of Health Services

Bureau of Epidemiology and Disease Control Services
Office of Infectious Disease Services
Vector-Borne and Zoonotic Disease Section
3815 North Black Canyon Highway
Phoenix, Arizona 85015-5351
(602) 230-5866
(602) 230-5818 FAX

FIFE SYMINGTON, GOVERNOR
JAMES B. GRIFFITH, ACTING DIRECTOR

Comment Set 3

January 16, 1998

Alex Watt
U.S. Army Corps of Engineers
Los Angeles District
Environmental Resources Branch
P.O. Box 532711
Los Angeles, California 90053-2325

Dear Mr. Watt:

I recently had a chance to review the November 1997 draft of the Rio Salado Feasibility Report and the Environmental Impact Statement, and I would like to take this opportunity to comment on some aspects of the report. I was favorably impressed with the overall quality and caliber of the report and the magnitude and complexity of the project.

The report outlines various alternatives to create a variety of habitats for wildlife, including mesquite bosks, cottonwood willow zones, open edge zones, etc. My area of expertise is in biology and vector-borne diseases and thus, I took this opportunity to carefully review the proposed project in terms of potential emergence of vector-borne diseases associated with mosquitoes. Proposed lakes and ponds along the Salt River should not contribute significantly to mosquito breeding, nor should other proposed habitats, such as cottonwood/willow, mesquite bosk, open edge, etc. The shallow water wetlands, on the other hand, raise concerns due to its inherent mosquito breeding potential. Most of the proposals (P2-9 and T4 and T5) include plans for developing shallow water wetlands, including up to 100 acres for the Phoenix Reach and up to 16 acres for the Tempe Reach of the Salt River Bed. **1**

As you well know, wetlands/marshes often provide optimal conditions for mosquitoes, including those known to be competent vectors of disease. Any increase in vector population is likely to pose a public health threat to nearby communities. Thus, it is critical that the proper steps be taken during the design phase to minimize the risk of such a threat. Outlined below are some areas of the proposal which I view as potential problems. Possible corrective solutions are also included.

Shallow water habitats with emergent vegetation (such as the proposed wetlands) provide ideal breeding environments for mosquitoes such as *Anopheles* and *Culex* species. The latter, especially *Culex tarsalis*, are competent vectors for mosquito-borne encephalitis viruses, including those responsible for St. Louis Encephalitis (SLE) and Western Equine Encephalitis (WEE).

Both of these viruses are pathogenic to humans and their presence in Maricopa County has been detected through annual arbovirus mosquito surveillance. The WEE virus is also pathogenic to horses. Additionally, wetlands provide a habitat for a variety of birds (as intended), which are the primary reservoirs for the encephalitis viruses. Mosquitoes tend to acquire the virus from feeding on infected birds; these mosquitoes then become infective for life. Thus, wetlands can provide optimal conditions for both the virus reservoirs (*i.e.,* wild birds) and disease vectors (*i.e.,* mosquitoes). Lastly, presence of WEE and/or SLE positive mosquitoes in the area would pose a threat to persons living in the heavily populated communities nearby (Phoenix and Tempe) or to persons visiting the area.

As you are aware, such problems were created by another nearby demonstration project in southwest Phoenix which presently consists of only eight acres of wetlands habitat (*i.e.,* shallow water with emergent bulrushes). Mosquito eating fish (*Gambusia affinis*) were stocked to provide natural control, however, the bulrushes grew so dense that they blocked fish access into shallow water areas. As a result, the mosquito population exploded. Mosquito monitoring efforts by county, city and state officials often yielded 500 to 800 *Culex* mosquitoes per trap night, with some traps exceeding 10,000 mosquitoes per trap night. Collections of 20 or more mosquitoes per trap night are considered a public health risk requiring corrective action by health officials. SLE virus was isolated in mosquitoes collected in the demonstration project area in 1996, and WEE virus was isolated in mosquitoes collected in the vicinity of these wetlands (Salt River bed) in 1997. County and city officials have applied pesticides (both larvicides and adulticides) on multiple occasions to abate the problem, and yet, the mosquito problem has not been corrected satisfactorily. Thus, the concern over some of the plans outlined in the Rio Salado Report, for similar wetlands. The proposed wetlands area for the Rio Salado Project is estimated to be 14 times larger than the size of the demonstration project above. 1

For the reasons given above, it is imperative that aquatic habitats associated with the Rio Salado Project be designed to minimize the risk of infective mosquitoes in the area. In general, mosquitoes do not breed in deeper, open water. Permanent water conditions that will minimize mosquito breeding include: (1) deeper water - over 3 feet of water to prevent the growth of emergent vegetation; (2) steeper banks - 45 degrees or steeper, again to minimize growth of emergent vegetation; and (3) large water surface area to allow for wave action to occur with slight breezes.

If shallow water habitats with emergent vegetation are essential to the project, then they should be minimized in acreage as much as possible, and must be designed so as to prevent mosquito breeding. This may be accomplished by interspersing bulrush (or other emergent vegetation zones) with abundant deeper water channels so as to allow free movement of natural larvae predators, such as mosquito fish. The emergent vegetation must be managed so as to prevent it from growing too dense. Other options might include designing wetlands that are mostly subsurface, and/or allow for water level managment so that water can be drained down frequently to prevent water from standing too long. During the summer, water would have to be drawn down weekly in order to interupt the *Culex* mosquito breeding cycle.

Another area of concern, is the provision for the Environmental Commitment B-8 [page 4.5-4 of the Environmental Impact Statement (EIS)]) to be implemented should mosquitoes become a problem. Provisions under this plan will only allow for the use/introduction of native predators (such as water strider, giant water bugs, etc.) but not pesticides. Commitment B-8 may be appropriate for marshlands and other habitats that are far removed from populated areas, but is too restrictive for marshlands in the middle of Phoenix and Tempe. Natural predators can help reduce mosquito populations, but are often inadequate to control significant mosquito problems such as those seen at the demonstration project mentioned above. As natural predators go, mosquito fish (*Gambusia affinis*) tend to do an excellent job of controlling mosquito larvae in water habitats that are accessible to them. Unfortunately, this species is not native to Arizona, and comments outlined on page 4.5-4 of the EIS would suggest that this excellent predator would not be used in the water habitats of Rio Salado. In my opinion, relying on natural predators to control mosquitoes (without the options of using mosquito fish or pesticides) would not be sufficient to control the mosquito population. **1**

As stated before, the Rio Salado Project is likely to bring major benefits to people and wildlife in the area, and with careful planning and proper habitat design the various goals of the project can be accomplished without posing a public health threat to people in the area. I would be more than willing to provide future input pertaining to mosquito prevention. Please feel free to contact me at (602) 230-5918.

Sincerely,

Craig Levy
Program Manager
Vector-Borne & Zoonotic Diseases Section

Comment Set 3: Arizona Department of Health Services, Bureau of Epidemiology and Disease Control Services (January 16, 1998)

1. Thank you for your input into the design of the proposed wetlands habitat. We understand and appreciate the health concerns associated with mosquito breeding in the water bodies of the habitat area. Your recommendations will be given serious consideration in the design of the project's water bodies and associated habitat. In addition, the Cities of Tempe and Phoenix will need to work with County and State public health agencies on a continuing basis to formulate and implement appropriate methods of mosquito control, as warranted.

   The wording of Environmental Commitment B-8 has been modified so as *not* to preclude the use of chemical pesticides or the introduction of mosquitofish to control breeding (please see the response to Comment Set 12: Maricopa County Environmental Services Department).

Central City

VILLAGE PLANNING COMMITTEE

January 12, 1998

Comment Set 4

Peter Atonna
Deputy Planning Director
Phoenix Planning Department
200 W. Washington St., 6th Fl.
Phoenix, AZ 85003-1611

Dear Mr. Atonna:

The Central City Village Planning Committee has voted unanimously to support the Rio Salado Habitat Restoration Project. We represent the area of Phoenix immediately adjacent to and north of the Rio Salado. We believe the project could be a tremendous benefit to our area as well as all of Phoenix.

Please accept this letter as our enthusiastic support for the proposed project.

Let me know if I can provide any further information or assistance.

Sincerely,

Jesse Carpenter, Chair
Central City Village Planning Committee

crr:\c:\cc\forms\011298a

Comment Set 4: Central City Village Planning Committee (January 12, 1998)

Comment noted.

Comment Set 5

J. D. HAYWORTH
5TH DISTRICT, ARIZONA

[illegible]NGTON OFFICE:
1[illegible]WORTH BUILDING
WASHINGTON, DC 20515
(202) 225-2190

ARIZONA OFFICES:
1017 S. GILBERT ROAD
SUITE 203
MESA, AZ 85204
(602) 926-4151
1-800-874-0457

1300 SOUTH MILTON
SUITE 207
FLAGSTAFF, AZ 86001
(520) 556-8760

Congress of the United States
House of Representatives
Washington, DC 20515–0306

COMMITTEES:
WAYS AND MEANS
SUBCOMMITTEES:
HUMAN RESOURCES
SOCIAL SECURITY

VETERANS' AFFAIRS
SUBCOMMITTEE:
BENEFITS
VICE CHAIR

ASSISTANT MAJORITY WHIP

January 27, 1998

Colonel Robert Davis
District Engineer
PO Box 532711
Los Angeles, CA 90053-2352

Dear Colonel Davis:

This letter is a response to your request for comments on the proposal to restore wetlands along the Salt River in Phoenix and Tempe, Arizona.

The undersigned Members of Congress strongly urge you to proceed with this project. The Sonoran Desert and the Salt-Gila watershed have lost approximately 90 percent of their historic wetlands due, at least in part, to water engineering projects of the federal government. The Rio Salado project would help restore a portion of the valuable lost habitat along the dry river bed of the Salt River. This is entirely consistent with the direction Congress has embraced for the Corps of Engineers in provisions of the Water Resources Development Acts over the past ten years.

In addition to the obvious direct national environmental benefits from this effort, the project is expected to act as a catalyst for community development in the areas surrounding the project. This is in the true spirit of congressional and Administration efforts to provide new direction for the Corps of Engineers Water Resources Development program.

We look forward to a favorable report to Congress for consideration in the anticipated Water Resources Development Act of 1998.

Sincerely,

Bob Stump
Member of Congress

Jim Kolbe
Member of Congress

Colonel Davis
Page 2
January 27, 1998

Ed Pastor
Member of Congress

J.D. Hayworth
Member of Congress

Matt Salmon
Member of Congress

Comment Set 5: Congress of the United States, House of Representatives (January 27, 1998)

Comment noted.

Comment Set 6

DESERT VIEW VILLAGE

VILLAGE PLANNING COMMITTEE

Post Office Box 607
Cave Creek, AZ 85327
January 20,1998

Mayor Skip Rimsza
Phoenix City Council
200 West Washington
Phoenix, AZ 85003

Re: Rio Salado Project Plan

Dear Mayor Rimsza,

On January 6th, 1998, at the regularly scheduled meeting of the Desert View Planning Committee, the Committee unanimously passed a motion to support the Rio Salado Project plan.

The Committee members felt it was an excellent project and look forward to getting some follow up on its progress.

Thank you very much for your time and attention to this matter.

Sincerely,

Faith Sussman

Faith Sussman
Secretary, DVTV Planning Committee

Comment Set 6: Desert View Village Planning Committee (January 20, 1998)

Comment noted.

VIA CERTIFIED MAIL Z 292 704 634, RETURN RECEIPT REQUESTED

January 14, 1998

US Army Corps of Engineers
Mr. Alex Watt
Environmental Resources Branch (ATTN: CESPL-PD-RQ)
P.O.Box 532711
Los Angeles, CA 90053

Re: COMMENTS ON THE DRAFT EIS FOR RIO SALADO PROJECT FOR DON'T WASTE ARIZONA, INC.

Dear Mr. Watt:

Don't Waste Arizona, Inc. (DWA) is an Arizona non-profit environmental organization with numerous members in South Phoenix. DWA's address is 6205 South 12th Street, Phoenix, AZ 85040. DWA's telephone number is (602) 268-6110. The following are DWA's Comments on the Draft Environmental Statement for the Proposed Rio Salado Project.

COMMENTS ON THE DRAFT EIS FOR RIO SALADO PROJECT
for Don't Waste Arizona, Inc.

The Draft Environmental Impact Statement (DEIS) for the Proposed Rio Salado Project is insufficient for the following reasons:

The assertion that this Rio Salado Project is about "environmental restoration" is a ruse to cover the actual agenda, which among other things includes a plan to use taxpayer money to cover the millions of dollars of liability of various companies and various corporations that own defunct and closed landfills along the Salt River bed, the City of Phoenix, and the cleanup and restoration costs of cement companies and sand and gravel outfits along the Salt River bed. This Rio Salado plan failed in several democratic elections, so now the political forces behind Rio Salado are using this "environmental restoration" ruse and attempting to use federal money, hence the bogus Draft Environmental Impact Statement (DEIS). 1

The scam includes the new assertion that the dry river bed is somehow now "ugly" or unsightful. No one thought so until a cleanup at taxpayer and not Principally Responsible Party (PRP) expense was desired. A no action alternative is written off in the DEIS as not solving this new artificial "ugliness" crisis. Curiously enough, tourists come from all over the country to admire and tour amidst the deserts of Arizona, and they see plenty of empty riverbeds and dry gulleys in their travels. Following the Rio Salado Project "ugliness" rationale, we would be spending considerable fortunes soon converting Arizona all around the state to Minnesota. 2

There really ought to be a full accounting of all money spent on this Rio Salado Project, not just this latest version/resurrection, but all the money ever spent. Who got it and what was it spent on? Too much is unaccounted for now, and attempts by the public and interested parties to get this information have been ignored and/or rebuffed. 3

Regarding "environmental restoration," restoring a riparian ecosystem along the Salt River bed is
50 years too late. Once a riparian ecosystem is destroyed, it cannot simply be recreated by adding
water. There are other, newer problems with this concept. There is one of the nation's busiest
airports along the banks of the Salt River and sandwiched between the Tempe and Phoenix
projects. There are also now a large number (63) of landfills and dumps along the the Salt River
bed that were not there when the riparian system existed before the Salt River dried up. Restoring
the riparian areas by adding water constantly will only cause these landfills to be inundated and
seep their chemical wastes and germs into the aquifer and riverbed. When the next floods along the 4
Salt River arrive, and they surely will, much of these 63 landfills that have been softened up by the
inundation caused by the Rio Salado Project will wash out and along the Salt River bed. Also, the
recharge caused by the seepage and constant waterflow from the Rio Salado Project will affect the
flow of water into and around the 19th Avenue Superfund Site, and to make the claim in the DEIS
that not recharging near this landfill will somehow stop this effect is ludicrous and unscientific. The
liners for landfills always leak, eventually, and so will the liners of the Rio Salado Project.

The DEIS states, "During construction, should an area of suspected contamination be encountered,
construction activity in the area shall be stopped and soil sampling shall be conducted to determine
the nature and extent of the potential contamination. If testing indicates that contamination does
exist, the area shall be cleaned up in accordance with applicable State regulations." It is no
accident that <u>federal</u> standards are not mentioned or used here in this <u>federal</u> DEIS, *especially
since the State of Arizona has just relaxed by a considerable margin and factors of 10 to 100 its
cleanup standards*. If severe contamination is found, it can take decades, even hundreds of years
to clean up. So what will really happen when this contamination is found, for it is surely there, is
that it will really be <u>just covered over</u>, and the Rio Salado Project would just go on as if nothing
happened or was found. Otherwise, the Rio Salado Project will never be built, while waiting for a 5
cleanup of the contamination. There are plenty of other mysterious plumes of contamination,
mostly solvents, found near and traveling towards the Salt River bed, enough that the state's
"environmental" agencies and City of Phoenix have tried to stop looking and recording them.
Similarly, when there were barrels of hazardous waste found at the 19th Avenue Landfill
Superfund Site recently during excavations there, these were just reburied at the landfill, hardly in
compliance with State or federal law. The Arizona Department of Environmental Quality and the
United States Environmental Protection Agency were and are <u>fully</u> aware of all of this, but the
barrels are still at the site of their re-burial.

The issue of what the next floods will have on the Rio Salado Project are not adequately addressed.
As with most of the DEIS, unsubstantiated piffle is used to sidestep the real impacts of the Rio
Salado Project, as if honorable mention and discussion of some of what we know is sufficient to 6
lay the foundation for asserting that there will not be sufficient impacts. There is little or no
scientific basis to support the conclusion that there will "no significant impact" caused by the Rio
Salado Project. The DEIS is inadequate in its analysis and conclusions.

There are also new invader species since the Salt River bed dried up that would irreversibly
complicate a "restored" riparian ecosystem. An example of this is bermuda grass, which in a short
amount of time would **choke** all the banks and areas adjacent the Rio Salado Project with its 7
growth. There are no natural controls on this bermuda, or on several other invasive foreign plant
and animal species that would prevent the successful re-creation of the riparian area planned for the
Rio Salado Project.

The cost of cleaning up these old landfills is mentioned in the DEIS as $49.5 to $90.8 million, but
there is not documentation to make any of this a firm figure. 8

And how clever that the sand and gravel outfits and their crony politicians have turned the tables on the public in this plan! Where before the Rio Salado Project, spelled P-O-L-L-U-T-E-R B-A-I-L-O-U-T, these sand and gravel companies were going to have to pay millions to undo the damage and effects of their decades of mining in the riverbed, now they will make millions selling concrete and cement to the Project! There was even a recent court decision that stated that the riverbeds belonged to the citizens of the state, and that the state had violated the public trust <u>and</u> the state constitution by allowing these sand and gravel outfits to mine the riverbeds (including the Salt River), a mining operation that was allowed to occur without paying the proper fees to the State Land Department's education fund of the children of Arizona, incidentally. 9

The DEIS states the effects of transportation, the effects of the extra traffic this Rio Salado Project is purported to bring as people travel to the Rio Salado Project area to recreate, will be not significant, which is an admission either that *few* people are *actually* expected to go near the Rio Salado Project, or else it is an unsubstantiated assumption. 10

The Surface Water Quality Standards for the Salt River in this Rio Salado Project are horrifying. Considering that the Motorola 52nd Street Superfund Site is considered an NPL site due to the Trichloroethylene (TCE) that is there, and considering that there is a requirement that the aquifer in the Superfund Site is required to be cleaned up to 5ppb TCE, having a standard of 20,000 ppb acute and 1,300 chronic for TCE in the surface water of the Rio Salado is an abomination and a threat to public health. And since there has already been discussion of taking water treated to the 5ppb standard from the OU-1, and perhaps OU-2, of that Superfund Site and channeling it to the Rio Salado, it is easy to see that part of the <u>real plan</u> is likely to pump the contaminated water from the aquifer and put it, **untreated**, directly into the Rio Salado. The standards for Chloroform, 14,000 ppb acute and 900ppb chronic, which TCE breaks down into after pretreatment, are similarly egregious, as are those for PCE, 6,500ppb acute, 680ppb chronic; TCA, 2,600ppb acute and 1,600ppb chronic; Benzene, 2,700ppb acute and 180ppb chronic. Benzene in any concentration provides an additional, unacceptable, cancer risk. The cumulative impact of all these dangerous chemicals, TCA, TCE, PCE, Benzene, and Chloroform, as they volatilize and waft over the South Phoenix area, an identified Environmental Justice area, are not addressed in the DEIS. The cumulative effects of these chemicals with the other many industrial chemicals, and especially those tracked by the Toxic Release Inventory in the air in South Phoenix, as evidenced by the concentration of facilities filing Form R Reports in South Phoenix, are completely unaddressed by the DEIS. To be adequate, the DEIS would have had to reviewed the chemicals **already in the air** in South Phoenix and *then* reviewed the **additional chemicals to be put into the air** in South Phoenix from the offgassing from Rio Salado Project. The absence of this type of cumulative risk study is further, if not complete, evidence of Environmental Injustice and Environmental Racism, a blatant violation of Executive Order 12898. These chemicals present a health hazard to children and weakened populations, and their cumulative effects are unaddressed in the DEIS. The fecal coliform limits of 4,000 cfu/100ml acute and 1,000 cfu/100ml chronic in surface water are dangerous, more than five times the normal discharge standard as allowed by federal Clean Water Act. Children and animals can conceivably get wet and carry home diseases. If they don't, there will be plenty of flies, mosquitoes, and other vectors to do this. There is a significant population near the bed of the Salt River that may not be able to read and/or understand the signs that will inevitably be posted near the Rio Salado Project to warn people to not get wet or to eat fish caught there. The stinking, chemical cesspool may not need these warning signs as the smell and mosquitoes and flies will alert passersby of the Project health hazards. 11

Of course, using these Surface Water Quality Standards for the Salt River in this Rio Salado 12

Project would be illegal and a clear violation of the federal Clean Water Act. The fact that the DEIS uses these Surface Water Quality Standards and even considers these to be valid shows either gross incompetence or betrays the rest of the corrupt agenda for this Rio Salado Project.

Because the Salt River is the "waters of the United States," the standards for water in the Salt River have to meet the federal standards of the Clean Water Act. (Every informed person knows what a joke, and how totally UNprotective of public health and safety, the State of Arizona's Surface Water Quality Standards are.) Because there will be a flow of water through the stinking, toxic cesspool called the Rio Salado Project, there will be a flow and discharge to the Salt River beyond the Project. This flow/discharge would have to meet Clean Water Act standards and would have to require a NPDES permit. (This incidentally, is never mentioned in the DEIS, another example of its inadequacy.) Unless there is more of the total corruption and scheme to destroy the environment as illustrated by the DEIS, the NPDES permit issued at the federal level would have 12
to be back at the level of a normal discharge permit, with levels of allowed chemicals, Total Dissolved Solids (TDS), Total Settleable Solids (TSS), etc. at a ***fraction*** of those discussed in the DEIS, which means the *outrageous* standards allowed and proposed by the public health-threatening Arizona Surface Water Quality Standards could not be legally allowed. Water flowing out of the proposed, stinking, toxic cesspool called the Rio Salado Project at the levels allowed by the public health-threatening Arizona Surface Water Quality Standards would not and could not meet NPDES standards. That someone will still try to implement these illegal Surface Water Quality Standards for the Rio Salado project is likely, but would result in citizen suit and injunctive relief. Of course, the NEPA process and its accompanying litigation opportunities should short-circuit this fraudulent scheme called the Rio Salado Project.

Further, with these Surface Water Quality Standards, there would have to be a high fence to keep people away from the dangerously polluted water and to help prevent contact with the water. Some recreation area that would be behind the chain-link, ten-foot high fence! The public could really 13
enjoy that, couldn't they? The alternative is to just endanger the public with these unsafe standards.

The DEIS even admits that many of the plants planned for revegetation in the Rio Salado Project would be harmed by high concentrations of Total Dissolved Solids (TDS), but there are **no** Surface Water Quality Standards for the Salt River in the Phoenix portion of the Proposed Rio Salado Project for TDS, Total Suspended Solids (TSS), or even Chlorides, Fluorides, Nitrates, which are 14
all salts and harmful to plant life, or DBCP. Since there is no standard, there is no way to enforce a water quality that would prevent the revegetation project from being poisoned and replanted year after year on taxpayer expense.

The DEIS mentions in a favorable light the Tres Rios Project, which purported was built to create a riparian area in the vicinity of the 91st Avenue Wastewater facility operated by the City of Phoenix using that facility's water and using the Tres Rios to treat the water. It has recently come to public light that all is not going as planned at the Tres Rio Project, and that the mosquito that carries equine encephalitis has been caught in mosquito traps near there. This raises the specter of what will happen when the Rio Salado Project is built. In the DEIS, mosquitoes would be controlled by "native predators" that "will be introduced or attracted to the area should mosquitoes 15
become problematic." Once these mosquitoes become "problematic," the damage is done and it is too late. Once there is an outbreak of any disease carried by these mosquitoes, and/or when clouds of these mosquitoes find the spectators at a night game at the baseball stadium, the effect will be that people will desert the downtown area and Salt River bed and the businesses and communities nearby will suffer severe economic hardships. Besides, these natural controls somehow have not

worked well enough at Tres Rios to prevent a problem. Fortunately, the Tres Rios Project area is sparsely populated at present; the Rio Salado Project is near hundreds of thousands. In the DEIS, there assertion is made that "No chemical pesticides shall be employed." This is an empty promise and unenforceable. If natural controls fail than clouds of Malathion will surely blanket the area, as well as downtown and South Phoenix.

The DEIS is insufficient on many grounds, including failure to investigate fully the impacts of mosquitoes and the diseases they will vector to people and animals, the impacts of the use of pesticides to control these mosquitoes, the nuisance effect these mosquitoes will have in the area and indeed on the neighborhoods and businesses unfortunate enough to be near the Rio Salado Project, including the baseball stadium and central Phoenix and South Phoenix. **15**

Posting signs prohibiting the dumping of pets in the Rio Salado will not prevent them from from being dumped there or ranging there, and reporting them to local animal control officials won't stop the harm they will cause to the riparian ecosystem, and potentially, to people. **16**

The construction of riparian areas will attract birds, which will not mix well with the airport that exists here now. There will tragic encounters with birds, causing planes to crash and killing people and causing great amounts of property damage. Because the Tempe and Phoenix projects will be at either end of the airport, birds will naturally flock back and forth. In other wildlife restoration projects, the proximate habitats would be considered the creation of two habitats with a natural wildlife corridor. This natural tendency of birds to flock back and forth between habitats is not even addressed in the DEIS. **17**

The DEIS process deliberately excluded almost everyone and every group in the Environmental Justice area identifed by ADEQ. ADEQ's Environmental Justice Program has always been just a sham, specifically designed to <u>discourage</u> the participation of affected parties and concerned community groups in South Phoenix. The panel was hand-picked by ADEQ staff and those others who asked to be put on the panel were not. South Phoenix residents who have attended these meetings have been summarily ignored by ADEQ staff and/or only given five (5) minutes to speak, and only at the end of these ADEQ EJ meetings. When ADEQ had its one and only formal public meeting regarding its EPA-funded Environmental Justice Project, only three (3) people from the public spoke at the comment period, and their comments were never addressed or responded to by ADEQ.

The DEIS was never provided to any groups that work on Environmental Justice issues in South Phoenix, even recipients of EPA Environmental Justice grants. There has not been any attempt to conduct hearings or an outreach to South Phoenix about the Rio Salado Project, in direct violation of Executive Order 12898. The list of parties contacted betrays all of this. The sand and gravel outfits, City of Phoenix, certain companies, all were contacted and provided the DEIS and opportunity to comment. South Phoenix residents and community groups were left out of the process. If the goals of Executive Order 12898 were indeed to be followed and accomplished in the Rio Salado Project, there would be the effort to "promote enforcement of all health and environmental statutes." This, of course, would require the federal government and state to enforce the laws requiring the cleanup of these landfills and Superfund Sites along the riverbed, and not force the taxpayers to pick up the costs. If public participation were ensured, then it would have already happened, and there would have been meetings aplenty in South Phoenix about this, and there weren't. And if the goal of improving "research and data collection relating to the health of and environment of minority populations and low-income populations" were to be achieved, there would have had to have been these aforementioned meetings that somehow never happened, and **18** these topics would have been discussed. The Executive Order on Environmental Justice has been ignored and certainly not fulfilled.

The harmful effects politically and culturally of going forward with this Rio Salado Project are not fully investigated. To force this upon the taxpayers after they have repeatedly voted it down is undemocratic and more close to fascism. Tempe, when voting on this in previous years, approved it by a margin of only three (3) votes. The rest of the voters in other areas, especially Phoenix, resoundingly voted down this proposed Rio Salado Project, more than once. To use federal funds to do this now sends the message that the voters no longer have democracy here in Arizona, which may be true, but disheartening nonetheless. 19

The DEIS is horribly deficient for, but not limited to, the aforementioned reasons. A real, full blown, competent, Environmental Impact Statement that actually includes the steps and follows the legal requirements of the NEPA law is necessary for the Rio Salado Project in order to comply with federal NEPA law. The DEIS does not suffice.

Sincerely,

Stephen M Brittle

Stephen M. Brittle

Scott Meyer

Scott Meyer

DON'T WASTE ARIZONA, INC.

Comment Set 7: Don't Waste Arizona, Inc. (January 14, 1998)

1. The proposed Rio Salado ecosystem restoration project does not involve the clean-up of any landfills along the Salt River channel. Although numerous closed landfills are located in close proximity to the Rio Salado project site, the improvements associated with the proposed Rio Salado project are not located at the sites of any such landfills. The project involves only the restoration of natural habitat with some incidental recreational benefits.

2. Comment noted. The purpose of the Rio Salado project is to restore natural habitat in the river channel. Therefore, after restoration, it is hoped that the river will look more like it did prior to upstream diversion of its natural, perennial flows. In its natural state, the Salt River channel would not be a dry riverbed. It would be filled with vegetation and have water running through it year around. Although many would consider this an improvement to the scenic quality of the river, any such improvement in visual quality is an incidental benefit of the ecosystem restoration project.

3. The proposed project is not related to any previous projects entitled "Rio Salado." As a result, the Corps does not have any financial information pertaining to previous "Rio Salado" projects.

4. The proposed ecosystem restoration project involves more than simply "adding water" to the river channel. It will involve the application of scientific knowledge regarding the flora and fauna of the Sonoran Desert in an attempt to create a functioning riparian ecosystem resembling that which historically existed within the flood plain of the Salt River. However, it is true that the habitat that is restored may not equal in quality or size the habitat which historically existed within the flood plain of the river. The influences of urbanization, the lack of natural water flows, and the need to maintain the flood protection capacity of the channel limit the ability to create and maintain "pristine" natural habitat in the river channel. Even though the habitat which is restored may not match that which existed historically, it will still represent a significant improvement in the habitat quality of the river and is expected to support a wide variety of native bird and wildlife species. Although there are various challenges, wetlands habitat can be successfully restored if a reliable water source is available and site conditions are favorable.

5. The wording of Environmental Commitment H-3 has been modified in the Final EIS to require clean up of contamination in accordance with both State and federal regulations:

   H-3 During construction, should an area of suspected contamination be encountered, construction activity in the area shall be stopped and soil sampling shall be conducted to determine the nature and extent of the potential contamination. If testing indicates that contamination does exist, the area shall be cleaned up in accordance with applicable State *and federal* regulations.

6. The Rio Salado ecosystem restoration project is not a flood control project. It is not intended to resolve any existing issues regarding the potential effects of flooding on the landfills adjacent to the river channel. As indicated in the Draft Feasibility Report (and supported by analysis in the Technical

Appendices), the improvements associated with the proposed Rio Salado ecosystem restoration project will not adversely effect the flood control capacity or function of the river channel.

7. As discussed in Section 4.5 of the Draft EIS, an ongoing effort will be required to prevent the intrusion of non-native vegetation into the restored habitat areas. The project includes an ongoing maintenance program to remove exotic vegetation and an adaptive management program to help keep the restored ecosystem in a healthy condition. Although ongoing vigilance will be required to address the problems of exotic plants and animals, it should be possible to maintain habitat that is substantially similar to natural conditions and that is suitable for a large number of native wildlife species.

8. The Draft EIS does not mention a cost for cleaning up the closed landfills in the vicinity of the river channel. However, Section III-D of the Feasibility Report indicates that a report prepared by Dames & Moore in 1987 estimated a cost of $49,500,000 to $90,800,000 for investigation and remediation of 63 identified landfill sites in the vicinity of the Salt River channel. The Dames & Moore study encompassed a large area which extended completely through the Phoenix metropolitan area. The summary of the Dames & Moore study presented in the Draft Feasibility Report was provided as background information only. The full reference for this study can be found on page X-2 of the Draft Feasibility Report (Reference No. 30).

9. Comment noted. The Rio Salado project will not assume the clean-up responsibilities for any sand and gravel companies that have operated in the river channel. To this point, no arrangements have been made with any companies for the supply of construction materials to the project.

10. The Rio Salado project has been designed for the purpose of ecosystem restoration, not public recreation. The recreational benefits of the project are considered incidental to the project's primary ecosystem restoration goals. As a result, recreational facilities associated with the project are intentionally limited. The recreational facilities included in the project primarily consist of paved maintenance roads which can be used as recreational trails by hikers and bicyclists, and unpaved trails for equestrians.

    Recreational traffic associated with the proposed project is not expected to cause any significant impacts to the level of service on nearby roadways for several reasons. As stated above, the proposed project has only limited recreational facilities and, therefore, is not expected to generate a significant amount of recreational traffic. Since the primary recreational facilities are trails, many recreational users are expected to arrive on foot, on horseback, or by bicycle. Also, traffic generation is typically only considered potentially significant if it occurs during either the daily morning or afternoon peak hours during the work week (Monday-Friday). However, most recreational use would be expected to occur in non-peak traffic periods, such as evenings and weekends. Recreational traffic would also be dispersed throughout the various segments of the project, rather than concentrated in any single location. Public entries to the project would be available at multiple locations and each proposed entry point is accessed via a major arterial roadway.

11. Whatever water source is used for the Rio Salado project will be treated as necessary to meet all applicable NPDES water quality standards before being released into Indian Bend Wash or the Salt River channel. Therefore, there will be no contaminated water released into Indian Bend Wash or the river channel. The Draft Feasibility Report indicates that well OU-2 may be a potential future water source for the Phoenix Reach.

12. The Draft EIS does propose any water quality standards for the project, but simply indicates that the water utilized to support the project will be treated as necessary to meet applicable NPDES water quality standards. These standards are established by the Arizona Department of Environmental Quality and the U.S. Environmental Protection Agency, and are consistent with the provisions of the federal Clean Water Act. Water introduced into the Salt River channel in the Phoenix Reach, including water to create a perennial stream will infiltrate into the river bed upstream of 11th Avenue.

13. The water released into Indian Bend Wash and the Salt River channel will be treated to meet the NPDES standards for aquatic warm water, fish consumption, and partial body contact. Therefore, it will not be necessary for the public to avoid contact with the water for public health reasons. However, because the water features of the project are intended for habitat purposes, not public recreation, only limited public access to these water bodies will be allowed. Human use of the streams and marshes could disturb wildlife and damage fragile native vegetation.

14. Water utilized to support vegetation will be treated to NPDES standards. As a result of its high quality, the water should present no harmful effects to the health of the plants.

15. Mosquito breeding can be a problem in areas of still or slow-moving water. In addition, thick emergent vegetation can prevent predators (e.g., mosquitofish) from effectively controlling mosquito populations. In recognition of this potential problem, Environmental Commitment B-8 in the has been modified in the Final EIS so that the use of chemical pesticides and the introduction of mosquitofish to control mosquito breeding are not precluded. Please see the response to Comment Set 12: Maricopa County Environmental Services Department.

16. As recognized in the Draft EIS, abandoned pets can cause damage to the habitat by preying on or out-competing native wildlife species. For this reason, the Draft EIS proposes measures to help minimize this potential problem. The commenter is correct in stating that this problem probably cannot be avoided completely. However, the potential damage caused by feral or stray pets can be effectively managed through ongoing vigilance and should not adversely effect the suitability of the habitat for most native wildlife species.

17. Riparian and marsh habitat will not be located in close proximity to the airport. In accordance with Federal Aviation Administration guidelines, no areas of open water will be located within 10,000 feet of the airport runways. This is considered sufficient separation to minimize the potential for large bird strikes by aircraft taking off and landing at Sky Harbor International Airport. The FAA has not

expressed any specific concern about potential hazards associated with birds crossing through the air space of the airport when flying from one area to another.

18. The availability of the Draft EIS for public review was widely advertised. The City of Phoenix mailed a newsletter on the Rio Salado project and the Draft EIS to over 2,000 individuals and organizations, including anyone who had requested to be included on the City's mailing list. City staff made presentations on the project to approximately 50 groups and organizations and had about 200 individual meetings on the project with members of the public. Notices announcing public hearings and the availability of the Draft EIS were published in the newspaper, and there was extensive press coverage of the project. Over 1,000 copies of summary reports on the project were distributed to the public. The Draft EIS was also available for review at local libraries. The project was reviewed and endorsed at public meetings by Phoenix's Planning Commission and Parks and Recreation Board. The project was also presented to the Arizona Environmental Justice Committee. Letters of support for the proposed Rio Salado project have been received from the South Phoenix community, including the South Mountain Village Planning Committee. Once again, the proposed Rio Salado project does not involve the clean-up of any closed landfills, or any known contaminated sites, along the Salt River channel.

19. Comment noted.

Encanto

VILLAGE PLANNING COMMITTEE

January 5, 1997

Comment Set 8

Dear Mr. Atonna:

Re: Rio Salado Habitat Restoration Project

Please accept this letter as support for the above referenced project being submitted for implementation.

If this project is accepted, the Rio Salado area will turn into a greenbelt to preserving fish and wildlife habitat. The Encanto Village sees this project as a great benefit to over a million people annually who will walk through Rio Salado area for recreation, cultural experiences, nature and wildlife explorations.

The Encanto Village Planning Committee has voted to support the Rio Salado Habitat Restoration Project proposals and hopes for a positive response in the funding process. Please feel welcome to contact me if further comments are needed.

Sincerely,

Robert Coons
Chairperson

c:\word5\crr\deshen1

Comment Set 8: Encanto Village Planning Committee (January 5, 1998)

Comment noted.

MARICOPA AUDUBON SOCIETY

Dedicated to Wildlife Preservation

January 8, 1998
525 E Del Rio Dr
Tempe, AZ 85282

Comment Set 9

Mr. Mike Ternak
U.S. Army Corps of Engineers
Planning Section C (Attn: CESPL-PD-WC)
3636 N. Central Ave., Suite 740
Phoenix, AZ 85012-1936

Dear Mr. Ternak:

I appreciated the opportunity to study the Rio Salado Draft Feasibility Rept. and associated EIS, and to verbally respond at the Tempe Public Meeting on January 7. I had previously filled out a Corps survey form (~ two years ago), and had sat in on a couple meetings pertaining to using Rio Salado as an American Heritage River. I have lived in Tempe since 1966, and am the immediate Past-President of Maricopa Audubon Society (~3000 memberships).

I firmly believe that this riparian restoration project should proceed. Presently, the Phoenix Metro area has no such type sanctuary. There are only remnants of what the river used to be (1) above Granite Reef Dam and (2) below 91st Avenue. The Rio Salado project would provide this recreational/educational experience right in our midst. Furthermore, it would convert an ugly eye-sore into a natural gem, and would give back to our native wildlife some of what was taken away with the advent of the upstream dams.

I would call your attention to several things:

- I hope that water for the Tempe portion will not be diverted from the Indian Bend Pump Ditch. Tempe's history on this sort of thing is not good. The mitigation-wetlands between 52nd and 44th Streets has been dried up, and the mesquite bosque planting north or the Red Mtn. Freeway (east of Mill) has mostly failed. What is required of a mitigation site? Only that it be built? **1**
- Tempe nearly dried up a 30 year old riparian stand below its Papago Park Water Treatment Plant. Only quick action by the AZ Historical Society and several community agencies/organizations saved it. Now called "Greenlines". However, the scenic and lush Indian Bend Pump Ditch which also historically received overflow from (1) the small lake at the end of the Greenlines, and (2) the lower lake at end of Indian Bend Wash, has been essentially dry for nearly a year. Again it seems a case of sacrificing old established riparian habitat for future possible sites designed to enhance the Tempe Town Lake. **2**

- The Report briefly discusses utilization of water from the Mesa waste-water treatment plant near Dobson (P 67 of Appendices). I don't foresee Mesa giving away their water to Tempe. But it has occurred to me to utilize this water for a Mesa municipal wetlands/riparian sanctuary located on the private holdings immediately east of the present plant (between Dobson and Alma School, and adjacent the Indian sand/gravel operation in the river bottom). I believe that this site was one of those being considered for the East Valley sports complex. The local residents would surely balk at a high profile sports complex, but might welcome a sanctuary with top-notch education center. It would be good for Mesa. 3
- I believe that all reclaimed sewage water in the Arid West should be used/purified through wetland/riparian habitat, before it is reused, stored underground or is relegated to any consumptive, one-time-only evaporative application. A lot of these are going in. There should be many more. 4

The Urban Habitat Committee of the Maricopa Audubon Society is working to protect, enhance and create wildlife habitat in the Metro-Phx area. We are always eager to work with anyone who has similar interests.

Sincerely,

Dwayne Fink

Dwayne Fink

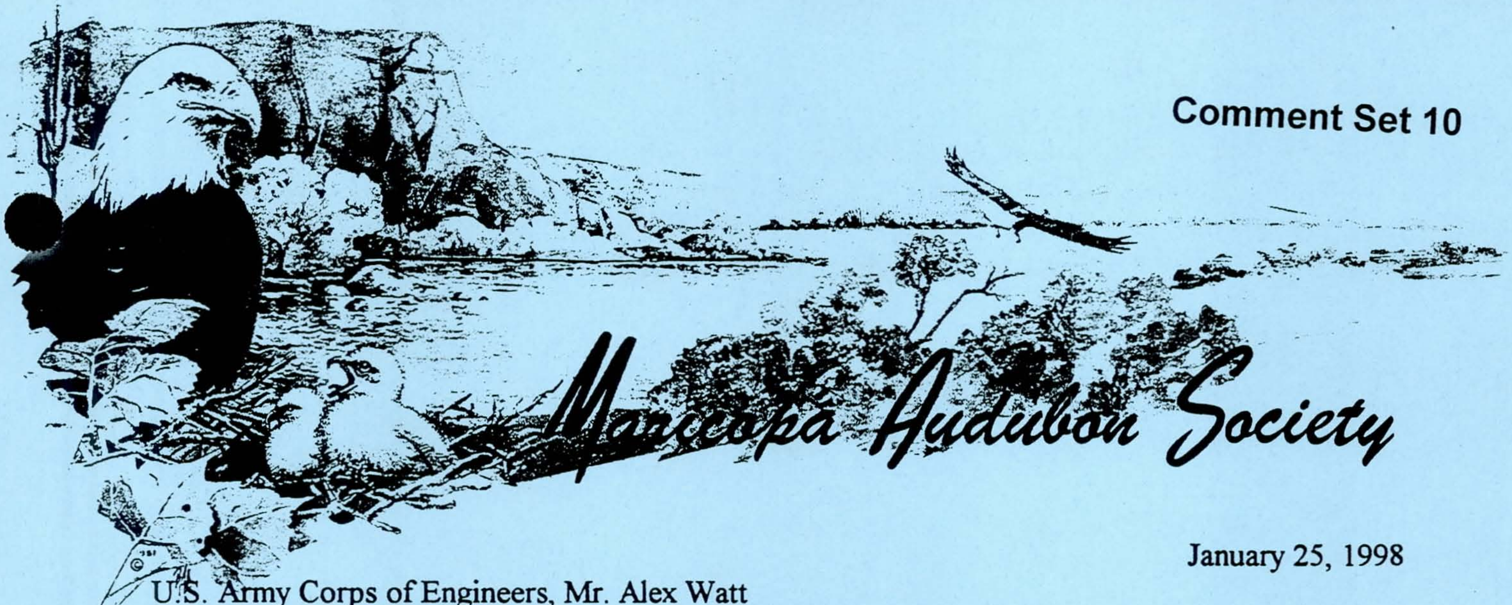
Comment Set 9: Maricopa Audubon Society (January 8, 1998)

1. The project as currently proposed does not involve the diversion of water from the Indian Bend Pump Ditch. Regarding the former mitigation wetlands located between 52nd and 44th Streets, the FAA required the abandonment of the wetland site due to its proximity to the runways of the Sky Harbor International Airport. Please note that the proposed Rio Salado project is an ecosystem restoration project, not a mitigation requirement.

2. Comment noted. This comment does not pertain to the proposed project.

3. Suggestion noted.

4. Comment noted. This comment does not pertain to the proposed project.



January 25, 1998

U.S. Army Corps of Engineers, Mr. Alex Watt
Environmental Resources Branch (ATTN: CESPL-PD-RQ)
P.O. Box 532711
Los Angeles, CA 90053 Commentary to: DEIS RIO SALADO, SALT RIVER, AZ.

Dear U.S. Army Corps of Engineers:

The Maricopa Audubon Society wishes to strongly support the DEIS and Draft Feasibility Report for the Nov. 1997 documentations on the Rio Salado, Salt River, Arizona proposal. This farsighted and highly creative Corps project will contribute to the restoration and rehabilitation of a type of riparian ecosystem which is currently the most highly threatened habitat type in Arizona.

Riparian habitats are the ribbons of life in the Sonoran Desert as well as in the upland habitats of this state. Some 99.2% of the cottonwood/willow habitat has been lost in this state according to aerial and other studies. Certainly there is no question that diversions, dams and stream channelizations have been a major factor. Over 120 years of extensive and heavy overgrazing on State, BLM, private and Forest Service lands has taken its riparian toll. This project will provide a long overdue offset or reprieve of those damages.

Two other beleaguered Arizona vegetational communities that will greatly benefit from this project are: (1) the mesquite bosques on the banks of our state's watercourses, and (2) our cattail and bulrush vegetation in the wetlands associated with these watercourses. This project should play an auspicious roll in offsetting some of these losses.

The selection of only native vegetation cannot be stressed enough. Congratulations! You have recognized and accomplished that in the study and DEIS.

<u>There are a few areas which need to be addressed in the DEIS:</u>

1. Create sandbar and mudflat habitat for shorebirds-- these areas need no added vegetation. They should be sited and managed to contain nutrients. Permanent shallow or standing water and also running water are needed to create nutrients and habitat. They will serve as invaluable habitat for spring and fall migrants, and also for over-wintering migrants from the North. They may also provide habitat for breeding Black-necked Stilts. The inclusion of islands will be critical 1
for stilts (or Snowy Plovers) breeding -- to be free of cats, rats and other predators. There are very few suitable sand bar or island habitats at present in Arizona. Such habitats have been lost

on the former natural sandbar and mudflat reaches of the now largely destroyed Salt, Gila, Colorado, Big Sandy, Santa Maria, Bill Williams, Santa Cruz etc. The eight or so project wells can provide rehabilitation of this lost riverine and wetland habitat. Wastewater treatment ponds in Arizona are seldom efficient in providing comparable shorebird breeding, passage and 1
overwintering habitat. The potential recreational benefit of this project's shorebird and heron habitat, which are engaging for the public to watch and enjoy, is great.

2. Deep pockets and pools are needed in the channel for native fish species.

a. Historically these pockets allowed for their survival in dry times.

b. Emphasis should be on the introduction and protection of habitat for native species of fish. Non-natives should be excluded where possible. Since fishing habitat in these reaches is 2
almost non-existent now, it is not like anyone is being deprived of an existing resource. We must strive toward a native fish rehabilitation.

3. Restoration and rehabilitation means avoiding park/grass and berms in low flow channels or the riverbottom. Cities may be tempted to create parks rather than restoration. Willows and Cottonwoods must be planted in dense, continuous rows the way "nature" does it along Sonoran rivers. We must avoid isolated park-like trees. The artist's rendition of punctate tree dots in the DEIS is frightening and misses the point on how the row-like aspect of Sonoran Desert riparian 3
vegetation actually occurs. This is not a park project. But in its natural form Sonoran riparian vegetation can have very appealing esthetic aspects, and immense "natural" recreational benefit.

4. As the DEIS points out, all bridged riverbottom reaches should be accessible to pedestrians. Parking is needed. This will be a benefit to recreationists wanting to enjoy the native vegetation 4
and to observe the native fish and other wildlife there.

5. The Indian Bend addition should be a rehabilitation and celebration of native plants, not a Bermuda grass park.

a. Trails are desirable but <u>not</u> Bermuda grass. Park grass is already in upper Indian Bend. We have bountiful amounts of Bermuda citywide. It encourages starlings, pigeons, English 5
Sparrows etc. but offers very little native diversity for other native birds, mammals, reptiles and amphibians. On the upland banks if it is absolutely necessary for preventing erosion use it-- but not in the riverbottom or mid levels.

6. Project pluses: Sinking wells will prevent waterlogging of the shallow Phoenix water table.

a. waterlogging causes old landfill sites to contaminate even more. 6

b. pumping in some areas may be natural air stripping for TCE removal.

7. Pumping should be attempted at night or in off demand times, though riverbed pump lifts are so shallow this may not even be a factor. 7

8. Willow/cottonwood grows taller and faster than salt cedar-- looking at the 91st Ave. and downstream area. But after floods, ripping and bulldozing Salt Cedar may be necessary. It will definitely be necessary to allow contouring for cottonwood/willow and bulrush/cattail restoration. 8
This should be factored in as a cost.

9. <u>Parks vs. native restoration</u>. The proposed Rio Salado native vegetation restoration can be a
natural botanical marvel of the Southwest, and a return to the glorious past scenic and wildlife
wonders of the Salt River. River bottoms should include native bushes and shrubs: saltbush, 9
quailbush, desert broom, etc. Palo Verde and ironwood where possible are an important esthetic
and habitat benefit. Ironwood is heavily impacted statewide from fuelwood cutting and other
mankind-caused developments.

10. Some may claim it will cost too much to restore after floods. No! Mesquites and xeric
plants will generally survive as they are at the lower velocity, upper levels of the floodplain and
banks. Wells properly placed will be unaffected. Some pond areas will have to be dozed and 10
recontoured. Holes for native fish will have to be recreated. Cattails and bulrushes and
willow/cottonwood may or may not spontaneously recur. In fact, floods may increase their
amount and germinate them in the dense rows mimicking nature.

11. Islands, where possible, should not be under bridges as bridges may create difficult access or
prevent concealment for large waders, herons and all kinds of other species. The EIS shows
islands at the bridges. These may be the flattest sites and therefore much easier for island 11
creation. In any case, as many islands as possible are desirable,- even if some are under bridges.

12. The "Average Annual Habitat Units" in the Draft Technical Appendices section is a
quantitative but not qualitative report. The outstanding and compelling benefit of this project is
for those Sonoran Desert breeding birds which have already lost much of their
cottonwood/willow, mesquite, cattail/bulrush habitat. Plantings and engineering for average
annual habitat units must consider specifically the habitat needs of: 12

> *Least Bittern, Snowy Egret, Common Egret, Great Blue Heron, Virginia Rail, Blue Grosbeak, Bullock's Oriole, Summer Tanager, Yellow-breasted Chat, Yellow-billed Cuckoo, Lucy's Warbler, Bell's Vireo, Yellow Warbler, Marsh Wren, Song Sparrow*

13. Please enclose capacity in cfs of each Salt/Gila bridge both above and below the project from
Granite Reef to Buckeye. This is relevant for a project in a floodplain for the various 13
engineering/planning reasons.

14. Economic, recreational and esthetic benefits this project should consider:
A. *USFWS,* News Release of Feb. 1997 (Albuquerque, NM), reports "more than 76 million Americans
watched, photographed, fed birds and other wildlife in 1991, spending $18.1 billion. This spending
generated nearly $40 billion in total economic activity...supporting 766,000 jobs and resulting in $3 billion
in state and Federal tax revenues."
B. This project will provide the answer to a great longing of the Arizona public to have riparian habitat
which is no longer devastated and denuded by cattle. Cattle preferentially eat cottonwood and willow and 14
cattail and bulrush sprouts, shoots, seedlings and saplings. Behavior Research Center poll shows 57% of
Arizona residents want cattle off of public lands (Nov. 23, 1997, *AZ Daily Star*, p. 6).
C. Birdwatching is one of the fastest growing recreational activities in U.S. Over the past decade birding
increased 155%, hiking 95%, skiing 59%, walking 43%, golf 29%, camping 25%, source: National survey
on recreation and the environment, (U. of Georgia Survey Research Ctr., 1995).

D. There is no question that rare or highly desired desert riparian species will be seen and enjoyed in this Rio Salado restoration project by many citizens. In 1991 24.7 million Americans reported they traveled to watch birds (Southwick Associates, Bird Conservation Magazine, Spring 1991).
E. Arizona retail sales for non-consumptive bird use was $128.4 million in 1991 (Southwick Assoc.). 14
F. Bird recreation is a growth industry. In 1985 there were five national birding festivals; in 1997 there were 60 (source *Bird Conservation Mag*., Spring 1997).
G. Northern Arizona U. survey, May 15, 1995, *AZ Republic*: 800 residents surveyed: 76% said they would be willing to pay higher costs to protect the environment, and 52% would be willing to pay higher taxes.

Let us know how the Maricopa Audubon Society can be of assistance and work with the Corps in the details and planning of this outstanding proposal.

Sincerely,

Scott Burge

Scott Burge, Conservation Committee, Maricopa Audubon Society
8869 S. Myrtle
Tempe AZ 85284, tel. 897-8608 (h), 968-5141 (w) filename salado 1-7-98

Comment Set 10: Maricopa Audubon Society (January 25, 1998)

1. These suggestions will be taken into consideration in the design of the habitat areas.

2. These suggestions will be taken into consideration in the design of the habitat areas.

3. The purpose of the proposed project is ecosystem restoration with incidental recreation benefits. For this reason, park areas and turf have been intentionally limited in the project design. The habitat areas will be designed to mimic natural conditions.

4. The preliminary design for the Phoenix Reach includes parking at three gateway areas on the overbanks of the river channel. The Tempe Reach includes parking south of Curry Road, outside the Indian Bend Wash channel.

5. Comment noted.

6. Comment noted.

7. Pumping will be basically continuous in order to maintain a constant flow of water through the riparian and marsh habitat areas.

8. Comment noted. As stated in the Draft EIS, a weeding program will be implemented to keep non-native plants out of the habitat areas. This includes the removal of salt cedar.

9. Comment noted.

10. Comment noted.

11. Islands are proposed under the bridges to help protect the bridge pilings from flood flows. These islands will extend well beyond the bridges so that they can also serve as habitat for waterfowl, wading birds, and shorebirds. Since the perennial stream will be braided, islands will also be created naturally in other areas of the low-flow channel. Islands for habitat purposes may also be created in the marshes on the benches of the river channel.

12. Comment noted. Quantified habitat units were generated for the purposes of the incremental cost analysis, which compares the cost effectiveness of the various project alternatives.

13. At a minimum, all of the bridges crossing the river channel can accommodate the flows associated with a 100-year flood event and many of the bridges have even greater capacity.

14. Comment noted.

Maricopa Audubon Society's
Urban Habitat Committee
4024 E Desert Flower Lane
Phoenix, AZ 85044
(602) 759-2475
email: drowley@amug.org

Comment Set 11

January 27, 1998

Mr. Alex Watt
Project Manager
United States Army Corp Of Engineers
Environmental Resources Branch (ATTN: CESPL-PD-RQ)
P.O. Box 532711
Los Angeles, CA 90053

Re: Comments to USACE, Draft Environmental Impact Statement (DEIS)

Dear Sir:

The Maricopa Audubon Society's Urban Habitat Committee applauds the United States Army Corp of Engineers, South Pacific Division, Los Angeles District, for their design, conceptual and logistical efforts resulting in a well produced Rio Salado *Draft Feasibility Report* and *Environmental Impact Statement*. The through treatment of the project's components shows your understanding of how instrumental the Rio Salado project can be to recovering regional lower Sonoran desert riparian wildlife habitat and species. The draft report is well written, easy to follow, and presents enough graphics to avoid an unwieldy and lengthy document.

We are providing the following comments to your agency, as solicited by the Phoenix planning office staff. These comments are but some that our members have forwarded as concerns with regard to the Rio Salado project. Should further clarification on a particular point be required, we will gladly provide that information. The first comment section addresses each draft as it is written. Comments are preceded by a page location in the draft, followed by the comment, statement or question. The second comment section addresses design, concept and logistical concerns not deemed appropriate are viewed as oversights in this projects mission to restore lower Sonoran desert riparian habitat.

We of Maricopa Audubon Society's Urban Habitat Committee would like to extend an offer of service by our members to help ensure Rio Salado's success. Our capable members are willing to provide assistance and support in a number of venues, including development of wildlife and environment related education materials, biologic field surveys and monitoring, and conceptual-technical support related to wildlife and habitat.

Section 1.

example. DEIS Page (pp) III-6, paragraph (p) 1, line (l) 4

DEIS pp. ES-7, Table ES-3, Geology, Class II-IV

1) G-2, Slope stabilization by vegetation and not soil cement. 1
2) G-3, Avoid removing currently vegetated areas, i.e. I-10 bridge and the south bank. 2
3) G-4, Stream meanders should be left to form naturally and not constructed "naturally". 3
4) Representative native plant materials should be from standards found in Arizona Game and Fish Department's Heritage database. 4

DEIS pp. ES-9, Table ES-3, Hydrology, Class III-IV

1) Riparian vegetation succession processes are dependent upon high magnitude, low frequency hydrologic flow regimes. 5
2) Use air stripping processes to remove volatile hydrocarbons from contaminated waters when possible. 6

DEIS pp. ES-9-10, Table ES-3, Biological Resources, Class II-IV

1) B-2, Window to eradicate Tamarisk should be narrowed to November- December. 7
2) B-4, Wash off vegetation with water trucks. 8
3) B-6, Weeding programs should be by manual methods. 9
4) B-8, We suggest Mosquito fish not be used, instead use native fishes, for example the Gila Top Minnows 10

Section 2.

There are number of components that Maricopa Audubon Society's Urban Habitat Committee feels are important to this habitat restoration project, but these did not appear in the draft. We urge USACE to consider some options to improve the likelihood of the restorative project's success.

1) Our first comment and criticism addresses the lack of a mechanism that will hold participating cities accountable for long-term maintenance of the Rio Salado project to enhance native wildlife habitat. The concern is founded by recent events where factions within each participating city have mitigated areas for wildlife habitat only to retract their commitment to retain the areas a few years later. For example, the area on First Avenue and 52nd Street in Tempe. 11

2) The number of forecasted recreational visits in the Rio Salado project area averages 1430 persons per day (or 286 persons per mile/day of project). A usage rate of this 12

magnitude would certainly detract from Rio Salado's value as restored wildlife habitat. We feel this number is excessive, and the designed use of recreation facilities should be much lower. Exclusion zones need to be designed and maintained to provide adequate habitat for retiring and easily disturbed wildlife species. 12

3) We have concerns regarding how the Rio Salado project will be managed beyond Federal participation with regard to representative native wildlife species including plants, vertebrates and invertebrates. We believe the project should require the participating cities designate target species, monitor their success, and direct management activities towards the determined species. Management of species should determine how maintenance and construction activities will be performed. Dictated by wildlife needs and not aesthetic whims of city park department heads. 13

4) We have major concerns of a social and logistical nature about the level of commitment the participating cities has to maintaining the project area as wildlife habitat. Vagrancy and loitering are rampant in some extant parks yet the cities appear incapable of removing this element from public parks.
a. police and park rangers should have zero tolerance to vagrancy and loitering but from experience while performing research in the Moon Valley-Cave Creek park, the city has demonstrated a lethargic and uncommitted response to these problems. 14
b. strict rules should be applied to reduce off-trail usage that is detrimental to brooding wildlife, cause trampling of vegetation, increase litter and vagrancy.

5) Monitoring and Adaptive Management Plans pp. VI-11, p. 2, I and DEIS, Appendix G, p. G-1 describes how the planting success of the project will be evaluated. Maricopa Audubon Society's Urban Habitat Committee is fully supportive of USACE plans to maintain native plant communities and manage construction plans to enhance species composition through a monitoring program. We have concerns about the designed density of trees to be planted. There appears an insufficient number of plantings to produce canopy closure as plants mature.
a. How these trees are to be maintained are of special concern. From experience, the Department of Parks and Recreation of both cities disallow native trees and shrubs to grow and develop naturally. Park trees and shrubs are generally trimmed into single stemmed trunks, without multiple canopy layers, have a very low density preventing canopy closure and deadwood is immediately removed. Unless restrictions in types of maintenance on planted vegetation are included in your final report, we feel the participating cities will abuse and subvert the project's intent to restore habitat for wildlife by creating vacant park-like environments. 15

6) Maricopa Audubon Society's Urban Habitat Committee commends the USACE in recognizing habitat types in the lower Sonoran desert bioregion are diverse and distinct. Each habitat type is defined by ecologic and environmental parameters, including plant community and landscape factors. We feel these habitat factors will need further consideration to address the establishment of whole plant communities. 16
a. We suggest that some seeding/ planting of aquatic strand habitat may be necessary

for two reasons. Propagules of species indicative to this habitat are not always transported aerially. From a landscape ecologic perspective the Salt River habitat is fragmented, thus lacking significant corridors leading to a disjunct in propagule
dispersion, thereby reducing natural revegetation. 16
b. To reduce infestation by Tamarisk, competition by native species may be necessary, requiring native species be planted in the aquatic strand habitat.

7) Constructed island habitats located under transportation bridges should be moved
up or downstream to enhance wildlife safety from traffic, reduce overhead disturbance 17
by humans, and increase areal habitat of what we perceive as critical exclusion areas important to brooding and nesting wildlife.

8) Deep pocket pools and meanders in the stream are needed by native fishes and
should be created to facilitate them. We suggest that some pocket pools be placed 18
under bridges and in lieu of islands.

9) Sandbars and mudflat habitat for shorebirds are needed but omitted in the design:
a. the habitat-landscape elements should be situated and managed to contain nutrients
or food, with permanent shallow, standing water. 19
b. Specifically the sandbar-mudflat habitat should be managed for migratory shorebirds and not for resident shorebirds, which have a different habitat requirement that can be found in other areas of this project.

10) Soil cemented low flow channels should be built "leaky" to provide soil moisture to bank habitats. This type of construction would increase wetted areas along the
channel, allow spontaneous stands of vegetation to develop along the channel, 20
increasing species composition and vegetation structure.

11) Should alternative P9 be approved:
a. We suggest that the decommissioned gravel mines be contoured as per your plans. However, these pit areas should be landscaped with contiguous vegetation types. In order to be suitable nesting-brooding areas for larger mammal and bird species the areas could act as buffers from human disturbance.
b. We do not support any golf course installations along the Rio Salado river within the 21
project area (as suggested in Fig.5.10, Phoenix Reach, Section C-C). These types of recreational facilities do not accomplish the project's mission of native habitat restoration, are generally deleterious to native wildlife species, nor do they provide educational benefits to the general public.

12) Anthropically created habitats are generally difficult to populate with threatened and endangered wildlife species. Much of the problem lies in the lack of available areal and structural habitat, such as rocks, woody debris, soil mosaics. Vegetation allowed to
grow unabated and die in place will be key towards the success in restoring a native 22
wildlife component to Rio Salado project's mission. Our comment is to implore that planted tree and shrub densities be increased to create a closed canopy, and that

these canopies are allowed to grow in multiple layers. We know that native animal
species are adapted and dependent upon many native plant species. Landscaped 22
plantings should avoid monospecific stands, yet should have contiguous canopies of
vegetation type.

13) Tamarisk will be an obvious problem, but other woody perennial species such as Parkinsonia aculeata, Washingtonia spp., Rhus lancea, Eucalyptus spp. will require
attention in invasive plant eradication programs. 23
a. Eradication activities should include adjacent and within channel areas for effective control of invasive plant species.

14) We are concerned that feral animals and invasive plants, will proliferate so as to degrade Rio Salado's potential as native wildlife habitat. Our comment is to urge
USACE to devise a mechanism by which participating cities will be encumbered to 24
remove non-native wildlife components beyond the time of Federal participation.

Maricopa Audubon Society's Urban Habitat Committee would like to see the participating cities pursue some of the alternatives proposed by USACE. The project's alternative plans which best provide and broaden wildlife habitat is preferred. For example, Phoenix reach alternative P9 is preferred because the areal extent of vegetation habitat is increased while habitat patch edge is reduced. We support the Tempe reach to be built but with more emphasis placed on habitat restoration and less focused on recreation and development.

We ask that USACE incorporate these comments and suggestions in their final proposal efforts. To incorporate the suggestions and comments should require little logistic and design changes to the Rio Salado, but the project's success as wildlife habitat restoration would be furthered immensely. We thank the United States Army Corp of Engineers for the opportunity to provide comment, and look forward to interacting with the agency as the project moves forward.

Thank You,

Cliff Drowley

CLIFF DROWLEY - URBAN HABITAT CHAIR

Michael R. Baker - member

Jeanine Baker member

Karen Stucke - member

cc:

Roy Jones - President, Maricopa Audubon Society
John Delventhal - Vice President, Maricopa Audubon Society
Robert Witzeman - Conservation, Maricopa Audubon Society
Janice Miano - Publicity, Maricopa Audubon Society

Comment Set 11: Maricopa Audubon Society, Urban Habitat Committee (January 27, 1998)

1. Suggestion noted. The need for slope stabilization has not been determined at this time and, therefore, specific measures for slope stabilization have not been identified. Soil cement is only proposed to stabilize the sides of the low-flow channel in the Phoenix Reach.

2. Because a detailed grading plan has not yet been prepared for the project, the degree to which existing vegetation can be kept in place is not known. Very little vegetation currently exists on the banks of the river channel.

3. Comment noted.

4. Comment noted.

5. Comment noted. The current flood regime of the river will not be altered by the proposed project. Like most rivers, this includes infrequent high volume flows and more frequent, low volume flows.

6. All water will be treated to standards established by the Arizona Department of Environmental Quality and the U.S. Environmental Protection Agency. The treatment method will depend on the specific types and concentrations of contaminants to be removed, and will be based on the cost and effectiveness of different treatment options.

7. Suggestion noted. The appropriate eradication window for tamarisk will be subject to further investigation.

8. Suggestion noted.

9. Suggestion noted.

10. Suggestion noted. Please see the responses to Comment Set 3: Arizona Department of Health Services, Comment Set 12: Maricopa County Environmental Services Department, and Comment Set 28: Bureau of Reclamation.

11. The Corps will enter into a Local Cooperation Agreement with the Cities of Tempe and Phoenix that will spell out the responsibilities of each city for long-term maintenance and operation of the project, including prohibitions against future modifications which might degrade the restored habitat areas or otherwise compromise the project's primary ecosystem restoration purpose.

12. Because Rio Salado is not a recreation project, it has not been designed to accommodate any specific number of recreational users. However, planning for the project has recognized various incidental recreational opportunities associated with the ecosystem restoration of the river. Therefore, some passive recreation facilities have been incorporated into the project design. The project will include

exclusion zones where the public will not be permitted so as to minimize disturbance to wildlife and damage to native vegetation.

13. A detailed monitoring plan for the project has not yet been developed. It is anticipated that each city will seek the cooperation of qualified local groups and organizations to help monitor bird and wildlife species which utilize the habitat areas. This input will be utilized as part of an adaptive management effort that will identify problems associated with the health of the habitat, and help define necessary corrective measures. Requirements for maintenance and monitoring will be described in the Final Monitoring and Adaptive Management Plan, as well as in the Local Cooperation Agreements between the Corps and the Cities of Tempe and Phoenix.

14. Comment noted. Please see the preceding responses.

15. Comment noted. Since this is an ecosystem restoration project, not a park project, specialized maintenance practices specific to habitat management will need to be formulated and implemented by each city. The requirement for this kind of specialized management and maintenance will be described in the Local Cooperation Agreements between the Corps and the Cities of Tempe and Phoenix, and in the Final Monitoring and Adaptive Management Plan. It is anticipated that the tree canopy will be closed in some areas and partially closed in others. The planting densities cited in the Draft EIS represent average densities for the each habitat area. Densities for tree planting may be modified in the final design, or supplemented with other propagation methods, in order to achieve appropriate canopy cover.

16. Suggestion noted. The low-flow channel is designed to carry periodic flood flows that would otherwise damage the habitat on the benches of the river channel. These flows will regularly scour the low-flow channel (about every three years on average), preventing the establishment of any substantial riparian vegetation. In addition, if large trees or shrubs are permitted to become established in the low-flow channel, it will reduce the capacity of the low-flow channel, resulting in more frequent flood damage to other habitat areas. Therefore, the low-flow channel will only contain short-lived, successional plant species adapted to periodic flooding.

17. Suggestion noted. Islands are proposed under the bridges to protect the bridge pilings from flood flows. These islands will extend well beyond the bridges so that they can also serve as habitat for waterfowl, wading birds, and shorebirds. In addition, other islands will be created naturally in other areas by the braided stream in the low-flow channel. Islands for habitat purposes may also be created in the marshes on the benches of the river channel.

18. Suggestion noted. No decision has made at this time as to whether native fish will be introduced into the water bodies of the habitat. Please see the response to Comment Set 12: Maricopa County Environmental Services Department, and the response to Comment #6 from Comment Set 28: Bureau of Reclamation.

19. Suggestion noted. To this point, the creation of habitat for shorebirds has not been a specific objective of the project. Therefore, mudflats have not been incorporated into the preliminary project design. The creation of habitat for shorebirds will be given consideration in the final design of the project.

20. In the Phoenix Reach, streams and marshes will be created on the benches of the river channel (on each side of the low-flow channel) providing soil moisture to support riparian and wetland vegetation. Therefore, it will not be necessary to utilize "leaky" soil cement along the sides of the low-flow channel.

21. Comment noted. However, at this time, the gravel pits along the Phoenix Reach are not available for acquisition. They could possibly be incorporated into a future expansion of the project. The golf course identified in Figure 5.10 of the Draft Feasibility Report is not part of the proposed project. It is a separate project which has been proposed near the river channel at the location indicated in Figure 5.10.

22. Suggestion noted.

23. Suggestion noted. The project includes a program for removal and ongoing eradication of non-native vegetation.

24. Suggestion noted. The EIS includes an environmental commitment for control of feral animals. As stated above, the project also includes a program for removal and ongoing eradication of non-native vegetation.

ENVIRONMENTAL SERVICES DEPARTMENT

Albert F. Brown, M.P.A., R.S.
Director

VECTOR CONTROL OFFICE

4707 E. Washington Street
Phoenix, Arizona 85034

Telephone (602) 273-0895
FAX (602) 273-0460

January 16, 1998

Comment Set 12

Alex Watt
U.S. Army Corps of Engineers
Los Angeles District
Environmental Resources Branch
P.O. Box 532711
Los Angeles, California

Dear Mr. Watt:

After reviewing the Rio Salado Draft Feasibility Report and Draft Environmental Impact Statement, I feel that the project's potential to become a source of mosquitoes, and the plan to control them should they become problematic, is addressed in a dangerously simplistic manner. This area has had a long history of mosquito-borne arbovirus, therefore any constructed marshlands, that may become a source of mosquitoes, near inhabited areas, must be designed and operated so as to not create an unnecessary and unacceptable risk for the community.

Of particular concern are the comments, regarding mosquitoes, on page 4.5-4 of the Draft EIS:

- Extensive populations of *Gambusia affinis* (Western Mosquitofish) occur in a wide range of habitats, throughout this valley, and have contributed to a high level of mosquito control in many of these areas. The recommendation to exclude this efficient predator, from the Rio Salado Project (if that is even possible), and rely on other unproved predators, does not address the increased risk to the community. 1
- While minimizing (or even eliminating) the need to use pesticides, is a commendable goal, one cannot presuppose success. A prohibition on the use of chemical pesticides could prove to be a dangerous decision.

Even if Mosquitofish are present, very dense emergent vegetation, particularly in shallow water, can severely limit their effectiveness in controlling mosquito populations. This situation occurred in the Tres-Rios Research Project Constructed Wetlands, and also seriously limited monitoring and larviciding efforts. Careful consideration must be given ,to the vegetation used in, and the planned maintenance of, the Rio Salado marsh areas, to avoid this type of problem.

Please contact me, at this office, any time there is additional opportunity for input regarding mosquito prevention and control measures, in relation to this or any other similar project in this region.

Sincerely yours:

Thomas G. Engelthaler

Thomas G. Engelthaler,
Vector Control Manager

cc: John A. Power, P.E.. Manager, Water and Waste Division

Comment Set 12: Maricopa County Environmental Services Department, Vector Control Office (January 16, 1998)

1. Environmental Commitment B-8 in the Draft EIS was intended to avoid management practices which could have adverse effects on birds and aquatic life in the habitat areas. However, due to the practical need to address potential public health concerns associated with mosquito infestation, this mitigation measure has been modified in the Final EIS so that it does not preclude the use of chemical pesticides or the introduction of mosquitofish to control mosquito breeding. In the Final EIS, the wording of Environmental Commitment B-8 has been modified to read as follows:

   B-8 In order to minimize the use of chemical pesticides within the habitat area, native predators should be introduced or attracted to the area to help control mosquitoes. Native predators include waterstriders, giant water bugs, common backswimmers, dragonflies, water boatman, barn swallows, black phoebes, song sparrows, bats, and native fish. Although the use of native fish species (e.g., Gila topminnow) would be preferable, the introduction of mosquitofish to help control mosquito populations shall not be prohibited.

   The dominant emergent vegetation species that will become established in the marshes are cattail (*Typha* sp.) and giant bulrush (*Scirpus californicus*). These species are expected to become established even if not planted as part of the restoration effort. This vegetation is important to the success of the marsh habitat and is expected to thrive in the proposed project's wetland areas. However, as experienced at the Tres Rios Constructed Wetlands project, dense growth of this vegetation could hamper mosquito control efforts, and may limit the effectiveness of mosquitofish in controlling mosquito populations. As a result, it may be necessary to periodically thin out the emergent vegetation in the marshes and ponds of the proposed project for the purposes of mosquito control and monitoring. In addition, the marsh areas can be designed to limit the growth of large, thick expanses of emergent vegetation.

Flood Control District

of

Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009-6399
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5897

Comment Set 13

January 30, 1998

Mr. Mike Ternak, P.E.
US Army Corps of Engineers
3636 North Central Avenue, Suite 740
Phoenix, Arizona 85012-1936

Re: Flood Control District of Maricopa County (FCDMC) review comments for: Rio Salado Draft Report Feasibility Report, Environmental Impact Statement, and Technical Appendices, Corps of Engineers, November 1997

Dear Mr. Ternak:

The following are the Flood Control District's comments on the subject report:

General

The report indicates that "Any alternative considered must not compromise the level of flood protection currently provided by reduction of channel capacity or other adverse impacts to conveyance." The District believes this to be a very important project constraint that should be addressed in detail as plans progress. A defined maintenance plan, which does not allow vegetative growth to exceed established design criteria, will be important. The maintenance plan should address in detail measures to be taken for the control of vegetative growth through the life of the project to assure that flooding potential is not increased. Permits to allow vegetative management should be issued for the life of the project. The control of invasive species (Salt Cedar) needs to be addressed and its maintenance should be defined and included in all permitting. 1

Other important issues concerning design and cost are included in the comments below:

Draft Feasibility Report and Draft Environmental Impact Statement

Page	Comments	
IV-13	Plates 4-1 through plates 4-5 are not included.	2
IV-14	Plate 4-5 is not included.	3
V-31	Section A-A at center indicates " Remove bank to increase bench, allow trees in channel." The removal of bank could cause channel migration and erosion during high flow.	4

Draft Feasibility Report and Draft Environmental Impact Statement (cont.)

Page **Comments**

VI-10 Table 6.6
- In which line item are the costs of the 13 side drain outlet structures and the 2 drop structures (located outside the low flow channel)?
- Is the cost of excavating the 4 lakes included in the low flow channel cost estimate? 5
- What is the excavation volume for the lakes?
- O&M for lake and channel clearing are not included.
- Replacement cost for vegetation replanting is not included.
- Sediment removal is not included in the table (reference page 4.4-2 Erosion and Siltation).

VI-14 What is the added maintenance costs associated with flooding? 6

Draft Technical Appendices

Appendix A

3 Plates 1A-5A are missing. 7

12 A new sediment assessment needs to be made with armor layer destroyed. 8

13 What loss rates were experienced in designing the Rio Salado Lake? 9

28 The FCDMC does not publish runoff coefficients. 10

36 The FCDMC did not include runoff coefficients in its report. 11

Appendix B

7 Maximum "n" value has been doubled or greater; yet no increase in water surface elevation. Therefore, the increase in velocity in the design and current toe-down depth of the existing banks with respect to scour and erosion needs to be assessed. 12

Enclosure 8 How will the stability of the daylight point of the low flow channel be maintained? 13

Enclosure 10 With a high overbank vegetation, what is the design velocity and flow depth for the toe-down of the low flow channel? 14

Enclosure 16 The impact of increased velocity on scour of existing soil cement banks and low flow channel design needs to be assessed. 15

Enclosure 25 What consideration is given to bridge capacity with a stable invert? Will it cause additional scour on adjoining piers? 16

Draft Technical Appendices (cont.)

Appendix G

E-4 If gravel islands are stabilized, either through vegetation or other means, what will the impact be on the bridges? 17

Detail Page 18 Calls for stabilizer for gravel islands. 18

Appendix H We recommend an evaluation and comparison of unit prices for all major construction items with completed local construction of a similar nature. 19

Can the gravel island be constructed by a less expensive method? Has the replacement cost of the islands been included in the maintenance cost estimates?

Low Flow Channel – General Comments

Due to the large sizes of bed material transported along the channel bed of the Salt River, the low flow channel lining located in the channel bed will be subject to heavy abrasion. Therefore, using standard soil cement for this lining may not be appropriate. Roller Compacted Cement or a higher strength soil cement appears to be more appropriate. A significant increase in the cost of the low flow channel would result if this is the case. 20

The toe down of the existing bank protection lining in the Salt River ranges from 10 to 15 feet. The lining for the proposed low flow channel may have the potential for even higher toe scour. The proposed 5 to 7 feet toe down will, therefore, be inadequate during flows of higher events such as the 100-year event. 21

Allowing side drainage to flow in the benched area parallel to the low flow channel lining will result in major maintenance problems. If not controlled, this water will carve its own flow path and with sustained discharges, will deepen the nuisance channels significantly. A pilot channel with clearly defined inlet weir locations in the benched area may be used to control flows and prevent problems. 22

If you have any questions related to these comments please, contact me at 506-4774 or Tom Renckly at 506-8610.

Sincerely,

T. Renf / for

Richard G. Perreault
CIP and Policy Branch Manager

Copy to: Ray Acuna, City of Phoenix

Comment Set 13: Maricopa County Flood Control District (January 30, 1998)

1. Comment noted. The project has been designed to maintain the flood control capacity of the channel while permitting extensive growth of native vegetation. It should not be necessary to clear vegetation, or limit the growth of vegetation, in order to maintain the flood protection capacity of the channel. The project includes an ongoing maintenance program to remove non-native vegetation, including salt cedar, from the habitat areas.

2. These plates are inundation maps that were inadvertently left out in the printing of the Draft Feasibility Report. They are included in the Final Feasibility Report.

3. This plate is included in the Final Feasibility Report.

4. Bank removal is no longer proposed. It had been proposed in the Phoenix Reach alternatives which included restoration of the gravel pits adjacent to the river channel. The gravel pits would essentially fill up and act as off-line detention basins. The removal of the banks would create minimal non-conveyance areas relative to the main channel within the gravel pits. The gravel pits are no longer project features.

5. The foundation drainage costs for the side drain outlets are included in the low-flow channel costs. The cost of excavating the four shallow ponds is also included in the low-flow channel cost. The excavation volume for the ponds is estimated at 102,371 CY. The lake design includes collection inlet and outlet structures to ensure performance, integrity and minimize O&M. No specific vegetation plantings will be performed for the low-flow channel. Volunteer vegetation is not expected in open water areas of the low-flow channel. Due to more frequent discharges in the low-flow channel, scour may also contribute towards clearing. Replacement cost for vegetation replanting is estimated in the OMRR&R costs for habitat for both Tempe and Phoenix.

6. The frequency-based maintenance cost associated with flooding is estimated at $76,000 annually for Tempe and $324,000 annually for Phoenix.

7. Plates 1A-5A are renumbered as Plate 4-1 through 4-5 and have been included in the feasibility report. Note that the Hydrology Appendix A does not include these plates but refers to their location in the Feasibility Report.

8. This will be assessed with a sediment analysis for with-project conditions in the next phase of the project.

9. It is assumed the commentor is referring to Tempe Town Lake. The Corps was not involved in the design of Town Lake and, therefore, does not have information on assumed loss rates for the lake.

10. Comment noted.

11. Comment noted.

12. In the Phoenix Reach, no increase in water surface elevation will occur since the conveyance area will be increased by the low-flow channel. In the Tempe and Phoenix Reaches, minimal increase in the water surface elevation will occur during low discharges; but during high flows, most of the vegetation will be washed out, lowering the n value to near design conditions. See Paragraphs 18 and 20 in Appendix B of the Feasibility Report for further discussions.

13. This is a detailed design comment that will be resolved in the next phase of the project.

14. Please refer to Paragraph 8 in Appendix B of the Feasibility Report for design criteria of low-flow channel.

15. This will be assessed with a sediment analysis for with-project conditions in the next phase of the project.

16. This will be assessed with a sediment analysis for with-project conditions in the next phase of the project.

17. The gravel islands will not be stabilized. They will be built strictly by fill. The fill concept is being utilized for the islands under the bridges because some form of apron or hardening is required at these locations to protect the bridge piers. Therefore, the design and cost of these islands are related to the safety and protection of the bridges. During the upcoming planning, engineering, and design phase of the project, alternative design concepts for the islands will be evaluated in attempt to identify the most cost-effective approach for providing the necessary pier protection.

18. See preceding response.

19. Comment noted. Please see the response to Comment #17 above.

20. Comment noted. Roller Compacted Concrete will be used instead of soil cement.

21. Comment noted. This issue will be assessed with a sediment analysis for with-project conditions in the next phase of the project.

22. Comment noted. The side drains can be designed to address these concerns. This issue will be resolved in the next phase of the project.

Maryvale

VILLAGE PLANNING COMMITTEE

January 13, 1997

Comment Set 14

Dear Mr. Atonna:

Re: Rio Salado Habitat Restoration Project

Please accept this letter as support for the above referenced project being submitted for implementation.

If this project is accepted, the Rio Salado area will turn into a greenbelt to preserving fish and wildlife habitat. The Maryvale Village sees this project as a great benefit to over a million people annually who will walk through Rio Salado area for recreation, cultural experiences, nature and wildlife explorations.

The Maryvale Village Planning Committee has voted to support the Rio Salado Habitat Restoration Project proposals and hopes for a positive response in the funding process. Please feel welcome to contact me if further comments are needed.

Sincerely,

Claudette Manzo

Claudette Manzo
Chairperson

c:\word5\crr\deshmv1

Comment Set 14: Maryvale Village Planning Committee (January 13, 1998)

Comment noted.

JM

Janice Miano
6129 East Hollyhock #5 ~ Phoenix, AZ 85018-6750 USA
(602) 946-1327
Email: jmiano@juno.com

Comment Set 15

January 24, 1998

Mr. Alex Watt
Project Manager
United States Army Corp Of Engineers
Environmental Resources Branch (ATTN: CESPL-PD-RQ)
P.O. Box 532711
Los Angeles, CA 90053

Re: Comments to USACE, Draft Environmental Impact Statement (DEIS)

Dear Sir:

I applaud the United States Army Corp of Engineers, South Pacific Division, Los Angeles District, for their design, conceptual and logistical efforts resulting in a well produced Rio Salado Draft Feasibility Report and Environmental Impact Statement. The through treatment of the project's components shows your understanding of how instrumental the Rio Salado project can be to recovering regional lower Sonoran desert riparian wildlife habitat and species.

There are numerous project components to Rio Salado that I view important towards habitat restoration and wildlife enhancement. I urge USACE to consider some options to improve the likelihood of the restorative project's success.

- My first comment and criticism addresses the lack of a mechanism that will hold participating cities accountable for long-term maintenance of the Rio Salado project to enhance native wildlife habitat. The concern is founded by recent events where factions within each participating city have mitigated areas for wildlife habitat only to retract their commitment to retain the areas a few years later. For example, the area on First Avenue and 52nd Street in Tempe. 1

- The number of forecasted recreational visits in the Rio Salado project area averages 1430 persons per day (or 286 persons per mile/day of project). A usage rate of this magnitude would certainly detract from Rio Salado's value as restored wildlife habitat. I feel this number is excessive, and the designed use of recreation facilities should be much lower. Exclusion zones need to be designed and maintained to provide adequate habitat for retiring and easily disturbed wildlife species. 2

- I have concerns regarding how the Rio Salado project will be managed beyond Federal participation with regard to representative native wildlife species including plants, vertebrates and invertebrates. I believe the project should require the participating cities designate target species, monitor their success, and direct management activities towards the determined species. Management of species should determine how maintenance and construction activities will be performed. Dictated by wildlife needs and not aesthetic whims of city park department heads. 3

- I have major concerns of a social and logistical nature about the level of commitment the participating cities has to maintaining the project area as wildlife habitat. Vagrancy and loitering are rampant in some extant parks yet the cities appear incapable of removing this element from public parks. 4

- I am fully supportive of USACE plans to maintain native plant communities and manage construction plans to enhance species composition through a monitoring program. We have concerns about the designed density of trees to be planted. There appears an insufficient number of plantings to produce canopy closure as plants mature. 5

I commend the USACE in recognizing habitat types in the lower Sonoran desert bioregion are diverse and distinct and I would like to see the participating cities pursue some of the alternatives proposed by USACE. The project's alternative plans which best provide and broaden wildlife habitat is preferred. I thank the United States Army Corp of Engineers for the opportunity to provide these comments.

Yours truly,

Janice Miano

Janice Miano

Comment Set 15: Janice Miano (January 24, 1998)

1. Please see the responses to Comments #11, #13, and #15 from Comment Set 11: Maricopa Audubon Society, Urban Habitat Committee.

2. Please see the response to Comment #12 from Comment Set 11: Maricopa Audubon Society, Urban Habitat Committee.

3. Please see the response to Comment #13 from Comment Set 11: Maricopa Audubon Society, Urban Habitat Committee.

4. Please see the response to Comment #14 from Comment Set 11: Maricopa Audubon Society, Urban Habitat Committee.

5. Please see the response to Comment #15 from Comment Set 11: Maricopa Audubon Society, Urban Habitat Committee.

North Mountain

VILLAGE PLANNING COMMITTEE

December 29, 1997

Comment Set 16

Dear Mr. Atonna:

Re: Rio Salado Habitat Restoration Project

Please accept this letter as support for the above referenced project being submitted for implementation.

If this project is accepted, the Rio Salado area will turn into a greenbelt to preserving fish and wildlife habitat. The North Mountain Village sees this project as a great benefit to over a million people annually who will walk through Rio Salado area for recreation, cultural experiences, nature and wildlife explorations.

The North Mountain Village Planning Committee has voted to support the Rio Salado Habitat Restoration Project proposals and hopes for a positive response in the funding process. Please feel welcome to contact me if further comments are needed.

Sincerely,

Richard Gramlich
Chairperson

c:\word5\crr\deshnm1

Comment Set 16: North Mountain Village Planning Committee (December 29, 1997)

Comment noted.

ED PASTOR
2D DISTRICT, ARIZONA

PLEASE REPLY TO:
☐ 2465 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515-0302
(202) 225-4065

COMMITTEE ON APPROPRIATIONS

Congress of the United States
House of Representatives

☐ 402 N. THIRD AVE.
PHOENIX, AZ 85003-1440
(602) 256-0551

☐ 2432 E. BROADWAY
TUCSON, AZ 85719-6008
(520) 624-9986

☐ 281 W. 24TH STREET, SUITE 118
YUMA, AZ 85364-6548
(520) 726-2234

Comment Set 17

January 8, 1997

Mayor Skip Rimsza
City of Phoenix
200 West Washington Street
Phoenix, AZ 85003

Dear Mayor Rimsza:

I apologize for not being able to personally attend the U.S. Army Corps of Engineers Public Hearing on the Phoenix Rio Salado Project. I am therefore asking that this letter be read into the record.

I strongly urge the Corps of Engineers to proceed expeditiously on the Rio Salado Wetlands Restoration Project. The Sonoran Desert and the Salt-Gila watershed have lost approximately 90% of their historic wetlands due in part to water engineering projects of the federal government. The Rio Salado project will help restore a portion of the valuable lost habitat along the dry river bed of the Salt River. While renewing the natural habitat and environment of a portion of the Salt, this project will undoubtedly spur community development and economic growth in the areas surrounding the project.

Recognizing the national environmental and local economic benefits of this project, the House of Representatives' Report for the FY 1998 Energy and Water Development Appropriations Bill included language which stated that the Committee "expects the Corps of Engineers to honor its commitment to the local project sponsor and complete the Rio Salado feasibility study in time for the project to be considered for authorization in the Water Resources Development Act of 1998."

As a member of the Appropriations Subcommittee on Energy and Water Development, I thank the Corps for its dedicated attention and hard work on this project. I look forward to seeing this project become a reality.

Sincerely,

Ed Pastor

Ed Pastor
Member of Congress

EP/dm:rp

Comment Set 17: Ed Pastor, Member of Congress (January 8, 1998)

Comment noted.

City of Phoenix
PARKS, RECREATION AND LIBRARY DEPARTMENT

Winner of the Carl Bertelsmann Prize

Comment Set 18

January 20, 1998

Mr. Peter Atonna, Deputy Planning Director
City Of Phoenix Planning Department
200 West Washington Street, 6th Floor
Phoenix, AZ 85003

Dear Mr. Atonna:

On October 23, 1997, the Parks and Recreation Board voted to endorse the habitat restoration project for the Rio Salado proposed by the City of Phoenix and the U.S. Army Corps of Engineers.

The Parks and Recreation Board is a seven-member organization composed of private citizens recommended by the Mayor and appointed by City Council. This Board assists the Parks, Recreation and Library Department in formulating policy to ensure park and recreation policies meet the needs of the community. This organization has been advising the department since the 1930s and is considered an integral part of future parks and recreation planning.

The Board has traditionally supported the expansion and preservation of natural habitats to ensure that future generations have access to these areas. We see the Rio Salado restoration project as a positive way to preserve the Sonoran Desert habitat that is a unique element of our community.

Please keep the Board informed on the progress of this proposed project.

Sincerely yours,

Flo Eckstein

Flo Eckstein, Chair
Parks and Recreation Board

2084t

200 West Washington Street, 16th Floor, Phoenix, Arizona 85003-1611 602-262-6861

Comment Set 18: City of Phoenix, Parks and Recreation Board (January 20, 1998)

Comment noted.

City of Phoenix
PLANNING DEPARTMENT

January 20, 1998

Winner of the
Carl Bertelsmann
Prize

BEST RUN CITY IN THE WORLD

Comment Set 19

On December 3, 1997, the Phoenix Planning Commission adopted a resolution to support the United States Army Corps of Engineers plan for habitat restoration of the Rio Salado/Salt River in Phoenix, Arizona. The vote to adopt the resolution passed with an 8-0 vote.

The Phoenix Planning Commission is a nine member body appointed by the Phoenix Mayor and City Council to serve as the body with primary responsibility to make recommendations to the Council on planning issues. The Commission has followed progress on the Rio Salado project through briefings from city staff and believe it can have a significant, positive impact on the surrounding community.

The Planning Commission supports the improvements to the river bed and neighboring properties which will result from this project. It appreciates the opportunity to learn about the project and voice its endorsement.

Jim Sasser

Jim Sasser, Chairperson
Phoenix Planning Commission

200 West Washington Street, Phoenix, Arizona 85003 602-262-7131 FAX: 602-495-3793

Comment Set 19: City of Phoenix, Planning Commission (January 20, 1998)

Comment noted.

PHOENIX ENTERPRISE COMMUNITY

City Manager's Office
200 W. Washington, 12th Flr.
Phoenix, AZ 85003-1611
(602) 261-8532
FAX: (602) 261-8327
www.ci.phoenix.az.us\BUSINESS\ecmenu.html

January 2, 1998

Comment Set 20

Lt. Col. Robert L. Davis
Division Engineer
U.S. Army Corps of Engineers
Los Angeles District
911 Wilshire Blvd.
Los Angeles, CA 90012

Dear Lt. Col. Davis:

On November 13, 1997, the Enterprise Community Steering Committee voted to endorse the habitat restoration project for the Rio Salado proposed by the City of Phoenix and the U.S. Army Corps of Engineers.

The Enterprise Community is a federally-designated area of central Phoenix. We are a commission comprised of people who live and work in the Enterprise Community and are appointed by the Mayor and City Council. The Phoenix Enterprise Community is bisected by the Rio Salado. For too many years, this dry riverbed has served as a barrier in our community. The habitat restoration project would create a bridge between the neighborhoods on the north and the south. It would give us a point of pride to focus on. It has the potential to revitalize our neighborhoods and provide an environmentally sensitive amenity, reflecting our Sonoran Desert lifestyle.

The goal of the EC Steering Committee is to oversee the revitalization and sustainable development of our central Phoenix community. A part of our original strategic plan was the support of a restored Rio Salado.

We are proud to support the Rio Salado habitat restoration project. We are proud to live, work and play in this often-overlooked part of Phoenix. We believe that this project will be an important part of the renaissance of our community.

Sincerely,

Gene C. Blue

Gene C. Blue
President, Arizona Opportunities Industrialization Center
Chair, Phoenix Enterprise Community Steering Committee

T:\DATA\ED\EC\RIORES.W61

Comment Set 20: Phoenix Enterprise Community Steering Committee (January 2, 1998)

Comment noted.

Comment Set 21

U.S. Corps of Engineers
3636 N. Central Ave.
Phoenix, Arizona 85012-1936

January 8, 1998

We, as members of South Valley/Laurel Estates Neighborhood Block Watch Association, recommend that the current plans per the recent feasibility report of the Rio Salado Project be put on fast track to its completion.

I was Chairman of the Citizens Advisory Committee for Target Area B in its early years. I remember attending a ground-breaking and introducing Mayor Margaret Hance at a park that was to abut the Rio Salado Project.

We are anticipating the coming of the project and I and other members of the South Valley/Laurel Estates Association are greatly pleased to have this showcase come to the rescue of this blighted area.

The Biltmore has its Adobe Golf Course, Scottsdale has its Fashion Square. We residents south of the river deserve something unique as a showcase for a long neglected area. Perhaps we can reverse the influx of the sources of the seeds of blight.

Sincerely,

Leo Rendon,
Past Chairman of Target Area B

Lu Rendon

Lu Rendon, President
South Valley/Laurel Estates Block Watch

Comment Set 21: Leo and Lu Rendon (January 8, 1998)

Comment noted.

MATT SALMON
MEMBER OF CONGRESS
FIRST DISTRICT, ARIZONA

COMMITTEES:
INTERNATIONAL RELATIONS
SUBCOMMITTEE ON ASIA AND THE PACIFIC
SUBCOMMITTEE ON INTERNATIONAL OPERATIONS AND HUMAN RIGHTS
SCIENCE
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT
SUBCOMMITTEE ON SPACE AND AERONAUTICS

Congress of the United States
House of Representatives

115 CANNON BUILDING
WASHINGTON, DC 20515
(202) 225-2635
e-mail: msalmon@hr.house.gov.

401 W. BASELINE ROAD, SUITE 209
TEMPE, AZ 85283
(602) 831-2900

COMMISSION ON SECURITY AND COOPERATION IN EUROPE
(HELSINKI COMMISSION ON HUMAN RIGHTS)
REPUBLICAN EDUCATION TASK FORCE

January 8, 1998

Comment Set 22

Mayor Skip Rimsza
City of Phoenix
200 West Washington Street
Phoenix, AZ 85003

Dear Mayor Rimsza:

As you know, I have been a supporter of the Rio Salado project since entering Congress three years ago. This project will help restore a portion of valuable lost wetland habitat along the dry river bed of the Salt River. It will also provide national environmental benefits, and it will encourage community development in the areas surrounding the project.

The U.S. Army Corps of Engineers has consistently supported the project, which requires only a small federal investment in addition to local resources. In order to begin the construction phase in 1999, Congressional authority will be required as part of the Water Resources Development Act of 1998. Thus far, the plan to restore the Salt River has proven to be sound both fiscally and environmentally. I trust that my Arizona colleagues will once again join me in supporting legislation that will move Rio Salado closer to completion.

Please consider this a statement for the record. I look forward to the realization of an important environmental and economic project in the first district of Arizona.

Sincerely,

MATT SALMON
Member of Congress

Comment Set 22: Matt Salmon, Member of Congress (January 8, 1998)

Comment noted.

P. O. Box 52025
Phoenix, AZ 85072-2025
(602) 236-5812
Fax (602) 236-5444

JOHN F. SULLIVAN
Associate General Manager
Water Group

January 27, 1998

Comment Set 23

HAND DELIVERED

Mr. Mike Ternak
U.S. Army Corps of Engineers
Planning Section C (Attn: CESPL-PD-WC)
3636 N. Central Avenue, Suite 740
Phoenix, Arizona 85012-1936

RE: Draft Rio Salado Feasibility Report and Environmental Impact Statement

Dear Mr. Ternak:

We have reviewed the Draft Rio Salado Feasibility Report and Environmental Impact Statement prepared by the U.S. Army Corps of Engineers (Corps) and would like to commend the Corps for its effort in providing a very thorough and informative analysis of the Rio Salado Project. SRP appreciates the opportunity to comment and hopes that you will find our observations useful in the preparation of the final Feasibility Report, Environmental Impact Statement and Record of Decision.

General Comments:

The Rio Salado Project will introduce a new water source to the stream bed for environmental restoration and incidental recreational uses. The Environmental Impact Statement (EIS) does not address the potential for increased water logging conditions downstream from the Phoenix reach of the Rio Salado. In recent years water levels have risen in the area downstream from the Rio Salado Project due to a number of factors, including fairly frequent flood flows, water releases from the 23rd and 91st Avenue wastewater treatment facilities, and reductions in groundwater use by area water users due to limitations imposed by the Groundwater Code and water exchanges between the City of Phoenix and the Roosevelt Irrigation District. Currently, in some areas, shallow groundwater must be pumped to lower the water table to enable agricultural lands to be farmed. SRP would like to see further evaluation of these conditions prior to completing the final Feasibility Report and EIS. To the extent that the Phoenix reach of the Rio Salado Project may exacerbate this problem, SRP 1 recommends that monitoring and mitigation of any impacts be required as a condition of the operation of the Rio Salado Project.

As recognized in both the Feasibility Report and the EIS, the habitat and recreational amenities created by Rio Salado will, on occasion, be impacted by flood flows released 1
from upstream SRP reservoirs. SRP was created to store and deliver water for the benefit of its shareholders. Although SRP cannot alter its current operations to provide for the preservation of a river bed resource, SRP will work with the operators of the Rio Salado Project to provide notification of water releases from SRP reservoirs.

Specific Comments:

1. Page III-11 and Appendix A, page 89:

   The water source for the Tempe Town Lake is not SRP water, as indicated. SRP's facilities may be used for the transportation and/or exchange of a non-SRP water supply, such as Central Arizona Project water, for use in the Town Lake. The text 2
   needs to be clarified to indicate that the water source is a non-SRP water supply which will be transported and delivered via SRP's transmission and distribution system.

2. Page V-7:

   The Corps should consider expanding its discussion of water rights in relation to the various water supply alternatives being considered. For example, the need to "find" a water supply is driven by the fact that the land in the bed of the river has limited water rights. Although the riverbed is located in SRP's service area, there are no SRP water rights appurtenant to this land. This prevents SRP from 3
   delivering SRP water to Rio Salado without being paid back with an alternative water supply via a water exchange. A discussion of these issues and their effect on the cost for the various water supply alternatives would be helpful for decision makers in evaluating the water supply alternatives.

3. Page VI-2, 7:

   The Draft Feasibility Report indicates that the proposed source of water for Rio Salado in both Tempe and Phoenix reaches is groundwater. Tempe well #6 will evidently serve as the water supply for the Tempe reach and six new wells will serve the Phoenix reach. Tempe's well is located on non-member land and is available, after some wellhead treatment, for use in the riverbed. It is our 4
   understanding that excess water may be available from well #6 and that it likely will be discharged to SRP's Indian Bend pump ditch. We would request that the operational parameters for this discharge be worked out between Tempe and SRP before this excess water is discharged to the Indian Bend pump ditch.

As for Phoenix, SRP recommends that Phoenix staff work with SRP staff to locate the six new water supply wells to ensure that they are located on non-member land and are designed to meet prior contractual obligations between Phoenix and SRP (e.g. limitations on connecting wells to Phoenix' potable system, pumping limited to non-member demand, etc.). **4**

4. Page VI-8:

It is mentioned that remediated groundwater from the Motorola 52nd Street Superfund Site may be a possible supplemental water supply for the Phoenix reach of the Rio Salado Project. We are uncertain whether the wells which will be used to pump the water to be remediated are on member or non-member lands. To the extent those wells are located on member lands, as indicated previously, such water could only be used in the Rio Salado Project in accordance with a water exchange. We believe that an acceptable water exchange arrangement could be put in place with Phoenix and/or Motorola to accommodate the use of this water in the Rio Salado Project. **5**

5. Appendix A, page 88:

SRP was authorized under the 1902 Reclamation Act for the purpose of developing a water storage and delivery system to ensure an adequate water supply for the shareholders of the Salt River Valley Water Users' Association. The reservoir system operated by SRP was not developed for flood control purposes. The text here should be clarified if the intent is to describe the flood control features of Modified Roosevelt Dam. **6**

Thank you for the opportunity to provide our input. I hope you find these comments useful. Please feel free to call Greg Kornrumph from my staff at 236-3264 if you have any questions about our comments.

Sincerely,

David C. Roberts for

John F. Sullivan

cc: Mr. Peter Atonna, Phoenix
Mr. Bill Chase, Phoenix
Mr. George Fletcher, Tempe
Mr. Greg Kornrumph, SRP
Mr. Tom Suriano, Motorola

Comment Set 23: Salt River Project (January 27, 1998)

1. The proposed project should have no effect on water logging problems downstream. Groundwater modeling performed by the Corps (see Appendix A of the Feasibility Report) indicates that the project will not significantly raise the groundwater level in the immediate vicinity of the Phoenix Reach and, therefore, should have no effect on downstream groundwater levels. Furthermore, the project is actually a net consumer of groundwater, with only an estimated 61% of the water recharging back into the aquifer (due to evaporation and transpiration).

2. Correction noted. The Salt River Project (SRP) will not be supplying water for the Town Lake project, although SRP's facilities may be used to deliver water to the project. The text of the Final Feasibility Report has been corrected.

3. Suggestion noted.

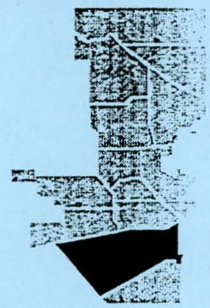
4. Comment noted. The City of Phoenix intends to locate its wells for the proposed project on non-member lands.

5. Comment noted.

6. Comment noted.

South Mountain

VILLAGE PLANNING COMMITTEE



January 20, 1998

Comment Set 24

Dear Mr. Atonna:

This letter is in support of the Phoenix Rio Salado Habitat Restoration Project. This project would benefit the South Mountain Village by revitalizing a dry river bed after many years of environmental neglect.

The Rio Salado (Salt River) is the gateway to South Mountain Village, which is an area with a rich and diverse historical background. Restoration of the river would have a positive impact on the village by creating low water flows, pathways and trails; as well as returning natural vegetation and wildlife to the river. Not only would it benefit South Mountain Village, but would also allow all Phoenix residents recreational and cultural opportunities to enjoy such a vast natural resource.

The South Mountain Village Planning Committee at their November 12, 1998 meeting voted to unanimously approve this project, and recommend that Rio Salado be given full consideration and approval in the 1998 Water Resource Development Act as a U.S. Army Corps of Engineers project. If further comments are needed, please feel free to contact me.

Sincerely,

John Hart

John Hart, Chairman
South Mountain Village Planning Committee

Comment Set 24: South Mountain Village Planning Committee (January 20, 1998)

Comment noted.

BOB STUMP
3D DISTRICT, ARIZONA

211 CANNON BUILDING
WASHINGTON, DC 20515-0303
(202) 225-4576

DISTRICT OFFICE:
230 N. FIRST AVENUE
2001 FEDERAL BUILDING
PHOENIX, AZ 85025
(602) 379-6923

Congress of the United States
House of Representatives
Washington, DC 20515-0303

VETERANS' AFFAIRS COMMITTEE
CHAIRMAN
SUBCOMMITTEE ON HOSPITALS AND HEALTH CARE

NATIONAL SECURITY COMMITTEE
VICE CHAIRMAN
SUBCOMMITTEE ON MILITARY INSTALLATIONS
SUBCOMMITTEE ON MILITARY PROCUREMENT

REPUBLICAN STEERING COMMITTEE

Comment Set 25

January 8, 1998

Mike Ternak
Study Manager
Corps of Engineers
Suite 740
3636 North Central Avenue
Phoenix, Arizona 85012-1936

BY FAX: (602) 640-5383

Dear Mr. Ternak,

It is my pleasure to support the Phoenix Rio Salado Project. I am sorry that I am unable to attend the public comment meeting personally tonight and respectfully request that the following comments be entered into the record.

The Phoenix Rio Salado Project is truly visionary and I am pleased to see the thoughtful and detailed work that has gone into making the Feasibility Plan. It is this very care and planning that will make the Phoenix Rio Salado Project a gem in the desert for all to enjoy, and not a mirage.

Residents and visitors to the Valley of the Sun will be able to enjoy the scenic desert riparian habitat of the Phoenix Rio Salado Project and the recreational opportunities that it will afford.
As water brings life to the desert, similarly, the Phoenix Rio Salado Project will be a catalyst for community revitalization in adjacent inner city neighborhoods, neighborhoods that have been blighted by illegal dumping and the lack of greenspace for exercise, or quiet contemplation.
Aside from the very practical benefit of enhancing existing flood management features, the habitat restoration component of the Phoenix Rio Salado Project will leave a positive and lasting legacy, a river full of life, where a dry river bed once scarred the environment.

I commend all who have worked so diligently to prepare the Feasibility Plan that sets the foundation for bringing this project into fruition.

Best wishes.

Sincerely,

BOB STUMP
Member of Congress

Comment Set 25: Bob Stump, Member of Congress (January 8, 1998)

Comment noted.

7 January, 1998

Comment Set 26

Project Manager, Rio Salado Feasibility Study/Phoenix
U.S. Army Corps of Engineers
3636 N. Central Ave.
Phoenix, AZ 85012-1936

Subject: Citizen Commentary

I have been deeply interested in this project since early 1997. I have followed the memoranda issued by the assistant city manager, and in December 1997 I was an attendee at a briefing by a representative from City of Phoenix Neighborhood Services Department. I have written various city officials stating my concerns, and had an article published in the Arizona Republic, which in its net, requested that the city place the issue on a ballot before any funds are spent.

I am in receipt of the December 1997 summary report prepared by the Phoenix Planning Department.

While referencing Webster New World Dictionary for definitions of Feasible/Feasibility, the words "Possible", "Reasonable", and "Practicable", all caught my attention, because at least in my mind, while reasonable and practicable indicate *desired aspects*, possible on the other hand is an intangible term weighted heavily by time-effort-expense-expertise of the participants.

I am of the opinion, that just about anything, including a Mars exploration by live astronauts or a wetlands/wildlife project in the current Salt River bed is possible. The question becomes one of prioritization's, costs, and returns on investments.

Let us take a look at the big picture. The U.S. Army Corps of Engineers has a proud history of engineering projects not only in the U.S.A., but around the world. The Corps of Engineers activities are funded by annual federal budgets and a congressional appropriation, based upon national needs, and the availability of federal income tax dollars.

Failing to find a need based upon flood control or other functional issue, the Corps by participation in this project, is evidently attempting to stretch its funding authority, to tap into a continuing piece of 1993 *pork barrel* legislation which broadly interpreted says that the corps can apply for funds to "fix up" previous federal screwups, under catch-all paragraphs dealing with water quality, recreation and habitat restoration. Shame on the congress of the United States for writing the legislation, and *shame on the otherwise prestigious Corps of Engineers* for agreeing to take part in a project which effectively landscapes river bed properties, which were acquired pillaged and defaced by private corporations (not a federal entity), through another federal/state travesty, which permitted phony, now grandfathered, mining claims at $25 or less per acre, to be filed upon lands which were natural resources.

Now the Sand and Rock companies (2) which effectively own 85% of the river bed properties in question, extending through both sides of the river, have evidently reached a point where it is no longer profitable to haul away a diminishing amount of available gravel, but they would like to further capitalize upon their initial robbery, by getting a combination of federal, state, county and city entities to repair the damage they caused, plus enhance the value of their properties adjacent to the river bed for future development projects.

I supported the original 80's referendum to commercialize the Rio Salado project through Phoenix, I would support a similar but lesser project, at this point in time, provided that it attempted to provide developments which would return tax revenues to the city, but I will not support a wetlands project in the middle of the city, including the expenditure of funds by the city of Phoenix to acquire property rights, drill and maintain and purify the water from 6 wells, or manage this project once the corps and other entities fade away from the picture.

To gain my support, and I am certain that I am not alone, this project must be modified to include a redirection of priorities as follows;

(a) Quit claim deeds (no cash purchases in excess of $25. per acre) to the city of Phoenix by Current Sand and Rock companies owning the river bed and all adjacent properties to a point not less than 150 feet from the outer edge of a new concrete channel, regardless of its ultimate width.

(b) A permanent concrete lined flood control channel meeting Maricopa County Flood Control District standards and sufficient in length (not less than the total project as currently defined, or any subsequent expansion to the east or west), depth and width to handle even a 100 year flood. A design similar to the AC/DC channel which runs adjacent to the Arizona Canal in north Phoenix would be a definite plus.
Both resulting channel banks (150 feet in width) to be filled and leveled to include paved limited access maintenance roads, limited access bicycle and hiking trails with native shrubbery landscaping, to provide a park like atmosphere, including remudas and durable childrens recreational equipment.

(c) Estimated annual upkeep expenses in excess of $1,000,000. or total multi year project development costs in excess of $20,000,000., *where borne by the the City of Phoenix*, would have to be pre-approved by the voters in the form of a ballot referendum.

Sincerely

Don

Donald R. Taylor, a concerned very long time resident.

816 East Butler Drive
Phoenix, Arizona 85020-3451
602-944-4215

Comment Set 26: Donald R. Taylor (January 7, 1998)

Comments noted.

January 14, 1998

Comment Set 27

US Army Corps of Engineers
Mr. Alex Watt
Environmental Resources Branch (ATTN: CESPL-PD-RQ)
P.O.Box 532711
Los Angeles, CA 90053

Re: COMMENTS ON THE DRAFT EIS FOR RIO SALADO PROJECT FOR TOXIC WASTE INVESTIGATIVE GROUP

Dear Mr. Watt:

Toxic Waste Investigative Group (TWIG) is an Arizona non-profit environmental organization with numerous members in South Phoenix. TWIG's address is c/o Pamela Swift, P.O. Box 6173, Phoenix, AZ 85009. TWIG's telephone number is (602) 272-6997. The following are TWIG's comments on the Draft Environmental Statement for the Proposed Rio Salado Project.

COMMENTS ON THE DRAFT EIS FOR RIO SALADO PROJECT
for Toxic Waste Investigative Group

The Draft Environmental Impact Statement (DEIS) for the Proposed Rio Salado Project is insufficient for the following reasons:

The assertion that this Rio Salado Project is about "environmental restoration" is a ruse to cover the actual agenda, which among other things includes a plan to use taxpayer money to cover the millions of dollars of liability of various companies and various corporations that own defunct and closed landfills along the Salt River bed, the City of Phoenix, and the cleanup and restoration costs of cement companies and sand and gravel outfits along the Salt River bed. This Rio Salado plan failed in several democratic elections, so now the political forces behind Rio Salado are using this "environmental restoration" ruse and attempting to use federal money, hence the bogus Draft Environmental Impact Statement (DEIS).

After these previous elections, where voters turned down propositions to have property taxes raised to pay 1
for the cleanup, concerned citizens opposed to the Rio Salado project called a press conference and appealed to the Phoenix City Council, Mayor Goddard, and other stakeholders to work with the Arizona Department of Environmental Quality (ADEQ), using the Dames and Moore Report prepared for ADEQ, which specifically identifies and lists the responsible parties who would be liable for the toxic cleanup, AND MAKE THESE POLLUTERS PAY TO CLEAN UP THEIR OWN POLLUTION AND DUMPS! After this cleanup, which should have been ordered long ago, then the issue of Rio Salado could be revisited. For ten years, this has been still ignored.

The Rio Salado Project is also another ruse to provide an avenue for the City of Phoenix to condemn
property along the Salt River, and then hand the land over to BIG MONEY INTERESTS so they can 2
build hotels and other commercial developments.

The scam includes the new assertion that the dry river bed is somehow now "ugly" or unsightful. No one thought so until a cleanup at taxpayer and not Principally Responsible Party (PRP) expense was desired. A no action alternative is written off in the DEIS as not solving this new artificial "ugliness" crisis.
Curiously enough, tourists come from all over the country to admire and tour amidst the deserts of 3
Arizona, and they see plenty of empty riverbeds and dry gulleys in their travels. Following the Rio Salado Project "ugliness" rationale, we would be spending considerable fortunes soon converting Arizona all around the state to Minnesota.

There really ought to be a full accounting of all money spent on this Rio Salado Project, not just this latest 4 version/resurrection, but all the money ever spent. Who got it and what was it spent on? Too much is unaccounted for now, and attempts by the public and interested parties to get this information have been ignored and/or rebuffed. 4

Regarding "environmental restoration," restoring a riparian ecosystem along the Salt River bed is 50 years too late. Once a riparian ecosystem is destroyed, it cannot simply be recreated by adding water. There are other, newer problems with this concept. There is one of the nation's busiest airports along the banks of the Salt River and sandwiched between the Tempe and Phoenix projects. There are also now a large number (63) of landfills and dumps along the the Salt River bed that were not there when the riparian system existed before the Salt River dried up. Restoring the riparian areas by adding water constantly will only cause these landfills to be inundated and seep their chemical wastes and germs into the aquifer and riverbed. When the next floods along the Salt River arrive, and they surely will, much of these 63 landfills that have been softened up by the inundation caused by the Rio Salado Project will wash out and along the Salt River bed. Also, the recharge caused by the seepage and constant waterflow from the Rio Salado Project will affect the flow of water into and around the 19th Avenue Superfund Site, and to make the claim in the DEIS that not recharging near this landfill will somehow stop this effect is ludicrous and unscientific. The liners for landfills always leak, eventually, and so will the liners of the Rio Salado Project. 5

The DEIS states, "During construction, should an area of suspected contamination be encountered, construction activity in the area shall be stopped and soil sampling shall be conducted to determine the nature and extent of the potential contamination. If testing indicates that contamination does exist, the area shall be cleaned up in accordance with applicable State regulations." It is no accident that federal standards are not mentioned or used here in this federal DEIS, *especially since the State of Arizona has just relaxed by a considerable margin and factors of 10 to 100 its cleanup standards*. If severe contamination is found, it can take decades, even hundreds of years to clean up. So what will really happen when this contamination is found, for it is surely there, is that it will really be just covered over, and the Rio Salado Project would just go on as if nothing happened or was found. Otherwise, the Rio Salado Project will never be built, while waiting for a cleanup of the contamination. There are plenty of other mysterious plumes of contamination, mostly solvents, found near and traveling towards the Salt River bed, enough that the state's "environmental" agencies and City of Phoenix have tried to stop looking and recording them. Similarly, when there were barrels of hazardous waste found at the 19th Avenue Landfill Superfund Site recently during excavations there, these were just reburied at the landfill, hardly in compliance with State or federal law. The Arizona Department of Environmental Quality and the United States Environmental Protection Agency were and are fully aware of all of this, but the barrels are still at the site of their re-burial. 6

The issue of what the next floods will have on the Rio Salado Project are not adequately addressed. As with most of the DEIS, unsubstantiated piffle is used to sidestep the real impacts of the Rio Salado Project, as if honorable mention and discussion of some of what we know is sufficient to lay the foundation for asserting that there will not be sufficient impacts. There is little or no scientific basis to support the conclusion that there will "no significant impact" caused by the Rio Salado Project. The DEIS is inadequate in its analysis and conclusions. 7

There are also new invader species since the Salt River bed dried up that would irreversibly complicate a "restored" riparian ecosystem. An example of this is bermuda grass, which in a short amount of time would **choke** all the banks and areas adjacent the Rio Salado Project with its growth. There are no natural controls on this bermuda, or on several other invasive foreign plant and animal species that would prevent the successful re-creation of the riparian area planned for the Rio Salado Project. 8

The cost of cleaning up these old landfills is mentioned in the DEIS as $49.5 to $90.8 million, but there is not documentation to make any of this a firm figure. The Dmes and Moore Report is a few years old now, and the projected costs of a cleanup as stated in the Dames and Moore Report and listed in the DEIS are not adjusted for inflation. 9

The DEIS states the effects of transportation, the effects of the extra traffic this Rio Salado Project is 10

purported to bring as people travel to the Rio Salado Project area to recreate, will be not significant, which
is an admission either that *few* people are *actually* expected to go near the Rio Salado Project, or else it is 10
an unsubstantiated assumption.

With the Surface Water Quality Standards for the Rio Salado project, there would have to be a high fence
to keep people away from the dangerously polluted water and to help prevent contact with the water.
Some recreation area that would be behind the chain-link, ten-foot high fence! The public could really
enjoy that Rio Salado Project through that big fence, couldn't they? The alternative is to just endanger the 11
public and allow them near this water with these unsafe standards. People will also fish there even if
there are signs warning them not to.

The DEIS even admits that many of the plants planned for revegetation in the Rio Salado Project would
be harmed by high concentrations of Total Dissolved Solids (TDS), but there are **no** Surface Water
Quality Standards for the Salt River in the Phoenix portion of the Proposed Rio Salado Project for TDS,
Total Suspended Solids (TSS), or even Chlorides, Fluorides, Nitrates, which are all salts and harmful to 12
plant life, or DBCP. Since there is no standard, there is no way to enforce a water quality that would
prevent the revegetation project from being poisoned and replanted year after year on taxpayer expense.
Then again, maybe the dead vegetation would just be left there. There is nothing in the DEIS that
addresses this.

The DEIS mentions in a favorable light the Tres Rios Project, which purported was built to create a
riparian area in the vicinity of the 91st Avenue Wastewater facility operated by the City of Phoenix using
that facility's water and using the Tres Rios to treat the water. It has recently come to public light that all
is not going as planned at the Tres Rio Project, and that the mosquito that carries equine encephalitis has
been caught in mosquito traps near there. This raises the specter of what will happen when the Rio
Salado Project is built. In the DEIS, mosquitoes would be controlled by "native predators" that "will be
introduced or attracted to the area should mosquitoes become problematic." Once these mosquitoes
become "problematic," the damage is done and it is too late. Once there is an outbreak of any disease
carried by these mosquitoes, and/or when clouds of these mosquitoes find the spectators at a night game at
the baseball stadium, the effect will be that people will desert the downtown area and Salt River bed and
the businesses and communities nearby will suffer severe economic hardships. Besides, these natural
controls somehow have not worked well enough at Tres Rios to prevent a problem. Fortunately, the Tres 13
Rios Project area is sparsely populated at present; the Rio Salado Project is near hundreds of thousands. In
the DEIS, there assertion is made that "No chemical pesticides shall be employed." This is an empty
promise and unenforceable. If natural controls fail than clouds of Malathion will surely blanket the area,
as well as downtown and South Phoenix.

The DEIS is insufficient on many grounds, including failure to investigate fully the impacts of mosquitoes
and the diseases they will vector to people and animals, the impacts of the use of pesticides to control
these mosquitoes, the nuisance effect these mosquitoes will have in the area and indeed on the
neighborhoods and businesses unfortunate enough to be near the Rio Salado Project, including the
baseball stadium and central Phoenix and South Phoenix.

Posting signs prohibiting the dumping of pets in the Rio Salado will not prevent them from from being
dumped there or ranging there, and reporting them to local animal control officials won't stop the harm 14
they will cause to the riparian ecosystem, and potentially, to people.

The construction of riparian areas will attract birds, which will not mix well with the airport that exists
here now. There will tragic encounters with birds, causing planes to crash and killing people and causing
great amounts of property damage. Because the Tempe and Phoenix projects will be at either end of the
airport, birds will naturally flock back and forth. In other wildlife restoration projects, the proximate 15
habitats would be considered the creation of two habitats with a natural wildlife corridor. This natural
tendency of birds to flock back and forth between habitats is not even addressed in the DEIS.

The DEIS process deliberately excluded almost everyone and every group in the Environmental Justice
area identifed by ADEQ. ADEQ's Environmental Justice Program has always been just a sham. 16

specifically designed to discourage the participation of affected parties and concerned community groups in South Phoenix. The panel was hand-picked by ADEQ staff and those others who asked to be put on the panel were not. South Phoenix residents who have attended these meetings have been summarily ignored by ADEQ staff and/or only given five (5) minutes to speak, and only at the end of these ADEQ EJ meetings. When ADEQ had its one and only formal public meeting regarding its EPA-funded Environmental Justice Project, only three (3) people from the public spoke at the comment period, and their comments were never addressed or responded to by ADEQ.

Further, the Corps of Engineers knew from previous meeting held years ago about the Rio Salado Project that Carolina Butler, Filiema Durazeo, Pamela Swift, Bob Witzman, and Phil Welch had all stated clearly that they wanted to be notified of any subsequent meetings or hearings about the Rio Salado Project, should any more be held. NONE of these people were EVER notified any of the meetings held by the Corps of Engineers as mentioned in the DEIS. And some of these meetings were held in San Francisco. How would affected parties in Phoenix be able to attend these San Francisco meetings, unles they are the fat cats this scam is actually supposed to help? This is also an Environmental Justice issue. At the meetings attended by the people just mentioned, the sand and gravel outfits and dump owners talked about what they wanted out of this Rio Salado Project, a cleanup, and NONE OF THEM EVER MENTIONED RESTORATION OF THE VEGETATION AT ALL! This previous testimony really does show the real
agenda of the Rio Salado Project. Their comments were taped by other attendees, incidentally. 16

The DEIS was never provided to **any** groups that work on Environmental Justice issues in South Phoenix, even recipients of EPA Environmental Justice grants. There has not been any attempt to conduct hearings or an outreach to South Phoenix about the Rio Salado Project, in direct violation of Executive Order 12898. The list of parties contacted betrays all of this. The sand and gravel outfits, City of Phoenix, certain companies, all were contacted and provided the DEIS and opportunity to comment. South Phoenix residents and community groups were left out of the process. If the goals of Executive Order 12898 were indeed to be followed and accomplished in the Rio Salado Project, there would be the effort to "promote enforcement of all health and environmental statutes." This, of course, would require the federal government and state to enforce the laws requiring the cleanup of these landfills and Superfund Sites along the riverbed, and not force the taxpayers to pick up the costs. If public participation were ensured, then it would have already happened, and there would have been meetings aplenty in South Phoenix about this, and there weren't. And if the goal of improving "research and data collection relating to the health of and environment of minority populations and low-income populations" were to be achieved, there would have had to have been these aforementioned meetings that somehow never happened, and these topics would have been discussed. The Executive Order on Environmental Justice has been ignored and certainly not fulfilled.

The harmful effects politically and culturally of going forward with this Rio Salado Project are not fully investigated. To force this upon the taxpayers after they have repeatedly voted it down is undemocratic and more close to fascism. Tempe, when voting on this in previous years, approved it by a margin of only three (3) votes. The rest of the voters in other areas, especially Phoenix, resoundingly voted down this proposed Rio Salado Project, more than once. To use federal funds to do this now sends the message that
the voters no longer have democracy here in Arizona, which may be true, but disheartening nonetheless. 17

The DEIS is horribly deficient for, but not limited to, the aforementioned reasons. A real, full blown, competent, Environmental Impact Statement that actually includes the steps and follows the legal requirements of the NEPA law is necessary for the Rio Salado Project in order to comply with federal NEPA law. The DEIS does not suffice.

Sincerely,

Pamela Swift

Pamela Swift
TWIG

Comment Set 27: Toxic Waste Investigative Group (January 14, 1998)

1. Please see the response to Comment #1 from Comment Set 7: Don't Waste Arizona, Inc.

2. The proposed project does not involve the condemnation of any land for the purposes of private land development.

3. Please see the response to Comment #2 from Comment Set 7: Don't Waste Arizona, Inc.

4. Please see the response to Comment #3 from Comment Set 7: Don't Waste Arizona, Inc.

5. Please see the response to Comment #4 from Comment Set 7: Don't Waste Arizona, Inc.

6. Please see the response to Comment #5 from Comment Set 7: Don't Waste Arizona, Inc.

7. Please see the response to Comment #6 from Comment Set 7: Don't Waste Arizona, Inc.

8. Please see the response to Comment #7 from Comment Set 7: Don't Waste Arizona, Inc.

9. Please see the response to Comment #8 from Comment Set 7: Don't Waste Arizona, Inc. The information presented in the Draft Feasibility Report is a brief summary of previous studies relevant to the project area. It is simply intended as background information. No attempt has been made to update these studies.

10. Please see the response to Comment #10 from Comment Set 7: Don't Waste Arizona, Inc.

11. Please see the response to Comment #13 from Comment Set 7: Don't Waste Arizona, Inc.

12. Please see the response to Comment #14 from Comment Set 7: Don't Waste Arizona, Inc.

13. Please see the response to Comment #15 from Comment Set 7: Don't Waste Arizona, Inc.

14. Please see the response to Comment #16 from Comment Set 7: Don't Waste Arizona, Inc.

15. Please see the response to Comment #17 from Comment Set 7: Don't Waste Arizona, Inc.

16. Please see the response to Comment #18 from Comment Set 7: Don't Waste Arizona, Inc.

17. Comment noted.

United States Department of the Interior

BUREAU OF RECLAMATION
Phoenix Area Office
P.O. Box 9980
Phoenix, Arizona 85068-0980

IN REPLY REFER TO

PXAO-1500 ENV-6.00

JAN 23 1998

Comment Set 28

Mr. Alex Watt
Environmental Support Section
U.S. Army Corps of Engineers
Los Angeles District Office
PO Box 532711
Los Angeles, California 90053-2325

Subject: Review of Draft Feasibility Report and Environmental Impact Statement (EIS) for the Rio Salado, Salt River, Maricopa County, Arizona

Dear Mr. Watt:

Thank you for the opportunity to review and comment on your draft Feasibility Report and EIS for the Rio Salado Project. Reclamation generally supports the proposed alternative. We will also be a cooperator on the upcoming EIS for the Tres Rios River Management Plan being prepared by your office. Consequently, we are very interested in impacts from the proposed Rio Salado development on the downstream Tres Rios River Management Project.

Enclosed for your information are our comments. If you have any questions, please contact Ms. Diane Laush at 602-395-5694.

Sincerely,

Bruce D. Ellis

Bruce D. Ellis
Chief, Environmental Resource
Management Division

Enclosure

cc: Ms. Nancy Kaufman, Regional Director, U.S. Fish and Wildlife Service, PO Box 1306, Albuquerque, New Mexico 87103 (w/encl)

COMMENTS
DRAFT FEASIBILITY REPORT/ENVIRONMENTAL IMPACT STATEMENT
RIO SALADO, SALT RIVER, ARIZONA

GENERAL

The Bureau of Reclamation supports the proposed alternative which will provide an overall benefit to the degraded habitat. The EIS was well written, we especially liked the format which described what criteria constitutes a significant impact. The specific comments are described below.

Section — Comment

2.1.3 Based on problems that have arisen with the Tres Rios Demonstration wetland with respect to mosquitos, I would suggest the use of bulrush species which have the least number of stems per square meter to facilitate the predation of mosquito larvae by fish and aquatic insects. 1

A similar problem could occur with the establishment of *Fragmites* which also tends to form dense clumps

2.1.4 In reference to statement that it may take several seasons to develop the wetland; it took less than 6 months for the Tres Rios Demo project to completely fill in the wetland habitat. 2

No discussion in the EIS on the amount of sediment that would be removed every year or the disposal site.

3.5.1.1 Cooper's hawk is a permanent resident raptor (sharp-shinned is only winter resident)

Harris Hawks are not riparian species but occur in the open desert predominately in sagauro/palo verde habitat. Similarly, prairie falcons also hunt in open terrain, not riparian habitat.

Peregrine falcons can currently be found in using riparian habitat in the area as wintering habitat. Consequently they probably 3 formerly used the Rio Salado area. However, any nesting habitat occurs over 20 miles upstream. Another raptor species that likely formerly used the area would have been osprey.

The following species were formerly listed as Category 2 under the ESA, but are no longer on any official State or Federal list: loggerhead shrike, California leaf-nosed bat, longfin dace, Sonoran sucker, desert sucker, and Yavapai pocket mouse.

3.5.1.2 Replace "lizard" with "herpetofauna" in the following sentence: Lizards present are limited to coachwhip, gopher snake . . . 4

4.4 Flooding - No real discussion of the percentage of habitat that could be lost due to flooding and how often this could happen. There is also no discussion of the effect of this vegetation on downstream areas. Around 91st Avenue, there is considerable 5 vegetation in the river bottom. Could the upstream debris pile up and exacerbate flooding? This situation has happened before and is the subject of an ongoing lawsuit.

4.5.2.1 Recommend an actual commitment to leave intact the small riparian habitat on the south side of the Salt River, west of I-10. Why destroy the type of habitat you are spending money to create.

Commitment B-1 - The role of tamarisk in wildlife value is not as cut and dried as it used to be. Well over 50% of the endangered southwestern willow flycatcher nests in Arizona from 1993 to 1996 were in tamarisk. In 1997, over 90% on known nests were in tamarisk. Consequently, the value of tamarisk to wildlife cannot be so easily dismissed. (Although it is understood that the saltcedar in the project area is not suitable for southwestern willow flycatchers at this point in time.)

Wildlife - There was no discussion of impacts to wildlife as a result of habitat loss from flooding. It was suggested that due to surrounding development, wildlife would be limited to birds and bats. However, the river corridor itself will provide a pathway for wildlife (mammals) once the habitat is developed. However, unlike a more natural situation, there would not be any alternate areas available to provide habitat for wildlife after flooding. 6

Commitment B-8 - I would suggest coordination with the FWS to utilize native fish such as the Gila topminnow (experimental, non-essential population) to aid in mosquito control in addition to the species listed. With respect to the establishment of purple martins, according the Maricopa Audubon, they are a rare summer visitor in the Phoenix area. I would delete them from your list.

Appendix A Some of the species listed are not very common in the area. Horned grebe is a rare transient; replace with eared grebe and pied-billed grebe
short-eared owl is uncommon winter visitor
mountain bluebird is an irregular winter visitor 7
Lawrence' goldfinch is an irregular winter visitor

Comment Set 28: U.S. Department of the Interior, Bureau of Reclamation (January 23, 1998)

1. Suggestion noted. This suggestion will be considered in formulating the planting plan for the wetland areas.

2. Comment noted. While the wetland vegetation is expected to fill in quickly, it will probably take longer for a more complete aquatic ecosystem to develop.

   The Salt River channel in the two project reaches in a sediment-deficient condition because very little sediment is transported to the project area under current conditions. Therefore, sediment accumulation is not expected to be a significant problem. It is anticipated that any sediment that needs to be removed from the habitat areas can be redistributed within the river channel. If it is necessary to remove accumulated sediment from the channel in the future, a disposal site will be identified at that time.

3. Comment noted. The appropriate corrections have been made to the text of Section 3.5 in the Final EIS.

4. Comment noted. The appropriate corrections have been made to the text of Section 3.5 in the Final EIS.

5. Vegetation damage associated with flood flows is discussed in Section VI-D of the Draft Feasibility Report. Additional detail is provided in Appendix A of the Draft Feasibility Report. It was estimated that a 100-year flood would damage 95 percent of the vegetation in the channel. This damage includes uprooted vegetation as well as plants that may be damaged due to prolonged inundation until flood waters recede. The largest flood that would not cause appreciable vegetation damage was taken as the flood that would first exceed the capacity of the low-flow channel (typically less than a 5-year flood). The damage-discharge relationship was assumed to be a straight line between this event and the 100-year flood. On average, 7 to 11 percent of the vegetation would be damaged annually.

   The additional debris that would be added to flood waters by the proposed project is considered insignificant in comparison to the total amount of debris which is currently transported from upstream sources.

6. It should be possible to retain the existing habitat area located on the south side of the river channel, west of Interstate 10. This may require a shift in the currently proposed alignment of the low-flow channel. This modification would be reflected in the final design for the Phoenix Reach.

   It is true that tamarisk does have some wildlife value even though it is a non-native species. The primary concern is that it aggressively out-competes native vegetation which is more valuable to native wildlife than tamarisk. In addition, the intent of the project is to restore natural habitat and tamarisk and other non-native vegetation are not part of the natural riparian ecosystem of the Sonoran Desert.

A consequence of creating habitat in a floodway is that the habitat will be periodically damaged by floods and wildlife will be temporarily displaced. As indicated in the comment, this would primarily be a concern for the various small mammals that would inhabit the area. At this time, there is no plan for providing a haven for wildlife displaced by flood waters; however, the mesquite habitat planned for the overbanks may provide a temporary refuge. To some degree, this situation already exists since the river channel currently serves as a wildlife corridor (although in a degraded condition). The animals adapt to the upheaval caused by flooding and will move to other areas until habitat in the river channel is re-established. This situation will be treated in a manner similar to other urban interface areas in the Phoenix metropolitan area where similar conditions currently exist. This includes public education programs to inform the public about what to do when they encounter wildlife which inhabits these urban interface areas. When specific problems arise, they will be handled by local animal control officials in conjunction with the Department of Game and Fish.

We agree that the use of the native Gila topminnow as an experimental, non-essential population would be preferable to the use of mosquitofish for mosquito control. Studies have shown that the Gila topminnow is a very effective mosquito predator. This option will be investigated further. Purple martins have been deleted from the list of potential mosquito predators in the Final EIS.

7. Comment noted.

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
600 Harrison Street, Suite 515
San Francisco, California 94107-1376

January 23, 1997

Comment Set 29

ER 97/709

Mr. Alex Watt
U.S. Army Corps of Engineers, Los Angeles District
P.O. Box 532711
Los Angeles, CA 90053-2325

Dear Mr. Watt,

The Department of the Interior has reviewed the Draft Feasibility Report and Environmental Impact Statement (EIS) for the Rio Salado, Salt River, Maricopa County, Arizona, and has no comments to offer. 1

Thank you for the opportunity to comment on this document.

Sincerely,

Patricia S Port

Patricia Sanderson Port
Regional Environmental Officer

cc: Director, OEPC (w/orig. incoming)
Regional Director, FWS, Region II

Comment Set 29: U.S. Department of the Interior, Office of the Secretary (January 23, 1998)

Comment noted.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

75 Hawthorne Street

San Francisco, CA 94105-3901

Comment Set 30

Alex Watt
Environmental Resources Branch
U.S. Army Corps of Engineers
P.O. Box 532711
Los Angeles, California 90053

JAN 2 3 1998

Dear Mr. Watt:

The U.S. Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement (DEIS) for the ***RIO SALADO ENVIRONMENTAL RESTORATION PROJECT, Salt River, Maricopa County, Arizona***. Our comments are provided under the National Environmental Policy Act (NEPA), Section 309 of the Clean Air Act and the Council on Environmental Quality's NEPA Implementing Regulations (40 CFR 1500-1508).

The DEIS analyzes the impacts associated with environmental restoration at two sites along the Salt River. The first site, known as the Phoenix Reach, consists of a five-mile stretch of the river in the City of Phoenix. The second site, known as the Tempe Reach, is located in the City of Tempe on portions of the Salt River and Indian Bend Wash, a tributary of the river. The project's primary purpose is to restore natural habitat historically associated with the Salt River floodplain. Incidental to this is the creation of passive recreational opportunities associated with restored habitat areas, including the use of maintenance roads as trails, and areas for learning about the river's natural history. The project proposes to reintroduce water into the river channel and restore various habitat types in the channel and along the banks: cottonwood/willow riparian forest, freshwater marsh, aquatic strand and mesquite upland. The river's capacity to convey flood flows would be maintained and the river would continue to be a flood control facility.

We support efforts to undertake these restoration efforts along the river and in Indian Bend Wash and find that the DEIS contains a satisfactory description of the proposed project, existing conditions, potential impacts and mitigation measures. However, we have several concerns which should be addressed in the Final EIS (FEIS). Because of our concerns, we have rated the DEIS as EC-2, Environmental Concerns - Insufficient Information. Please refer to the "Summary of Rating Definitions and Follow-Up Action" (attached) for a detailed explanation of EPA's rating system. Our first concern is that the project's recreational and interpretive aspects have received a higher value than potential wildlife and aquatic-related functions. Although we do not discourage the value of recreational or interpretive elements in projects such as this, it has been
our experience that similar projects in urban areas have functioned more as urban parkland rather **1**
than serving as a significant resource for wildlife or to improve degraded aquatic conditions. We are concerned that the Corps has not placed the wildlife and aquatic aspects of the project on a similar footing with recreational and interpretive elements and suggest that this issue be addressed in the FEIS. Our second concern is that the DEIS does not address the potential relationship
between this project and at least three proposed sand and gravel mining operations in the area. **2**

The three sand and gravel operations that have applied for Section 404 permits are Salt River Sand and Rock above the Tempe Reach (PN #94-41120-00-RWF); Calmat of Arizona below 24th Street (PN#94-41103-00-RWF); and United Metro at 7th and 19th Avenues (PN#94-41166-00-RWF) both in the Phoenix Reach. We are concerned that the DEIS did not address how potential mitigation requirements from sand and gravel operations may fit into this project. Will mitigation done by the sand and gravel operators be adversely affected by the proposed Rio Salado restoration effort? Has any consideration been given to having the sand and gravel operators' mitigation measures be integrated into the Rio Salado project, e.g., by having the sand and gravel operators participate in Rio Salado restoration efforts such as funding the purchase of acreage for contribution to the Rio Salado project? 2

We note that other ecosystem restoration projects are currently under study in the area, for example, the Tres Rio project now being evaluated by the U.S. Bureau of Reclamation. However, there is no discussion in the DEIS about the relationship of the Rio Salado project to other planned or proposed ecosystem restoration projects, and whether the various projects may be integrated to provide a more complete restoration of the river's historic ecosystem, habitat and wildlife values. Although we acknowledge that this project is considerably more advanced in its impact documentation than projects such as Tres Rios, we believe the FEIS should briefly address the feasibility of integrating Federal agency planning efforts such as Rio Salado and Tres Rios. 3

Lastly, the Draft Feasibility Report (p. VII-3) states that "An NPDES permit will...be required for any water discharged to the river." The FEIS should clarify the type of NPDES permit(s) that may be required for the project: a general stormwater permit associated with construction of the project, a standard NPDES permit to cover direct discharges to waters of the United States (e.g., discharging pumped groundwater back to the river), or both. A general stormwater permit requires development of a Stormwater Pollution Prevention Plan and any NPDES permit(s) required by the project are issued by EPA Region IX. Water quality certification or waiver is required from the Arizona Department of Environmental Quality prior to EPA issuing the project's NPDES permit(s). 4

We appreciate the opportunity to comment on the DEIS. Please send one copy of the FEIS to me (code: CMD-2) at the letterhead address when it is filed with EPA's Washington, D.C. office. If you have any questions, please call my staff reviewer for this document, David Tomsovic, 415-744-1575.

Sincerely,

David Farrel, Chief
Federal Activities Office

Attachment: 1

SUMMARY OF RATING DEFINITIONS AND FOLLOW-UP ACTION

Environmental Impact of the Action

LO-Lack of Objections

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC-Environmental Concerns

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

EO-Environmental Objections

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU-Environmentally Unsatisfactory

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of environmental quality, public health or welfare. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommend for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1-Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2-Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

Category 3-Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From: EPA Manual 1640, "Policy and Procedures for the Review of Federal Actions Impacting the Environment."

Comment Set 30: U.S. Environmental Protection Agency, Region IX (January 23, 1998)

1. The Rio Salado project has been designed for the purpose of ecosystem restoration, not public recreation. However, recreation features have been formulated to allow the public to appreciate the restoration project and passively enjoy the uniqueness of the environmental resources in the area. These recreational benefits of the project are considered incidental to the project's primary ecosystem restoration goals. As a result, recreational facilities associated with the project are intentionally limited. The recreational facilities included in the project primarily consist of paved maintenance roads which can be used as recreational trails by hikers and bicyclists, and unpaved trails for equestrians. The public will be excluded from much of the habitat area in order to avoid disturbance to wildlife and damage to vegetation.

2. The specific relationship between the proposed project and potential mitigation associated with the pending 404 permits for sand and gravel operations has not been determined. The property in the river channel currently owned by sand and gravel companies will be acquired for the project. Therefore, it is not anticipated that there will be any conflicts between potential 404 permit mitigation and the proposed project. It is possible that the sand and gravel operators' mitigation may enhance the project, but this cannot be determined until the nature of the mitigation is known.

3. There is no specific relationship between the proposed expansion of the Tres Rios wetlands and the Rio Salado project except that both involve the Corps and the City of Phoenix. The Tres Rios project is located approximately 9 miles downstream from the Phoenix Reach of the Rio Salado project and involves the use of treated wastewater to support freshwater habitat, whereas the Rio Salado project will utilize treated groundwater as a water source. Although the two projects are somewhat different in nature for this reason, the issues and challenges associated with the design and maintenance of freshwater marsh habitat are similar. For this reason, lessons learned from the existing Tres Rios constructed wetlands project will be applied to the design of wetland habitat in the Rio Salado project. Similarly, experience that will be gained from the design and implementation of the Rio Salado project can be applied to the proposed expansion of the Tres Rios project. Presently, there are no plans to integrate the Rio Salado project with the Tres Rios project or any other ecosystem restoration projects; however, this does not exclude the possibility of future linkages between individual ecosystem restoration projects.

4. The proposed project will require NPDES permits for both construction and ongoing discharges into Indian Bend Wash and the Salt River channel. Specifically, a general stormwater permit will be required for construction and a standard NPDES permit will be required to cover direct discharges of pumped groundwater into Indian Bend Wash and the river channel.

APPENDIX I

Tempe Public Hearing Transcript and Responses to Verbal Testimony

US Army Corps of Engineers
Public Hearing for the
Rio Salado Wildlife Restoration
Feasibility Study and Environmental Impact Statement

Steve Nielsen called the meeting to order and introduced himself as the City of Tempe Project Manager of the Rio Salado Project working out of the Economic Development Office. He spoke on behalf of the City of Tempe as local sponsor to the meeting. This meeting was the culmination of months of research and collaboration with the Corps of Engineers for the Draft Feasibility Study for Riparian Habitat & Wildlife Restoration components within the Salt River. He thanked everyone for attending such an important historic event, and welcomed everyone on behalf of the Mayor and City Council. Steve then turned the meeting over to Colonel Larry Davis of the US Army Corps of Engineers.

Colonel Larry Davis, introduced himself as the District Engineer for the Los Angeles Engineer District, US Army Corps of Engineers. The following text was presented by Colonel Davis with a slide presentation:

SLIDE 1 CORPS LAD LOGO

Thank you for the welcome Steve, Good evening, ladies and gentlemen. I am Colonel Larry Davis, the District Engineer for the LAD of the USACE. Thank you for joining us tonight to listen to our presentation on the recommended environmental restoration plan for the draft Rio Salado Feasibility Study and EIS. I want to express thanks to the City of Tempe for arranging tonight's meeting. Tempe has been has been an outstanding partner in this study, and we have enjoyed a very successful working relationship with the city representatives from both Tempe and Phoenix.

With me tonight are several Corps staff members who have worked on this study. I'd like to take a moment to introduce them:
Bob Joe, LAD Chief of Planning
Mike Ternak, the Study Manager
Alex Watt is EIS coordinator for the study.
Joe Dixon, Chief of our Phoenix Planning Office

SLIDE 2 TITLE SLIDE

We are here to present and receive comment on our draft Rio Salado Feasibility Report and EIS. Let me give you an idea of how tonight's meeting should go. First, I will give a short presentation and overview on the study process, findings, conclusions and recommendations contained within the draft feasibility report. I will describe the recommended plan and summarize its costs and benefits. I will cover the remaining study schedule and report on the actions required to put the project in place.

After my presentation, we will get to the most important item on the meeting agenda, which is the public comment session. It's the reason we are here tonight, to hear from you. At that time, you will have the opportunity to comment on the report. We will use the attendance cards that you filled out as you entered. We will go through the cards and give everyone who indicated an opportunity to speak. We will also open the floor for anyone else that wants to comment. We ask that your comments relate to the Rio Salado Environmental Restoration Feasibility Study. We will be recording all of the comments and questions that we receive tonight. This information will be incorporated into the final report.

SLIDE 3 STUDY AUTHORITY

Initial funding for this, two-phase study was appropriated under the 1994 Senate Energy and Water Development Appropriations Bill.

The Reconnaissance Study was completed in 1995. The Reconnaissance Report identified a Federal interest in proceeding into a second Feasibility phase to explore "environmental restoration with incidental recreation of the Salt River at Rio Salado, in both Tempe and Phoenix, Arizona." The Corps' Headquarters certified the reconnaissance report in June 1995, which gave the LAD authority to move into the cost-shared feasibility phase.

SLIDE 4 NON-FEDERAL SPONSORS

The reconnaissance phase was 100% Federally funded, however, feasibility studies are required to be cost shared 50/50 between Federal and non-Federal sources. The two non-Federal sponsors are the cities of Tempe and Phoenix.

They have both been outstanding sponsors to work with and, if we are successful in getting this project authorized, we look forward to continue working with each of them into the design and construction phase.

SLIDES 5, 6, AND 7 STUDY AREA MAPS

5. The entire study area includes 5 miles of the Salt River in Phoenix. It includes portions of the Salt River and Indian Bend Wash in Tempe.

6. The Tempe Study area includes approximately 1.3 miles of Indian Bend Wash from McKellips Road downstream to the confluence with the Salt River. There are two separate portions of the Salt River for the Tempe restoration area. There is a half mile area from McClintock Dive to the upstream dam for Tempe Town Lake. There is another half mile area downstream of the lake to Priest Drive. For planning purposes, we have made the assumption that Tempe Town Lake will be completed and in place prior to the restoration project.

7. The Phoenix study area is the Salt River from the Interstate 10 bridge downstream to 19th Avenue. A total of about 5 river miles.

SLIDE 8 STUDY PURPOSE

The purpose of the feasibility study is to evaluate problems in the study area, develop alternatives, and make a recommendation to Congress on the findings. For this study, the recommendation will be to implement the proposed environmental restoration project. The report includes an EIS and a presentation of the estimated costs and benefits.

SLIDES 9, 10, 11 and 12 DEPICTION OF THE PROBLEM

9. Regionally, riparian forests have disappeared throughout the Sonoran Desert. Some estimates indicate that as much as 75 to 90 % have vanished. These ecosystems are critical as wildlife habitat, as corridors for wildlife to migrate, and to help support ecological diversity. This picture was taken in the late 1890's at the Hayden Ferry crossing, near downtown Tempe. It shoes the expanse of the floodplain prior to any upstream dams.

10. Historically the study area had optimal conditions for high quality riparian forests and related plant communities. In the 1900's, as upstream water projects began to change the hydrology of the river, the riparian vegetation was slowly eliminated as the river dried up.

11. Today the Salt River is essentially devoid of vegetation through the metropolitan area. This aerial photo shows the Salt River and Indian Bend Wash in Tempe. Any existing vegetation is

sparse and of low quality.

12. The primary problems include:
Loss of habitat and associated riparian vegetation
Loss of ecosystem functions
Loss of ecological diversity
and an underutilized land use for the degraded river

SLIDE 13 PLANNING OBJECTIVES
Our feasibility planning objectives were to solve the identified problems within our authorities, planning guidance and regulations. These objectives were to:

Restore the river to a more natural condition.
Emphasize restoration with native plant species and plant communities that dominated prior to the manmade changes.
Provide increased opportunities for wildlife to utilize this river corridor.
And to increase recreation and environmental education opportunities.

SLIDE 14 RIPARIAN HABITAT MODEL
The alternatives we formulated tried to simulate, as much as possible, what a natural riparian cross-section would look like. Riparian models, such as depicted in this slide, were used in trying to develop restoration alternatives.

SLIDE 15, 16, AND 17 EXAMPLES OF HABITAT TYPES TO BE RESTORED
15. Some examples of the habitat types we are proposing to restore can still be found in the river, both upstream and downstream of the metropolitan area. These slides show some of these areas. This is a mature Mesquite Grove upstream of Granite Reef Diversion Dam.

16. This slide shows Cottonwood and Willow tree areas, which can still be found downstream of the confluence with the Gila River.

17. Or as this slide shows, the constructed wetlands demonstration project, at 91st Avenue, is an excellent example of a successful engineered wetlands project.

SLIDE 18 PLANNING CONSTRAINTS
The study area contains many existing conditions that needed to be dealt with in developing a plan. The alternatives and proposed action were formulated with consideration given to these identified planning constraints. Many of the proposed features and their specific locations were formulated to avoid problems with, or specifically address these constraints.

SLIDE 19 MANAGEMENT MEASURES
In general, the alternatives we formulated tried to evaluated different combinations, acreages, and locations of the various habitat types identified in our objectives. We looked at water use requirements and associated costs necessary to establish and support the various alternatives. Our water resource analysis focused on returning some type of hydrology to the river in order to establish, support and maintain the project. We performed cost and habitat benefit analysis to help select a plan that would be the most cost effective.

SLIDE 20 RECOMMENDED PLAN FEATURES
The overall proposed restoration plan for Tempe and Phoenix consists of:

160 acres of mesquite habitat.
119 acres of cottonwood and willow tree habitat.
74 acres of wetland-marsh, which includes some open water.
101 acres of aquatic habitat, which would be in the low flow channels of Indian Bend Wash and the Salt River.
A water Supply system consisting of groundwater extraction wells. One well for Tempe and six wells for Phoenix are proposed.
The Phoenix reach includes construction of a low flow channel.
We are also proposing a recreation plan that consists primarily of linear recreation features, such as trails. The recreation plan has been formulated to allow the public to passively view, appreciate and enjoy this unique restored natural resource within the urban area.

SLIDES 21, 22, 23, 24, 25, 26 PLAN VIEW OF PROPOSED PROJECT

21. The following slides show the proposed restoration project concept for Tempe and for Phoenix.

TEMPE:
In Tempe, the existing low flow channel within Indian Bend Wash will include aquatic types of vegetation, a stream, small ponds, and trees along the fringe areas. The wide terrace in Indian Bend wash between Curry Road and the Salt River will be restored with mesquite groves that once covered the area.

The Salt River would be restored with wetland marsh immediately upstream and downstream of Tempe Town Lake. Cottonwood and Willow trees would be established in the fringe areas adjacent to the wetland marsh. The vegetation would transition to lower water use mesquite and shrubs toward the upstream and downstream limits of the project at McClintock Drive to the east and Priest Drive to the west.

22. The plan includes a water supply and delivery system to supply the open water and irrigate the vegetation. Infrastructure improvements for the Tempe portion of the plan include a pump and bypass system around Town lake from the upstream to the downstream end of the lake in support of water quality and water surface elevation control in the wetlands.

The plan includes one small public parking along Indian Bend Wash area for public access. The recreation plan includes an interpretive trail system for viewing and habitat monitoring. Some interpretive signage, project information, kiosks, ramadas and picnic facilities are also proposed.

PHOENIX:
23. The Phoenix plan includes a low flow channel constructed in the bottom of the existing river bottom. The low flow channel is the brown feature on these slides. This flood management feature is designed to pass the more frequent flood flows. The low flow channel includes four grade control structures to minimize the flow velocity during flood releases. The low flow channel will convey the more frequent, smaller discharge events. The capacity of the low flow channel is 12,200 cfs which corresponds to one of the release increments from modified Roosevelt Dam for long term releases. The low flow channel will help protect the primary restoration feature areas from flood damages since most of the restoration features will be located between the low flow channel and the existing main bank of the river.

24. Six extraction wells will pump shallow groundwater to supply the water for the project. A water delivery system will bring water to the vegetation, wetlands, and open water. The water distribution system consists of a gravity flow component for all of the open water features

including the wetland-marsh and aquatic habitat. The water distribution system also will include a pressurized system to irrigate the lower water usage vegetation, such as mesquite trees. Habitat elements will include riparian tree species, volunteer grasses and shrubs, wetlands, open water and a small perennial stream.

25. The plan will include aquatic vegetation, a stream, and ponds in the low flow channel. The open water areas are indicated in blue. The wetland marsh areas will also include some open water areas. Cottonwood and willow trees would grow around the fringe areas of the wetlands. These are indicated in the slide by the dark green areas. Mesquite trees, as shown in the light green areas, would dominate the overbank areas and the dryer locations within the river.

26. Although the primary project purpose is for environmental restoration, there will be three public parking, access and information facilities. These are proposed at 16th Street, Central Avenue and 7th Avenue. The associated recreation plan will emphasize an interpretive trail system, viewing areas, and environmental educational opportunities. The recreation component will allow the public to enjoy this unique resource while learning about riparian habitats and the history of the Salt River.

SLIDE 27 TOTAL ESTIMATED COSTS FOR RIO SALADO PROJECT

The total estimated construction cost for the restoration portion of the project is $84,559,000. This consists of $78,652,000 for the Phoenix reach and $5,907,000 for the Tempe reach. These amounts include all design, real estate, and construction costs. The restoration project is cost shared at 65% Federal and 35% non-Federal.

The total recreation costs are estimated at $7,523,000. This consists of $6,837,000 for Phoenix and $686,000 for Tempe. Recreation cost sharing is 50/50.

SLIDE 28 OPERATION AND MAINTENANCE COSTS

After construction of the project is complete, the project would be turned over to the non-Federal sponsors. The sponsors would have the operation and maintenance responsibilities for the project. The majority of the O&M costs are expected to fall into two categories. The annual water supply costs are based on estimates to operate the water supply wells and pump the water necessary to support the project. These annual costs are estimated at about 1 million dollars for Phoenix and the hundred thousand for Tempe.

The other restoration maintenance cost is related to the occasional damage to the habitat from flood events. While the floods do provide important benefits to the riparian habitat, we have estimated the expected annual costs to replace habitat vegetation and restore the project, after flood events. These annual costs have been estimated to be $324,000 for Phoenix and $76,000 for Tempe.

SLIDE 29 BENEFITS OF THE PLAN

Overall the proposed plan will increase habitat values by an estimated 338 habitat value units. The habitat values are estimated from a method that was used to quantify the biological values of habitat in the study area. They were established by qualified personnel with experience in regional wildlife habitat.
The plan restores native plant communities and helps establish seed sources for new growth.
It provides increased habitat opportunities for wildlife species.
It returns the river to a more natural condition.
And the plan increases recreation and environmental education opportunities.

SLIDE 28 SUMMARY OF STUDY RECOMMENDATIONS

The most important of the study recommendations will be that the proposed plan be authorized for implementation.

The Monitoring and Adaptive Management Plan will allow the Corps to participated in minor modifications and adjustments for several years after the initial construction to ensure the project functions as intended.

The recommendations are also subject to non-Federal cost sharing obligations and responsibilities, and after completion of the construction, the non-Federal sponsors are required to operate and maintain the project at a 100% non-Federal cost.

SLIDE 30 REMAINING SCHEDULE FOR FEASIBILITY PHASE

The remaining feasibility study schedule is as follows:

Our public review period for the draft report will end on 27 January 1998.
Our goal is to forward the final feasibility report to our Division office by the end of February.
The official Public Notice for the final feasibility report comes from our Division office and is issued by the Division Commander, General Capka. This is scheduled for March.
A final report by the Chief of Engineers at HQUSACE is anticipated in June 1998. The Chiefs Report is used by HQUSACE in trying to get the project included in the WRDA 98 authorizing legislation.

SLIDE 31 FINAL CLOSING SLIDE

That completes my presentation. I would now like to open the floor to the most important part of the meeting...to listen to your comments. For those of you wishing to make a comment, there are several requests that we have.

To make the recorders job easier, and to assure the completeness of the record, please speak clearly and identify yourself. Again we would like to request that your comments pertain to the subject study and draft feasibility report. Written statements are also appreciated.

Colonel Larry Davis introduced Chris Messer.
Chris Messer, Colonel Larry Davis, Bob Joe and Mike Ternak sat at the front desk.
Comments were taken from the sheets filled out before the meeting.

PUBLIC COMMENTS:

Anthony Cabrera: Resident for 15 years, supports the project overall, he thanks everyone for taking the effort to move this project forward. His goal for his family is to work hard to make a better life for his family, this project will contribute to their quality of life. He did not have time to read the document, but looks forward to doing so. He applauds the efforts so far and hope they construct the project planned.

Notes on sign-in card: Project designer for Entranco Engineers - A project such as this will provide Tempe a basis on which to launch an extensive and exciting future. Recreational, riparian and financial opportunities will add to an already excellent rate of growth. Providing proper planning is taken into consideration, this project could be one of the top reasons to visit Arizona. I would like to commend the effort and entities involved to put this report together.

Lori Singelton: Environmental Issues Analyst for Salt River Project. SRP is a major multi-purpose reclamation project established over 90 years ago, serving electric customers and water share holders in the metropolitan area. Named for the major river that supplies water to the region, SRP is the largest supplier of water to the salt river valley. SRP has been and continues to be very involved with the City of Tempe on the Rio Salado project. We are also working with Tempe water supply issues. SRP is currently reviewing the Draft Plan and EIS, and will submit our comments in writing. SRP looks forward to continuing work on this exciting project. As an Officer for Valley Forward, Lori spoke on behalf of the organization that has advocated the regional restoration of the Salt River for many years. The Salt River is probably the single most noticeable landmark in the Valley of the Sun, cutting a path through towns, cities and rural areas of Central Arizona. This currently dry river bed is one of the first things people see as they fly in and out of Phoenix. What a pleasant aesthetic impression this project would make. The restoration and revitalization of this important landmark, the creation of a major riparian habitat, and the creation of this regional space corridor, will provide numerous economic, historic and environmental benefits to the Valley. The members of Valley Forward are committed to the success of this very visible project.

Notes on sign-in card: Support of Rio Salado by Valley Forward. Support of Rio Salado by Salt River Project. Comments on the EIS will be sent in writing.

Diane Brossart: President of Valley Forward Association. We are a 28 year old nonprofit business organization that focuses on the environmental and quality of life issues in the Valley of the Sun. Valley Forward represents companies large and small and municipalities including a long-standing partnership with Tempe, and individual citizen members as well. Valley Forward was founded in 1969, the primary goal was supporting the regional development of Rio Salado. We remain committed to the Rio Salado Project; recently a task force formed to dedicate time specifically to that goal. Many of the speakers tonight are here to communicate that support. On a personal note, I have been a valley resident for 15 years. At that time, I was familiar with the tax increment finance vote on the ballot. She supported it then and supports it now. I truly believe that Rio Salado is one of the most meaningful landuse projects in the valley and in the State at large. It would be a landmark for Arizona, a place for people from around the world to visit, a point of civic pride that would lead to neighborhood revitalization and an environmental demonstration project like no other. Valley Forward commends the leadership that Tempe has taken to bring this project to reality. We believe that an environmental focus when combined with community and economics is the only way to insure a successful Rio Salado plan. We encourage the City of Tempe, and other valley municipalities to lead the way to transforming the dry river bed into a flourishing environmental, recreational and economic show piece. We all know that the recent history of the Salt River is one of unfulfilled potential. Nearly 30 years after the original plan was proposed by ASU students, the river is still seen as a scar in the landscape, and an environmental and aesthetic detriment to the Valley. A successful Rio Salado Project will create a significant regional open space corridor, next to desirable living and new business and employment opportunities. It could literally reshape the region, strengthen the historic Tempe and Phoenix city cores, link the north and south sides of the river, and create a significant riparian habitat. Valley Forward staunchly supports Rio Salado and the work done by the Army Corps of Engineers. We'll continue to advocate this project at both the State and Federal legislative levels, and we applaud your efforts and encourage you to keep the dream alive.

Notes on sign-in card: Move forward on Rio Salado. Excellent project with regional impact. Environmental demonstration project. Economic Impact. Recreational amenities. Valley Forward Supports the regional development of Rio Salado.

Laurie Nessel: Tempe resident for 18 years. I haven't reviewed the document yet, but has been embarrassed by scar of Salt River. The Town Lake is a nice improvement but its something that can be seen in a lot of other places. This project brings the opportunity to recreate riparian habitat that is truly unique. However, it is imperative that it is native habitat, that concentrates on creating habitat for native wildlife, less concentration of recreational aspects of project. There will be plenty of recreational opportunities around the Town Lake center, and we can't compromise the environmental opportunity of providing native wildlife habitat in an urban setting. It provides an excellent educational opportunity to provide people a chance to see the native species without having to drive for hours to see what should have been here all along. The plan looked good from what I saw. But it is important maintain native plants with a continuous canopy with the understory to attract migratory species and retain native species.

Notes on sign-in card: Maricopa Audubon Society - I think that the Corps should sieze this opportunity to mitigate the decades of environmental destruction by insuring that a riparian area be set aside as part of the Tempe Rio Salado Project. Native plants, untended except to remove exotics, a continuous canopy as well as understory to attract native fauna would be exceptional!

Michael Baker: Concerned citizen and long time valley resident. Reflects same opinion as former speaker. However, he does not see why federal funding for a project benefiting primarily local citizens and developments. The federal government should not be involved in local projects, however, if the federal government is primarily used for habitat restoration to support and preserve national native species, is concerned with native habitat losses, and will help revitalize these habitat losses have occurred from other projects, then please continue.

Notes on sign-in card: Maricopa Audubon Society - If this project is for HABITAT restoration, then the city of Tempe needs to define what species will be targeted as a successful restoration project. As it stands, I favor that no Federal funds be given to the City of Tempe. Their Rio Salado project is for commercial/local resident patrons and does not benefit the region of Metropolitain Phoenix.

James Elmore: Dean emeritus of ASU College of Architecture. As Dean he established the year long project in 1966 that included doing something with the Salt River. Sixteen 5th year students, under the mentorship of professor Bob McConnell, defined the possibilities and named the project. Bob McConnell is now dean emeritus of Uof A College of Architecture and lives in Tucson. For the next two years it was worked on by other studios of students, until it expanded into the real world. Valley Forward shepherded the project in through 1970s and helped formulate legislation for the Rio Salado Development District. The RSDD developed the proposal it put before the Maricopa County voters in 1987. Voters turned down the proposed methods for funding, building and operating the project, not the ideals or the concept for the Salt River. Now Rio Salado is moving through the normal process of city development. Tempe is moving forward on the Town Lake, and the related projects. We have seen tonight what the cities of Tempe, Phoenix, and the Corps can do upstream and downstream of the Town Lake. Almost 11 miles of riverbed are on course towards realization of it's potential. Probably no comparable city in the whole world has such a reservoir of open space right at it's heart. Space that can provide a unique and rewarding amenity, while attracting regional infill development, which is important. What you see tonight is a monumental step forward, he hopes it is universally approved, adopted, built and enjoyed. (His written statement was submitted to the Corps).

Don Keuth: Co-chair Rio Salado Task Force for Valley Forward, President of the Phoenix Community Alliance, an organization dealing with Phoenix Metropolitan area businesses, representing 130 companies, he is also on the Board of Directors of SCENE (Southwest Center for Education and the Natural Environment) at Arizona State University, a group that focuses on environmental restoration and rehabilitation issues. We applaud the reasonable approach to the restoration of the Salt River. It is cost effective, bringing tremendous value to the citizens and can be supported by the citizens for the practical approach you've taken to making it happen.

Chuck Pedri: CH2MHill Civil Engineer, CH2MHill has been located in the Tempe area since 85, and supported the project in 1987. He is also a member of Valley Forward Association. CH2MHill is extremely excited to make James Elmore's dream turn into reality. The City of Tempe went out on a limb to develop the Town Lake. Now, the cities of Phoenix and Tempe, in coordination with the US Army Corps are taking the next big step forward to turn this ugly scar of the Salt River into an exciting show piece in the valley. When this project is completed, it will provide valuable riparian habitat with cottonwoods, willows, mesquite bosques and wetland marshes. The habitat will attract not only wildlife, but people as well. In the last 5 years around the State of Arizona we have seen an increase in the number of constructed wetland and riparian habitats throughout the state. It's amazing to see how excited the public has been, very excited, especially the kids, to find out about the concept of wetlands and to visit the constructed wetlands already built in the state. This project provides not only important habitat, but important educational and recreational opportunities. CH2MHill applauds the City of Tempe for having the foresight, and the guts to go alone with the Town Lake and CH2MHill applauds the City of Phoenix for taking on a bigger piece of the Rio Salado river and restoring it to it's original condition. Finally, we applaud the Army Corps of Engineers, for expanding their mission, so that we can fund such wonderful projects as the Rio Salado.

Carolina Butler: Born here in valley, lives in Scottsdale. One of the leaders of group defeating the county election in 87. It was defeated 2-1, using $1,500 to defeat the project, as compared to the supporters who used a million dollars towards the election. We had an easy victory with 2-1 results. Phoenix voters defeated the project in 1975 in a bond election. In the county wide election, where the project was defeated, the boundaries of the City of Tempe, they had a plurality of 18 votes. Tempe has spent an outrageous amount of money, billions of dollars on 18 votes, to bring this forward. If you look at the two precincts encompassing ASU, where the dream for Rio Salado was born, one of the ASU precincts defeated the plan as well. We helped defeat the plan then because it was an expensive plan, a 3 billion dollar plan, that was water wasteful in design and used poor land-use planning.

The main concern with the river is that it is a flood channel, as the Corps of Engineers knows. We are here in the desert, where it rains 7 inches per year, we are put to sleep because there is often no river in the channel. If you were born in Tempe in 40, you waited 24 years before seeing water in the Salt River. More recently, in 1980, we have seen up to 180,000 c.f.s. flow through the channel. Mother Nature has put this channel here to convey water from Verde, Upper Black & White Rivers through the Salt River to the Gila continues on to the Colorado River: we are talking about a major potential flow. This dry eyesore of a scar that people keep referring to has an important job, and that is, in rainy seasons, to carry 180,000 cfs and more down the channel. This is our main concern. Yes, it's an eyesore. The Cities of Phoenix, Tempe, Mesa, Scottsdale have used the river since World War II as city dumps. As a result, we have hundreds of dumps along the river, a few of those sites are superfund sites, a few are forever burning underground. We have some huge environmental problems with the river because of these cities. Our group successfully lobbied to get laws against dumping in waterways.

We want to keep channel open for flood water; don't build anything that would impede the flow when water comes. For instance when El Nino comes and causes downstream damage by carrying trees, picnic tables and ramadas downstream tearing things up further downstream;

we've seen this destruction before, and will see it again. This is not a plaything for temporary officials and organizations such as Valley Forward to toy with. The river takes care of itself, it behaves well, and has caused relatively little damage. Very few homes have been flooded. Let's help keep the river working well, within it's banks.

I express grave concern for the landfills along the river banks, for the ground water table, and the leaching of contaminants into the ground water, and into the town lake. Groundwater is too close to the surface at 15 feet below grade, these wetlands will only increase the problems. Contaminated ground water is impossible to clean up, and this project will add to these problems.

Furthermore, what congressional committee is your plan going to when it is submitted to congress? Answer: Transportation and Infrastructure Committee and the Water Resources subcommittee. Is that the only committee and subcommittee? Is it the same for both House & Senate? Answer: That is for the House, for the senate it would be the Public Works Committee, with some type of water resources subcommittee. Washington is far from Phoenix and Tempe, they often don't get the full story. Our group wants to submit citizen comment directly to Washington, so that they here our story. We have suffered greatly in the past regarding Rio Salado and the years of damage that proceeded it. Washington had no idea what was going on out here. Anyway, I want to congratulate you on the move to restoring the river to its more natural condition, I consider this a big plus and a gain for our side.

Have you submitted this plan to the officials at Sky Harbor Airport or any of the associations like the Pilots Association? Because I am concerned with the attraction of birds, which is a huge hazard to pilots. My husband and son and son-in-law have told me are all pilots and know of the hazards of birds to their lives. I am concerned with the 10,000 foot corridor around the runway concept that was mentioned. Has anyone told the birds that they are not allowed to fly within 10,000 feet? How will you keep birds from flying through this area? Answer: The FAA and Cities met early in the study process. No, we did not meet with the pilots. The regulation states that there can be no open water within 10,000 feet of the runway. This plan that we presented does not have any water in the area around the airport that is constrained. We do have some lower water using plants such as mesquite planned in this area. Open water areas are outside of the 10,000 foot area.

I strongly recommend running these plans by the pilots for approval. More and more often these projects at Federal, State, County and City level do not consult with citizen groups or special interest groups. The pilots would have serious concerns and comments that would have valuable in planning this project, and they should not be left out.

Web Crockett: Valley Forward representative. Valley Forward has supported James Elmores vision of the Rio Salado project from the beginning. We are very supportive of the plan that has been presented this evening. Specifically, I wanted to point out that in one of your slides, you showed the upper portion of the Indian Bend Wash; the lower portion of which is now a part of this project. I have crossed this wash every day for ten years, it was an eyesore, as is the lower portion now. Before the greenbelt was put in in the upper Indian Bend Wash, the Corps had proposed several proposals for this floodway, including a concrete channel engineered to handle the water. There were objections to that plan, and as a result, it was landscaped as you see it today. I have seen that wash flow before it was designed, and now after it has been landscaped with grass, trees and ponds. I've seen it flowing rim to rim in both scenarios, and it handled the flow both ways. The plan implemented is a greenbelt that serves as a flood channel flowing brim to brim, and after the water flows on, the plants fill in as they were before. The project was well engineered to handle the flood water and provide benefits of recreation and aesthetics for quality of life for residents speaks to the success of this corps project. The Rio Salado project will improve the quality of life of residents, and will improve the environment, will benefit residents and businesses, just as Indian Bend Wash has become a benefit to many people. We propose that the project presented for Rio Salado will do the same thing in the Salt River, and the Corps project in Indian Bend Wash did. Valley Forward's objectives to address environmental and quality of life issues in the Valley are directly met by this project. We believe that the Rio Salado project will help to improve the environment and quality of life, instead of being the eyesore it is today. We support the Corps of Engineers plan, and are appreciative Tempe and Phoenix's efforts to get it this far. We recognize the vote that turned down the grandiose plan presented in 1987, a plan that included 30 miles of different development along the Salt River at the cost of millions of dollars, and that maybe a scaled back version had it been presented back then may have been approved. Starting with a smaller plan may have worked, like the very workable plan presented here. It is unsightly to see the Salt River as the first thing seen flying into the Valley. This plan will benefit the State of Arizona, and we encourage you to move forward with the plan.

Jay Hicks: Carter & Burgess representing this architectural and engineering firm in Phoenix, Metropolitan Canal Alliance, Citizen of Tempe. Speaking on behalf of Carter Burgess and myself, we support and advocate for regional open space. The organizations that I am involved with strongly support regional open space be it along a canal or river corridors. The plans and programs presented by both the Cities of Tempe and Phoenix are visionary and will bring life back to a vital part of the valley that was once vibrant with activity and a place significant to the valley's origins. The proposed restoration itself, will focus our attention on a portion on the valley that will not require infrastructure changes to be implemented. It will not further deteriorate the air quality in the valley, or destruction of the outer desert environment, but rather promotes the redevelopment of our central city, minimizing environmental impacts and making it a better place to live work and play. We are in a critical point in time, and have the opportunity to make a substantial difference to our future. Restoration of the salt river is a good thing, and the time is right for this development. The organizations I represent, and as a citizen of Tempe, I am very supportive of the Feasibility Plan, and the efforts of the Cities of Tempe and Phoenix to implement this plan.

William Wilcox: Please note the presence of a group of young people - the Boy Scout Troop that are here in uniform, because this project relates more to them than to the adults in the room. As a member of Valley Forward, he applauds what is being done. However, I want to note another side to this project that people need to be made aware of, and that is, the economic advantage to the area; the enormous economic benefits that this project will have on the area. There comes a moment of truth in everyone's lives and they either meet the challenge or they don't. This is a moment of truth for the whole metropolitan area; we need to move forward with this project for the benefit of the region, for our young people, for our economic benefit and for our ecological preservation of our resources here. I certainly fully support this project.

Angela Dye: Trustee of Arizona Chapter of the American Society of Landscape Architects, which represents about 300 professional members. ASLA supports this project, it is tremendous joint effort and a master stroke towards sustaining both community and environment in the region, it is important community defining project. As landscape architects, and stewards of the land; we support this project and offer our skills and expertise it in any way that we can.

Notes on sign-in card: This joint project is a community defining effort, a project which is an important element in sustaining our communities and environment. I lend the concurrence of our chapter of some 300 members to advance the goals of restoration and rehabilitation of the Rio Salado. As landscape architects and sterwards of the land, we support this master stroke of environmental restoration. We will bring our skills and expertise to realizing this project.

Herbert Fibel: Seconds everything that Carolina Butler said earlier. I have reviewed the draft study and am surprised that the overflow of Granite Reef dam will occur every 3 years even with recent upgrades to Roosevelt dam. I live in Tempe, and I am a birder. For nine years as a volunteer, I have been teaching classes through Tempe Parks & Recreation with 81 field trips. Do you know where we travel to experience the maximum bird diversity on these field trips? We cannot go to Kiwanas park or Papago park to study native bird species, I assure you, rather we travel to the mesquite bosques along the Salt and Verde rivers, to the cottonwood/willow habitats along the Hasayampa River near Wickenburg. This is habitat that is getting scarcer and scarcer each year. I commend you for proposing the restoration of the mesquite bosques and cottonwood/willow habitat along the Salt River in Tempe and in Phoenix. I have just a few comments: I intend to write to my senators and congressmen for funding and support of the project, if it is indeed intended for bird and wildlife habitat. As a teacher and birder I would like to see natural areas, areas with no grass, no picnic and recreation areas, we can see those in parks already established. We don't need exotic birds, but a place to attract such species as Clapper Rails, Warblers, Bullock's Orioles, and the beautiful Vermilion Fly Catchers, and attract wildlife watchers. We don't need to attract Grackles, Starlings and skateboards. These areas need not only trees, but brush and undergrowth with plants allowed to mature naturally. Native birds are attracted to native vegetation. For funding I suggest the BOR mitigation funding in CA plan 6 and the Heritage Fund grant.

Scott Burge: Resident of Tempe. Does not oppose project but has major concerns. Like the last speaker, if this is an environmental project, it is interesting to note that your appendix (page 36, economic impacts) shows the number of visitors to the habitat to be 3,800 daily. There is no way you can create a native wildlife habitat in the lower Sonoran zone with that kind of people load. The problem is, what are we trying to accomplish here? There's a part of your appendices in the biological restoration section that shows a lists all of the bird species that were once here, and would be possible to attract to this area. Will this project make it more viable or less viable to attract the birds back to this area. Many of these species have found habitat in the Granite Reef Dam area, using newly introduced plants like the Tamarisk for breeding or in the cottonwoods at 115th Avenue. Between these two locations, there is no habitat available, if this habitat planned were implemented we would see summer birds and species such as cuckoos, gross beaks, warblers, etc. You can't have this if you overload the site with visitors. I encourage you to look at research provided by the nature conservancy and their refuges that limit access, sometimes by the number of people, or by the days it is open. If there is a Federal interest, it is what is the most valuable wildlife habitat in the country, for survival of wildlife. It is not that what is proposed is bad, just that it needs to look like where the birds and animals are naturally, not like a park. Either call it recreational or environmental, but the two don't mix. It needs to be run like a wildlife area as opposed to an extension of the Town Lake project. It will be a good trip, but the Army Corps can do it. I like the plans, but it is more difficult than what is currently being presented.

Robert Witzeman: Chairman of the Maricopa Audobon Society - congratulations on an excellent restoration plan. When you showed the first slides, you really got to the core of what rehabilitation or restoration of what lost habitat is about. Hayden Ferry, upstream at Granite Reef, the Mesquite Bosque at Mill Avenue, Tres Rios with cattails and bulrushes, and the other photos really tell the story, the current habitat is further out of town. We have the potential, using only eight wells, to bring all of that back. We have more breeding populations in Arizona than anywhere else in the U.S. Cottonwood/willow habitats have the densest population of breeding birds in the US. The Hasayampa refuge or 91st Ave. are the only places to see cottonwoods and willows. Cattle grazing has destroyed riparian habitat throughout the State on private and public lands. Cattle have destroyed mesquite bosques and eaten all the riparian cattail/bulrush vegetation. These Boy Scouts cannot experience habitat without traveling out of the city to see what used to be right here. Your project will bring this back, it is exciting and well planned.

Furthermore, pumping from the ground water in this area is good for the water tables. The water is only 30 feet down, pumping keeps clean water from reaching contaminated plumes, keeps areas from getting water logged. Toxic water is naturally stripped of contamination before it expands the damage. Like Scott Burge, I want to reiterate, this isn't a park. If 2/3 is paid by Federal government, then make it a restoration of an ecosystem like the title says. If the cities want a manicured Disney Desert, you'll attract grackles, starlings and sparrows, just like we have at all the golf courses and parks all over the valley: that is not a restoration. We will have that all over the Town Lake, and what you are proposing will be so much more exciting than Town Lake. Don't make the Indian Bend Wash area berm and grass. These Boy Scouts want to see frogs, turtles, lizards and native birds. We need natural and native vegetation left natural such as burrobush, quail bush, atriplex, etc. and it can not be maintained with a lawn mower like the rest of the Indian Bend Wash. I hope that the wells planned for use in this project aren't going to be used to water grass. There are high maintenance costs to parks, and the results will not attract native birds. A couple minor points; Sand pipers have not been taken into consideration. This is an oversight, there needs to be sand bars and mud flat habitat. Also, Islands should be placed away from bridges, not under bridges. Birds want to fly into bridges to reach islands when they seek the islands for protection.

Cliff Drowley: Resident of Phoenix. Thanks the Corps for completing a very visionary report. I am an engineer by training and found the document to be a first class document. Habitat in the southwest is very rare. The report itself emphasizes that greater than 90% of this habitat is lost in this area. We have an opportunity through this project to restore habitat to an area where it has been missing for a very long time. I have comments going along with real native habitat development:

Continuous canopy plantings of cottonwood and willow, this was not clear in the document. Planting native understory is important, and is mentioned in some sections and left out of others, I believe that will increase the cost, but it will provide a much better habitat. I encourage use of native plants over the long term, not only the 18 months mentioned. Eliminate non-native turf areas, especially in Indian Bend Wash. I would like to see accurate numbers on the densities of the bosque plantings, the numbers vary in different places in the report. I believe the highest density number given to be closest to appropriate for this type of habitat. It is a very thorough and complete report. Thank you for doing this, I strongly support the plan.

Notes on sign-in card: Maricopa Audubon Society - Good General Plan! Recommend - 1. continuous canopy, plan for cottonwood/willow habitat. 2. Eliminate grassy seating area on IBW. 3. Clarify planting schedule for understory, specifically in mesquite and cottonwood/willow habitats. Understory is crucial.

Dwayne Fink: Resident of Tempe 37 years, is a bird watcher. Over the last few years, I have done monthly bird counts at the 52nd Street habitat, on 44th Street, along Indian pump ditch, and in Kiwanas park. Now, the 52nd street wetlands is gone, it was starting to look very good, particularly where the water flowed. I am particularly concerned that Indian bend pump ditch wash continues to flow. The Indian Bend Wash portion does not clearly indicate water source. Whether it uses well #6, or some other source is not the issue; I do not want water at the Indian bend pump ditch diverted as a water source for the new habitat, at the detriment of a 30 year old established habitat. Mesa's waste water treatment plant at Price Road sounds like it would be going into the river and coming down stream. There is no real good sanctuary in the Valley, lots of golf courses, but no habitats. The area east of McClintock would make great habitat, using the Mesa water supply. I think you should consider this sanctuary area available near the Mesa treatment plant as an expansion to this much needed habitat project.

Notes on sign-in card: Maricopa Audubon Society - I intent to write a more thorough letter. My concern is where the water for the upper wetlands (Tempe) will come from. Will it take water out of the existing Indian Bend Pump Ditch? What about the water from the Mesa Treatment Plant?

Rex Gulbrantson: Executive Director of Papago Salado - Papago Salado's mission is to preserve and enhance the tri-city region of Papago Park and the Rio Salado region. Our association works on collaborative projects between the cities for cultural and historical attractions. I have reviewed the plan but haven't fully read it. Papago Salado supports the plan, and the efforts, and believe it will have a positive long term impact on the region.

Notes on sign-in card: In support of the planning process and habitat restoration.

Brian Knox: Chemical engineer, project engineer at Black & Veatch a world wide engineering company. I can reiterate the thanks for the involvement of the Corps in this project. I can empathize with the difficulty and courage to undertake a study like this for public comment. I wanted to emphasize the fact that this is a study in draft, with a flexibility of input from all of the groups that have come forward. There have been a lot of great ideas to add or change what was presented. We encourage you to take these comments to heart.

What you see in the room tonight are four generations of people who are interested in one form or another for Rio Salado. This speaks volumes of the level of commitment from the community either in support or opposition to this project. In the library are over 150 references in newspapers, magazines and other periodicals on this project show testament to the local support for what you are bringing forward. You are on the cutting edge of a long-held belief in this concept. I supports the project and your efforts.

Notes on sign-in card: We support the EIS.

Filomena Durazo: 7th Avenue resident, lives on south side of the river. I worked with Carolina Butler to defeat the project. Somehow, Phoenix and Tempe have not listened to the voters. The project goes between 16th Street and19th Avenue, and yet for 50 years, underground, landfills in this area have been burning. Landfills from 7th Avenue to 19th Avenue have been filled and burned and are still burning in this area. 27th Avenue is still burning. I have seen the flames burning from these landfills. Water is sprayed over the sites to keep the wind from carrying the flames off site. It is like a volcano, burning underground, as nature tries to burn our trash. This is where Rio Salado will be built, in the same area. On 19th Avenue, a man working on a tractor sunk into the ground and was burned. How will you guarantee the four generations of families who go for a picnic won't sink into the landfills that are burning, and be killed or injured. No mater how much water you add, there are so many landfills that are burning you won't put them out.

Another point, if we use sewage water, instead of table water, are we endangering getting the water table getting contaminated. Forty years ago there were Canadian geese flying down the Salt River, it would be nice to see this again. But no one tells of the dangers of Rio Salado.

The landfills burning or the dangers of birds. This project will go further than what is now proposed, it will go on. Are the sand and gravel operations planned to be moved? Are the residents on the north and south sides planned to be forced to be moved? How are you going to have a nice Rio Salado when the people that live there don't fit with your plan, when you want to put $200,000 homes along the Rio Salado to make it look nice. Like the Sky. Harbor, when 6,000 people were moved for construction of the airport. How many people are you going to move between 40th Street and 40th Avenue when this project expands beyond where it is now planned.

Keno Hawker: Mesa City Council Member elect - What caught my attention was an article in paper mentioned Corps of engineers. I've always admired the Corps work for the Indian Bend Wash project. I like what I see for this project, but I think you're not looking at the whole picture. You're doing the middle, but what is planned from Granite Reef Dam all the way to the diversion dam down stream. Why is this project only planned in the middle, and how could we expand this to Granite Reef? I realize that this project has both environmental and recreational components, and would like to know the relationship for Corps involvement. Who approached who about starting this project? Answer: Bob Jo stated that in order for the Corps to be involved, the local entity, like the City approaches Corps requesting involvement through Congress. The project purpose for recreation and environmental rehabilitation fits the Corps mission as it relates to a water course or environmental project; therefore the Corps can be involved if invited. The Reconnaissance Report identified the need for environmental restoration for the entire stretch of the Salt River from Granite Reef to the Gillespie Dam. But for a Feasibility Study, we require cost sharing in the study. After the Reconnaissance Study, Phoenix and Tempe came forward willing to support what seemed like manageable sections of the river. They were proactive in financially supporting the Feasibility Study. I would like to speak to you further on this topic, as Mesa and other Cities may be very interested in continuing what was started in the Reconnaissance Study. I appreciate trying to turn what has been called an eyesore into an asset. I encourage you and the communities to continue work on the side banks once the river bottom is restored to enhance the river edges also. There are opportunities there.

Colonel Davis: If I could interrupt for a minute, I want to thank you all for coming tonight. (Speaking to the Boy Scouts who were leaving). What you see tonight is that we try to be open, and listen to all sides, so that we don't go down the road with blinders on. We are willing to let everyone have a say, so that it is a government with the people not just us telling everyone else what to do to or for you. Thank you for coming, I hope you learned a little bit about how our process and the government system works.

Laurel Kimball: ASU College of Architecture and Environmental Design member, Valley Forward member, and has enjoyed getting to know Dean Elmore. For more than 30 years ASU has supported the project. 8-10 years ago I joined the team that the second conceptual study was completed in the college. For the record, the College of Architecture is very excited to see the Rio Salado become a reality. We believe it will become a place to increase understanding of the unique desert riparian environment that this brings and its role in the State's history. It is important to the community. There are wonderful opportunities for student involvement, studio projects, and our students, faculty and staff stand by ready to help however we can; we Delighted to see the project move forward.

Jim Lemon: North Tempe Neighborhood Association Neighborhood Board Member - There needs to be better communication for these types of projects between the City and neighborhoods where these proposed improvements are being considered. I have been working on Superfund programs in neighborhoods for some time now. Tempe Well no. 6 is being proposed for use of this for the project. I recognize the EPA reluctance to use these water sources for alternative projects like this. Please continue this effort with dialog with EPA and the neighborhoods. However, tax money should not be spent on water treatment for problems caused by private industries. For people who live and work in superfund areas we need to find alternate sources for water contaminated areas. The neighborhood groups I have contacted do not have a problem with using treated groundwater from the area, as long as it meets the Federal treatment standards and requirements and we are notified about its use. We do not want another situation like Indian bend park where fishing, swimming and boating is not allowed because of the urban contamination of the water sources into the park. There is a need for water decontamination, and it is welcomed but only if it can be used by residents.

Notes on sign-in card: I am a member of the North Tempe Neighborhood Associatino and we have never received any information from either the City of Tempe or the Corps on what is proposed north of Curry Road. Better communication is needed, other than newspaper article.

Jenine Baker: 33 year resident - Please note the delicate balance between attracting both wildlife species and human recreation. There was mention of threatened and endangered wildlife opportunities; native wildlife species and human recreation are historically mutually exclusive. Should true restoration and education should be sacrificed for recreation we will create yet another haven for non-native species. Please make habitat a priority, minimize recreation, provide a discreet nature center for viewing warblers using living natural rails not artificial rails. Exclude grass and picnic areas, make this a special area, wildlife habitat is fragile enough and need every opportunity.

Colonel Davis: As I alluded to earlier, this is a very healthy process. It was nice to hear the positive comments brought forward, but this is a draft program, it is flexible and able to be tweaked. The excellent comments addressed, positive and negative are important to the success of this project. Thank you for taking the time to come out tonight, and for the concern you have for this project.

Chris Messer: Thank you for your wonderful comments, there were a lot of good things said that we need to look into and address. Thank you for coming.

Notes on sign-in cards from people who did not speak:

Lynn Timmons: City of Phoenix staff, Scottsdale resident - Tempe's environmental restoration components are a very important part of the overall regional vision to restore the Salt River and link Indian bend Wash to Tres Rios. Fully support Tempe's commitment to it - hope it remains a priority along with the Town lake.

Janice Miano: Arizona is a desert. Please stay true to our "roots". Please plant natural species and allow the former native species to return. Please keep it wild like 91st Avenue- a "jewel" and not park-like - not a showpiece.

Theonoa Vyvial: Maricopa Audubon Society - Please keep habitat for birds and other animals - not just for people. Parks, grass, picnic tables. There seems to be plenty of "people" habitat around the Tempe Town Lake. PLEASE require that the remaining Tempe reach be planned for birds and other animals - other animals with closed canopy, undergrowth and no access for people - except through binoculars.

Jeff Jennings: Prostar Realty - I have been an advocate of the original Rio Salado Concept plan since the early 1980's. As presented, the Corps efforts will result in practical environmental and engineering solutions for that portion of the broad vision that should fall within government responsibility. If implemented in this fashion, the responsibilities and opportunities for the broader expanded vision will be held by the private sector. We will solve the base problem and allow free enterprise to pursue its purpose. Unquestionably, revitalization of this scar across our valley will benefit our retino, both environmentally and economically.

Jeanine Baker: What kind of species does the project hope to attract? If this is truly a restoration project, it will want to attract native species that long ago moved on. To bring them back, it must be understood - there is no extra room for picnic tables or grass. Fragmentation will destroy the goals of this project. I believe a discrete nature center could be planned, but what is the use if we cannot recover our species; it won't be worth doing a project at all. We do not need more homes for starlins and grackles.

Michele Hart: USPS - Excellent Program

US Army Corps of Engineers
Written Response to Verbal Comments from the
Public Hearing for the Rio Salado Wildlife Restoration
Feasibility Study and Environmental Impact Statement

page-7 Laurie Nessel:

Comments concerning use of native plant material are appreciated. It is our intent to use native plants for the initial planting. We listed Bermuda turf in Indian Bend Wash because Bermuda provides excellent erosion control to protect other riparian plant material. It would also visually connect the surrounding golf and park areas to the habitat. However, we are re-evaluating whether or not to use of turf in the Indian Bend Wash reach. The maintenance of non-native plant removal is something we cannot guarantee because of the tenacity of such species as Tamarisk. However, it is our intent to insure a maximum survival of native plant material. Comments concerning recreational uses of habitat are appreciated. The recreational opportunities in the habitat are passive activities such as bird watching, plant identification, photography, sketching, or walking. We plan to use exclusion zones for wildlife, and limited access in other areas for educational opportunities. We are re-evaluating whether to have a path in the upper Salt River reach, or to restrict human access to a pedestrian path on top of the dams (allowing visual access to the habitat). We do not have funding for this feature yet. Comments regarding maintenance of habitat for continuous canopy and understory were noted by several speakers. The design of the habitat would include areas of dense continuous canopy as well as areas of filtered canopy and open areas, as would appear naturally. Along with the tree canopy, a native plant palette of shrubs will provide similar understory for small mammals and birds. The City of Tempe does not intend to trim shrubs or trees, or do any high maintenance activities in the habitat. The intent would be to allow natural growth to occur, with minimal maintenance of blighted plants and non-native invasives.

Page-7 Michael Baker:

Comment on card noted that plan did not define what species would be targeted as a means of measuring the success of the restoration. The appendix listed an extensive list of birds that have been sighted in this area, however, we did not target specific species. If the Maricopa Audubon Society has specific birds they would like to attract, and know of ways not being presented in the draft plan, we would appreciate advise on design elements necessary for successful restoration. We are confident that the concept plan addresses the needs of most of the birds listed in the appendix, as these birds are already found in the area.

Page-8 Carolina Butler:

Comment regarding land fills burning in Phoenix cannot be addressed for the Tempe portion of this project. Comment regarding gravel mining operations are also not applicable within the City of Tempe reach, as these industries are not allowed in Tempe. Comments regarding flooding in the Salt River are recognized. The Flood Control District of Maricopa County will be reviewing and approving any plans within the Salt River Channel. The City of Tempe intends to keep all ramadas and picnic tables outside of the Salt River levees and outside of the low flow channel of the Indian Bend Wash. All buildings and structures are outside of the flood channel. However, trees will be planted to create habitat in the channel and along the banks to provide shade and aesthetic enhancement. Just as plant material bends, breaks or uproots during natural floods, the habitat will function as naturally as possible, distributing seeds and organic material further downstream and naturally revegetating other areas. In response to comments regarding ground water and land fill leaching into the Town Lake. The groundwater table in the Town Lake area ranges from between 30 to 150 feet. The only land fill adjacent to the Town Lake is contained (i.e., cannot leach into the channel) and non-toxic. The City of Tempe is required to maintain water quality within the Town Lake, which includes diversion of first flows of storm water from the streets around the lake through a large by-pass pipes. We are taking every precaution to protect our water resources. In response to comments about restoring the river to its more natural condition, see comments for Laurie Nessel. In response to submitting plans to Sky Harbor International Airport. A member of our staff acts as liaison between the City and the Airport to address aviation concerns. The FAA as the operator of the airport and federal governing agency, has jurisdiction over approval of development plans. The public hearing you attended was advertised for anyone who had concerns about this plan. We welcome any comments from any groups during the review period of this draft feasibility report. This meeting and future public hearings are the mechanism for interaction with citizens of all interests.

Page-11 Scott Burge:

Comments regarding the potential number of visitors to the area are noted. The listing of potential users seems large because of the urban attractions around the habitat area. The potential maximum users in ancillary areas affects the number of visitors. As part of the rating system to determine whether this project is worth building, the federal government requires the number of people who would possibly have access to or benefit from this habitat. The higher the number of potential users, the more points towards being a viable project we earn. This number does not reflect the number of people who would be in the habitat at one time or even on a given day. The City plans to include exclusion zones for wildlife refuge and limited access areas for educational use. Recreation will be limited to passive activities like bird watching, photography, hiking, sketching, etc. Any information that you have regarding design of the habitat would be appreciated.

Page-11 Robert Witzeman:

Comments regarding natural and native plant habitats are addressed in answers to Laurie Nessel. Comments about design elements such as sand bars and placement of bridges are noted. The plan shown is conceptual, for use with the feasibility study. At such time that funding for design is obtained, your comments will be addressed in the plan.

Page-12 Cliff Drowley:

Continuous canopy comment addressed in answers to Laurie Nessel. The number of plants and the design will provide areas of closed and open canopy. The turf existing in the golf area will remain.

Page-12 Dwayne Fink:

Comment regarding water source is noted. Although the use of water from Indian Bend Pump Ditch was listed as a potential water source, it is not considered a preferred source. If it were to be used, we would be increasing the flows in Indian Bend Wash through the canal in order to convey the water, but we would not be diverting water from SRP's Indian Bend Pump Ditch. Regarding Mesa's water treatment plant. The City of Mesa may be working with the Salt River Pima Maricopa Tribe to partner on habitat restoration in their portion of the Salt River, but this is outside the scope of this feasibility study, and outside of Tempe's jurisdiction.

Page-13 Filomena Durazo:

Comments regarding burning land fills are not part of the Tempe portion of the project.

Page-14 Jim Lemmon:

Comments regarding involvement of neighborhoods. This public hearing was mailed to chair heads of associations, advertised in the paper, and posted at the City. The purpose of this public hearing was to address all citizen interests in the project. Thank you for attending and representing your community. Regarding the water source for this project, we are still evaluating what the best source would be.

Page-14 Jenine Baker:

See comments to Laurie Nessel regarding native vegetation and limitation of recreational uses. See comments to Michael Baker regarding attraction of native species birds.

APPENDIX J

Phoenix Public Hearing Transcript and Responses to Verbal Testimony

US Army Corps of Engineers Public Hearing of January 8, 1998

Good evening, I am **Sheryl Sculley**, Assistant City Manager for the City of Phoenix and part of the City of Phoenix Corps of Engineers team working on the Rio Salado Habitat Restoration Project. We'd like to welcome all of you to our public hearing this evening. This is very exciting and we're glad to see so many people tonight to talk about the Habitat Restoration Project. This is a five mile environmental and flood control project within the city of Phoenix that we are going to talk about tonight and also some elements of the Tempe portion of the project. The City of Tempe is also a partner with us on the Habitat Restoration Project and will delineate that in just a few minutes.

I just want to mention before we get started tonight that what we are talking about in terms of the Rio Salado Project this evening is within the banks of the river. We're not talking about beyond the banks or development beyond the banks, but rather this project that is being presented to you this evening is about a Habitat Restoration Project within the river itself and returning water into the river. We think it will give us the opportunity to do other positive things for the community in the long term and we're happy to discuss those with you. But I just want to emphasis that the project presented tonight is about Habitat Restoration within the banks of the Salt River.

Let me just introduce briefly the other people sitting at the table here and there are many others I'm sure will be introduced in just a few minutes. To my immediate left is Colonel Larry Davis from the U.S. Army Corps Of Engineers in the L.A. district office. To his left is Bob Joe the Chief of Planning from the L. A. Office from the Corps of Engineers and to his left Mike Ternak, who works for the Corps of Engineers here in Phoenix on this project. Colonel Davis is going to talk in a minute, but let me just introduce a few other people who are here with us tonight. We have several representatives from our congressional offices. E.J. Jamsgard is here from Senator Kyl's office, Kevin Adams from Senator McCain's office, and Bruce Raydon from Congressman Shadegg's office. We also have three letters tonight that will be read into the record later from Congressman Salmon, Congressman Pastor and Congress Stump all supporting the project. I know that our Council members, Cody Williams and Doug Lingner, plan to be here this evening. Both had meetings elsewhere in the community but plan to be here a little bit later. I would like to recognize former Council members Calvin Goode, who is here tonight with us as well. We have a number of city staff members and Corps staff that are here with us tonight.

Members of the Rio Salado team will help us with questions and perhaps talk with individuals that we may not be able to get into a detailed dialogue because of the numbers of people here tonight. They will be able to take residents aside and answer questions you have that we won't have the time to get into in depth as part of the formal hearing. Once again, I would like to thank all of you for attending. We do have a brief presentation, and then we will take comments from the audience. At this time I would like to turn it over to Colonel Davis, who will make some introductions and also give a brief presentation on the proposed Habitat Restoration Program. Colonel...

Thank you ladies and gentlemen for joining us tonight. As Sheryl said, I'm **Colonel Larry Davis** the Commander and District Engineer of the Los Angeles District U. S. Army Corps of Engineers, and I want to thank you for joining us tonight to listen to our presentation of the recommended environmental restoration plan of the draft Rio Salado Feasibility Study and Environmental Impact Statement. Before you start, I've got to express my thanks to the City of Phoenix for arranging Frank's meeting and the City for being such an outstanding part of this study throughout. We've enjoyed a very successful and close-working relationship with the City, as well as representatives from Tempe. Now I am joined tonight by several folks, Sheryl introduced two who are sitting here at the table with me, but I'd like to recognize a couple of others seated up here in the front. First Mr. Alex Watt, who is the environmental impact study coordinator for this study and Mr. Joe Dixon, the chief of our Phoenix planning office. We also have our project manager for this study, Mr. Phil Benoit.

We're here to make a presentation, but more importantly to receive comments on our draft Rio Salado Feasibility Report and Environmental Impact Statement, so let me give you an idea of how tonight's meeting is going to go.

First, I'll give a short presentation, then an overview of the study process, the findings, the conclusions and the recommendations that are contained in the draft Feasibility Report. I'll cover the remaining study schedule and report on the actions required to put this project in place. After my presentation, we'll get to the most important part of the meeting, which is the public comment section. That's the reason we're here to night--to hear from you. At that time you'll have the opportunity to comment on the report. We'll use the attendance cards that you filled out as you entered to call speakers forward. At the end of that period if anyone else wishes to come up and make any comments, we will open the floor for anyone at all who would like to come up. We will be recording all your comments and the questions that you raise tonight. This information will be incorporated into the final report. The initial project for this two-phase study was approved in the 1994 Senate Energy and Water Development Appropriations Bill. The Reconnaissance Study was completed in 1995. The Reconnaissance Report identified federal interests in proceeding to a second, feasibility, phase to explore environmental restoration with incidental recreation of Salt River in both Tempe and Phoenix, Arizona. The Corps headquarters certified the Reconnaissance Report in June of 1995, which gave the Los Angeles District the authority to move into the cost shared feasibility studies.

Now the reconnaissance phase is 100 percent federally funded; however, feasibility studies are cost shared 50/50 between federal and non-federal sources. The two non-federal sources are the Cities of Tempe and Phoenix. They have both been outstanding sponsors to work with and if we're successful in getting this project off the rise, we look forward to working with each of them in the design and construction phase.

The entire area includes five miles of the Salt River in Phoenix and portions of the Salt River and Indian Bend Wash in Tempe. The Tempe study area includes approximately 1.3 miles of Indian Bend Wash, from McKellips Road downstream to the confluence with the Salt River. There are two separate portions of the Salt River in the Tempe restoration area. There is a half mile from McClintock Drive to the upstream dam for Tempe Town Lake. There is another half mile area downstream of the lake to Priest Drive. For planning purposes, we've made the assumption that Tempe Town Lake will be completed and in place prior to the restoration project. The Phoenix Study area is the Salt River from the Interstate 10 bridge downstream to 19th Avenue, a total of about five river miles.

The purpose of the feasibility study is to evaluate problems in the study area, develop alternatives, and make the recommendation to Congress. For this study, the recommendation will be to implement the proposed environmental restoration project. The report includes an environmental impact statement and a presentation of the estimated costs and benefits.

Regionally, riparian areas have disappeared from throughout the Sonoran Desert. Some estimates indicate that as much as 90 percent has been lost. These ecological systems are critical to the wildlife habitat as the basis for wildlife to migrate and to help support ecological diversity. This picture, taken in the late 1890's at the Hayden ferry crossing near downtown Tempe, shows the expansiveness of the flood plain prior to any upstream dams. Historically the study area had possible conditions for high quality wildlife habitat and related plant communities. In the 1900's as upstream water projects began to change, the river was slowly eliminated as the river dried up. Today, the Salt River is essentially void of vegetation through the metropolitan area. This aerial photo shows the Salt River and Indian Bend Wash in Tempe. Any existing vegetation is sparse and of low quality.

The primary problems include the loss of habitat association by current vegetation, the loss of ecosystem functions, the loss of ecological diversity and under-utilized land use for the degraded river. Our feasibility plan objectives would solve the identified problems within our parties planning guide and regulations. These objectives were to: Restore the river for a more natural condition, emphasize restoration with plant species and plant communities that dominated prior to the manmade changes. To provide increased opportunities for wildlife to utilize this river corridor and to increase recreation and environmental education opportunities. The alternative we formulated tried to simulate as much as possible what a natural riparian cross section would look like. Riparian models, such as depict on this slide, develop restoration alternatives. Some examples of the habitat types we are proposing to restore can still be found in rivers, both upstream and downstream of the metropolitan area. These slides show some of these areas.

This is a mature mesquite grove upstream from Granite Reef diversion dam. This slide shows cottonwood and willow tree areas which can still be found downstream of the confluence of the Gila River. This slide shows the constructed wetlands demonstration project at 91st Avenue, which is an excellent sample of a successful engineered wetlands project.

The study area contains many existing conditions that need to be dealt with in developing a plan. The alternatives or the actions were formulated with consideration given to these identified planning restraints. Many of the proposed features and their specific locations were formulated to avoid problems and to more specifically address these restraints. In general, the alternatives we formulated tried to evaluate different combinations, acreages, and locations where various habitat types were identified in our objectives. We looked at each requirement and associated costs necessary to establish and support the various alternatives. Our water resource analysis focused on returning some of the hydrology of the river in order to establish, support and maintain the project. We perform cost and habitat benefit analysis to help select the plan which would be most cost effective. The overall proposed restoration plan for Tempe and Phoenix consists of 160 acres of mesquite habitat, 119 acres of cottonwood-willow tree habitat, 74 acres of wetland marsh, which includes some open water areas, 101 acres of aquatic habitat, which would be in the low flow channels of Indian Bend Wash and the Salt River. A water supply system consisting of ground water extraction wells, one in Tempe and six in the Phoenix reach, which also includes construction of a low flow channel. It will also propose a recreation plan which consists primarily of linear recreation features such as trails. Recreation plans have been formulated to allow the public to view, appreciate and enjoy this unique restored natural resource within the urban area.

The following slides show the proposed restoration plan concept to Tempe and Phoenix. In Tempe the existing low flow channel with Indian Bend Wash will include aquatic types of vegetation, streams, small ponds and trees along the fringe areas. The wide terrace of Indian Bend Wash between Curry Road and Salt River will be restored with mesquite groves that once covered the area. The Salt River will be restored with wetland marsh immediately upstream and downstream of Tempe Town Lake. Cottonwood-willow trees would be established in the fringe areas adjacent to the wetland marsh. The plan includes a water supply delivery system to supply the open water and irrigate the vegetation. The plan includes one small public parking area along Indian Bend Wash for public access. The recreation plan includes an interpretive trail system for viewing and habitat monitoring.

The Phoenix plan includes a low flow channel constructed in the bottom of the existing river. The low flow channel is the brown feature on the slides. This flood measurement feature is designed to pass the more frequent flood flows. The low flow channel includes four grade control structures to minimize the flow velocity during flood releases. The low flow channel will also help protect the primary restoration features from flood damages, since most of the restoration features will be located between the low flow channel and the existing main bank of the river, not outside the existing banks. Six wells will pump shallow ground water to supply the water for the project. A water delivery system will bring water to the vegetation, wetlands and open water areas. The water distribution system consists of a gravity flow component for all the open water features including the wetland marsh and the aquatic habitat. The plan will include aquatic vegetation, a stream and ponds in the low flow channel. The open water areas are indicated in blue. The wetland marsh areas will also include some open water areas. Cottonwood and willow trees would grow around the fringe areas of the wetlands. These are indicated on the slide by the dark green areas. Mesquite trees, which show up in the light green areas, would dominate the higher bank areas and drier locations within the river. Although the primary project purpose is for environmental restoration, there will be public parking access and information facilities. These are proposed at 16th Street, Central Avenue and 7th Avenue. The associated recreation plan will emphasize an interpretative trail system, viewing areas and environmental educational opportunities. The total estimated costs for the restoration project portion of the project are shown on this slide, and they are broken down in the amounts for Phoenix and Tempe. The restoration project is cost shared at 65 percent federal and 35 percent non-federal. Likewise, the total recreation costs are indicated on the slide broken down as well. The recreation costs sharing is 50/50.

After construction of the project is complete, the project will be turned over to the non-federal sponsors. The sponsors would have the operation and maintenance responsibility for this project. Overall, the proposed plan will increase habitat values by an estimated 338 habitat value units. Habitat value units are estimated for the method that was used to quantify the biological values of habitat and study areas. They were established by qualified personnel with experience in regional wildlife habitat. It provides increased habitat opportunities for wildlife species. It returns the river to a more natural condition, and the plan increases recreation and environmental education opportunities. A draft environmental impact statement has been prepared as part of the study. The findings of the environmental impact statement are that the proposed project will have no significant adverse impacts, and no mitigation required.

The recommendations are also subject to non-federal cost sharing obligations and responsibilities and after completion of construction, the non-federal sponsors are required to operate and maintain the project at a 100 percent non-federal cost.

The remaining feasibility study schedule is as follows:

Our public review of the draft report will end on the 27th of January. Our goal is to prepare the final feasibility report for our division office by the end of February. The official public notice for the final feasibility report comes from our division office and is issued by the division commander. It is scheduled in March. A final report of the Chief of Engineers at Headquarters, United States Army Corps of Engineers, is anticipated in June, 1998. The chief's report will be used in trying to get the project included in the 1998 Water Resources Development Act, the authorizing legislation.

That concludes the presentation, and now I go to the floor to the most important part of the meeting, to listen to your comments. For those of you who wish to make comments, I have a couple of requests.

To make the recorder's job easier and to insure completeness of the record, please identify yourself when you come up to the podium. Also, I ask that you keep your comments to the subject study and the draft feasibility report. Written statements are also appreciated, and will be accepted at any time up through the 27th of January.

Before the first speaker comes forward, I'd also like to ask that because of the number of folks, who we see by the pile of cards here, have indicated the desire to speak, I'd appreciate it if you would try and keep your comments to no more than two to three minutes.

Before I ask the first speaker to come up, I've been asked by three of your members of Congress to read into the record their comments before we proceed. So if you'll indulge me for a second...

First of all, this is from **Congressman Ed Pastor**. It goes, "Dear Mayor Rimsza: I apologize for not being able to personally attend the U. S. Army Corps of Engineers public hearing on the Phoenix Rio Salado Project. I am, therefore, asking that this letter be read into the record. I strongly urge the Corps of Engineers to proceed expeditiously on the Rio Salado Wetlands Restoration Project. The Sonoran Desert and the Salt/Gila watersheds have lost approximately 90 percent of their historic wetlands due, in part, to water engineering projects of the federal government. The Rio Salado Project would help restore a portion of this valuable habitat lost along the dry riverbed of the Salt River. While reviewing the natural habitat and environment of the portion of the Salt, this project will undoubtedly spur community development and economic growth in the areas surrounding the project. Recognizing the national, environmental and local economic benefits of this project, the House of Representatives report to the FY 1998 Energy and Water Development Appropriations Bill include language which states that the Committee expects the Corps of Engineers to honor its commitment to the local project sponsors, and complete the Rio Salado Feasibility Study in time for the project to be considered for authorization in the Water Resources Development Act of 1998. As a member of the Appropriations Subcommittee on Energy and Water Development, I thank the Corps for its dedicated attention and hard work in this project. I look forward to seeing this project become a reality. Sincerely, Ed Pastor, a member of Congress."

The next letter comes from **Congressman Bob Stump**. "It's my pleasure to support the Phoenix Rio Salado Project. I'm sorry that I am unable to attend the public comment meeting personally tonight, and respectfully request that the following comments be entered into the record.

"The Phoenix Rio Salado Project is truly visionary, and I am pleased to see the thoughtful and detailed work which has gone into making the feasibility plan. It is this very care in planning that will make the Phoenix Rio Salado Project a gem in the desert for all to enjoy, and not a mirage. Residents and visitors to the Valley of the Sun will be able to enjoy the scenic desert riparian habitat of the Phoenix Rio Salado Project and the recreational opportunities that it will afford. As water brings life into the desert, similarly the Phoenix Rio Salado Project will be a catalyst for community revitalization in adjacent inner city neighborhoods, neighborhoods that have been blighted by illegal dumping and the lack of green space for exercise and quiet contemplation. Aside from the very practical benefit of enhancing existing flood management features, the habitat restoration component of the Phoenix Rio Salado Project will leave a positive and lasting legacy; a river full of life where a dry riverbed once starved the environment. I commend all the work of the diligently prepared feasibility plan that sets the foundation for bringing this project into fruition. Best wishes. Sincerely, Bob Stump, member of Congress."

And finally from **Matt Salmon**, member of Congress, "Dear Mayor Rimsza, As you know, I have been supportive of the Rio Salado Project since entering Congress three years ago. This project will help restore portions of valuable lost wetland habitat along the dry riverbed of the Salt River. It will also provide national environmental benefits, and it will encourage community development in the area surrounding the project. The U. S. Army Corps of Engineers is consistently supportive of the project, which requires only a small federal investment in addition to local resources. In order to begin the construction phase in 1999, Congressional authority will be required as part of the Water Resources Development Act of 1998. Thus far, the plan to restore the Salt River has proven to be sound both fiscally and environmentally. I trust that my Arizona colleagues will once again join me in supporting legislation that will move Rio Salado closer to completion. Please consider this a statement of record. I look forward to the realization of an important environmental and economic project in the First District of Arizona. Sincerely, Matt Salmon, Member of Congress."

OK, before I ask the first person to come down, Sheryl would like to recognize a couple more people joining us here tonight.

Before we get started with public comments, just quickly I'd like to introduce our Phoenix City Manager, Frank Fairbanks, who is here to my left, and also Paul Berumen, who is an assistant to Mayor Rimsza. Paul is here to speak a little bit later. I just wanted to recognize Paul. I would also like to ask a couple of staff people to stand up and be recognized because we have asked you to limit your comments to two to three minutes. If you'd like to pursue a particular question or issue and step outside with the staff members, there are a number who are here tonight that can help with some of the questions and perhaps some of your concerns or issues. Peter Atonna. Peter, identify yourself from our Planning Department. Karen Williams, Karen, I thought I saw you in the back if you could...there she is, our Neighborhood Services Department. L. B. Scacewater from Parks and Recreation. Over here Joy Mee in the back from our Planning Department as well. Steve Branca, Community and Economic Development. I just wanted these people to identify themselves so that if you would like to pursue an issue or have some further questions, you would be able to talk with these staff members, and just step outside the council chambers to do that. Thank you, Colonel.

Colonel Davis: I would now like to start asking people to come forward if you would, please come up to the podium. Your remarks are being recorded, so we can capture them and please identify yourself. Please forgive me all the few names or the many names that I've have mispronounced tonight, but I'll give you my best shot. Florence Eckstein.

Good evening. My name is **Flo Eckstein**, and I'm the chair for Phoenix Parks and Recreation Board, and I'm privileged to speak here in behalf of the members of our board. We were presented by City staff with a detailed explanation of all of the illustrations that you see before you about six weeks ago, and we enthusiastically endorsed the concept of restoration of the river, its plants and wildlife, of creating opportunities for recreation which will enhance the quality of life of Phoenix residents. While recreation is incidental to the project, it's terribly important to people who live near the river and to people who live throughout the city of Phoenix. The project complements what we are doing as a city to protect and preserve the mountain preserves, and to create a safe and life-enhancing national public amenity. The project is in consort with the work of the Parks Department to create opportunities for the citizens to enjoy our unique desert environment, and we very much look forward to working with the Corps of Engineers to make a revitalized Rio Salado a reality

Notes from the sign-in card: The Phoenix Parks & Recreation Board supports the plan.

Thank you. Dr. George Brooks.

My name is **George Brooks**, and I live at 5018 S. 21st Way in Phoenix. We are south of the Salt, and there was a time, Colonel, that we in South Phoenix fought for bridges to cross the Salt River when we had floods and rains. Tonight I am here to express my appreciation to you for the recommendation that is being prospered at this community to build another kind of bridge. This bridge says that we are one city. The Salt River banks will become walkways and habitats for animals species long removed from the area. The whole area shall be turned into a kind of fertile crescent, where people have the opportunity to move and have their being. It shall become a thing of beauty, a joy forever. It shall be a place where children shall come to play and experience nature. It shall be a place where we can all walk and none shall be afraid. They shall be protected by the best police department in the state, in the world really. It shall be a place where children shall come as a part of their exposure to the hospitality of this greatest city in the world. I, therefore, sir and madam, support this project. Thank you very much.

Thank you sir. Tammy Bosse

Tammy Bosse, and I'm the director of Capital Mall Association, another urban renewal project. It is delightful for me to be here to just offer my support for this wonderful project, and to thank the City and the U. S. Army Corps of Engineers for all the work they've put into this so far. We still have a long way to go and it's going to take a lot of persistence and a lot of hard choices about the funds and where they're going to go to support this, and so I just wanted to offer my support, and hope that we can all stick with it, and make the hard choices to make this a reality. Thank you.

Notes on sign-in card: I would like to register my support for this project. I had initially planned to speak but have a conflict of schedule that has developed, so I will not be able to speak. "Rio Salado restoration is a very exciting and important project. I appreciate the city's and U.S. Army Corps of Engineers' work on this project. We must all work together to keep this project moving forward."

Thank you, ma'am. Celeste Minzikah.

Hello. My name is **Celeste Minzikah**, and I've been a Phoenix resident since 1990, when I moved from Tempe, where I grew up and I attended college. My husband and I currently live in North Phoenix, but we have family and friends that live in the area of Rio Salado, the areas selected for this project. I was active actually eleven years ago against the previous Rio Salado Project due to what I considered to be the over commercialization plans of the area, such as constructing golf courses and luxury homes. I saw this as further displacing the economically strapped families and individuals that were living along the Rio Salado. I want to cite tonight that I feel a mixture of excitement and yet concern for the Rio Salado Project. Such interest devoted to the restoration of waterways and habitat has been long wanted, and I'm so hopeful to seeing it happening. I am pleased that the Army Corps of Engineers was involved in taking back certain sections of the river which it previously had been bought by companies that stripped and polluted the river. My concerns are principally regarding the welfare of people living along the Rio Salado and secondly, the costs already incurred and those estimated for implementing the project. I think that assurance of affordable housing and temporary housing shelter, for example, for the homeless population, must become a part of this overall plan if it is to succeed, and efforts for heavy commercialization in the area must be limited so as to curb further pollution that's unwise use of the land. And lastly, since this project increases in cost at such a rapid rate, we must take responsibility to continue to keep discussion alive and to act quickly, but wisely, in this process. Especially in light of the fact that no less than 52 studies have been conducted regarding the Rio Salado already and I offer whatever assistance I can do to be a part of this process, including any translating into Spanish if needed. Thank you.

Notes on sign-in card: I feel both excitement and concern regarding this project. Excitement because it is a long time coming to have such interest devoted to restoring waterways and habitats in Phoenix, and to take back certain sections of the river that had somehow--and shamefully so--gotten in the ownership of companies which stripped and polluted the river. I'm concerned about the efforts to add certain commercial businesses to the area such as more hotels and a golf course. Churches, small retail shops, and maybe Habitat for Humanity Homes would be more appropriate and of service in the surrounding areas.

Thank you. Felipe Zubia.

Hi. My name is **Felipe Zubia** and I'm representing the Maryvale Village Planning Committee. First I'd just like to make reference to Dr. Bate's reference to this actual project being a bridge, just a pivotal reference, because it is kind of a bridge to kind of bring the south and southwest communities into the larger community itself. To get away from that, and into the comments of the Maryvale Village Planning Committee, I guess from the Maryvale perspective, in an area where it is very limited on it's trail opportunities, we see this as a big plus. Although the Rio Salado is not within the Maryvale district, it does offer an opportunity. It is a little closer than some of the other trails that are now in the Squaw Peak and some of the other mountain areas around town, so we see that is a plus. We also see it as a plus for the valley as a whole. The project size and the scope of it is not only a benefit for the city of Phoenix, but to valley residents as a whole. Hopefully, gaining positive national and international attention for the issues that they are addressing. Some of the particular items I liked are including town way of development, understanding that is in the City of Tempe, but also the restoration and the attempt at renovating the natural life cycle of the riparian areas. That includes the allowance for the 25-, 50- and 100-year flood events. That action builds a positive reaction. It will not only add to the educational experience, but also recreational experience. And lastly, on the positive of the project is the economic positives. I guess from what we can tell, it appears that this whole area is within the IGA. Review of draft program areas will allow for a lot of the funding for redevelopment programs to bring in and increase job opportunity as well as housing opportunities. We believe that's going to be a big plus as well. As to concerns now, I guess probably the biggest concern, and probably the concern that will profit most likely, is that the remaining one-third of the funding. Understandably, you're not going to jump on funding sources at this point, but I think that if this goes on for too long, I see that as an imminent tax. Eventually a tax is going to be coming down the road, so you might want to address that as soon as practical. We understand that it is not going to be too quick. Secondly, the actual costs are ninety-five million dollars; maybe the concern of that really, really skyrocketing, if you run into unforeseen environmental cleanup projects. We want to make sure that those are addressed as thoroughly as possible. I guess one of the last concerns dealing with a more with technical nature, and that means the actual attempt at recreating the natural environment. One of the things we'd like to make a point is actually addressing some of the, some of the smaller but more variable details, and in particular transpiration rates, and how actually those are going to be working there. I mean, especially with trees such as cottonwoods who are notorious for their water consumption. We just want to make sure those details are addressed because those are the details that may in the end, when this project is implemented, may be the undoing of it if they're not addressed properly. Lastly, we just want to pledge our support in seeing this project unfolded. Thank you.

Thank you. Arthur Luera.

My name is **Arthur Luera**, and I'm the representative for the Central City Village Committee, and I am very happy that this project is back and alive. I believe it is a positive for the City of Phoenix to develop the center of its heart of the city, and I'll be very short. The concern that we do have is, first of all, on Page 16 of your study that has a cost per acre, for acreage of water; it does not have the terms so people that don't really know how much it's going to cost for the maintaining of the project, a very important issue. We're also concerned with not only the cost, but again in 1980, when the project was put to vote and it was defeated, in Central City Village Committee I have seen the psychological and philosophical destruction of communities. We still see it now with the Golden Gate Project. I know we shouldn't be creating this now, but I believe we need to. I would encourage that the study get with the neighborhoods and see what positive reactions or the economic development and the community development in that area is going to impact the community. It's very, very, important if we bring in 365 habitat units. We can restore 95 percent of the river. We certainly don't want to get rid of 95 percent of the population and then have the same problem we had at the Golden Gate. We've had this Baptist church that was over there, that the Catholic parishioners who go there. You see people there still suffering from the effects. I do like the project, I was raised and swam the river when I was a boy, and I am for it, although these things have to be addressed. Thank you very much.

Notes on sign-in card: A complete study into the impact that the project will have on the surrounding neighborhoods on long and short term basis.

Thank you. Donald Keuth.

Thank you. My name is **Donald Keuth**. I am president of Phoenix Community Alliance and on behalf of our 125 Corporations and members, we are very pleased to be here tonight. Since 1984 this Alliance has prided itself on its relationships with the City of Phoenix and the development and redevelopment of the central city. We applaud the Corps and the City for their efforts in this project. We believe the reasonableness of the scope and the costs are one that could be supported, and our organization is here to assist you in any way that we can to make sure this part of it moves ahead. One of the key issues as we look at the redevelopment and expansion of the Central City is not with focusing on housing and not just high end housing, but housing for all types, for all kinds of people. It needs to be quality housing and for that to occur, it needs to have the same kind of quality of life amenities that we see in the growth areas of the outskirts of this community. This type of development with trails, with the restoration of the habitat to add to those quality of life issues. We're here to reinforce our support for this project and applaud your efforts to make this a reality. Thank you.

Thank you. Penny Howe.

My name is **Penny Howe** I am vice chairman of the Phoenix Parks Board and a long-time advocate of environmental groups sources within the City of Phoenix. I want to convey to you tonight how pleased I am and excited I am to be here to speak out in favor of the Rio Salado habitat restoration project. I have been dubbed a "shameless agitator" by some of my friends and colleagues on the National Recreation and Parks Association Board of Trustees. Indeed, one fellow trustee went so far as to send me a pin bearing that title. It is a title that I accept and accept it proudly. I last wore this pin here, in this room, when Former Mayor Johnson and the City Council approved the land swap that resulted in us receiving a 75-acre park site at the Indian School property. I am happy to be able to wear it again this evening, as I am going to be shamelessly advocating for this project. The Rio Salado Habitat Restoration Project is a plan which I embrace enthusiastically, and for which I delight in agitating unshameably. The project embodies the concepts of preservation, restoration, re-creation and recreation. It offers to hope of new life, vitality and spirit. It promises to turn a land damaged, unhealthy eyesore into a unique, healthy, lush, riparian habitat teeming with desert and water birds, as well as wildlife. It will provide a quiet oases of trees, grasses and shrubs, wetlands, open water ponds and a small flowing stream--all within the center of intense urban development. When completed, this will be another signature resource to be appreciated by our current and future citizens. It will enhance our inventory of one-of-a-kind facilities and rival across the nation, which is already established by our North and South Mountain preserves. It will be augmented by the addition of Indian School Park and carefully protected desert preserves throughout the valley. Last Friday I sat in an overflow crowd of citizens and witnessed the inauguration of our newly elected and re-elected City Council members. I listened as Councilman Milton articulated his mission for desert preservation. As Councilman Gordon spoke to the need to protect neighborhoods and continue to promote quality of life city wide. As Councilman DiCiccio avowed to keep on keeping on, and as Councilman Williams assured us that City Council District 8 is alive, growing economically, and that, "We ain't seen nothin' yet". Rio Salado will be one step to all of these councilmen's visions for the future. It is about preservation. It is about neighborhoods and quality of life. It is about continuing to provide the best for Phoenix citizens, and it is about economic viability and growth. However, for me more importantly it is about a healthy, robust stretch of riparian environment that will serve as a haven for man, flora and fauna. We hear much these days about the loss of our desert and desert areas, acre by acre. Many do not realize that a similar destiny impacts our wetlands. Just last week a report was issued by Fish and Game officials warning that the entire San Pedro riparian area in southeast area is gravely threatened by man's encroachment. The National Recreational Park Association is constantly besieged by requests for assistance and collaboration in addressing these types of issues. We have in Rio Salado the opportunity to be a model for the preservation, restoration, re-creation and recreation. I shamelessly, unabashedly agitate and advocate for the overwhelming and enthusiastic support for this plan. I say to you simply let's do it.

Thank you. **Daniel Gann**.

About the only comment I have to say, I am in favor of the project. The question is my mind is that we have a lot of mountain runoff water, and I'm wondering why that is not being used rather than extracting such ground water. Another thing, I think trees and so forth are being planned will also help the air pollution that we have in the city. And that's about it, except for commenting I do favor the project.

Thank you sir. David Bruner.

Thank you Colonel Davis. My name is **David Bruner**. I am the treasurer and a board member of the Valley Forward Association. I'm here to support the feasibility plan drafted by the U. S. Army Corps of Engineers. Their support describes the nuts and bolts that help Phoenix, Tempe, and for that matter, the whole Valley community have enormous opportunity to transform its dry and barren riverbed into something desirable. This is not simply transformed a riverbed; however, this project has a potential to transform and revitalize the urban flora by redefining our cultural identify. It's no secret that Phoenix and the Valley of the Sun is both blessed with and cursed with an abundance of developable land. This are practically no limits on the course of expansion of the Valley. More and more of us are seeking a perceived higher quality of life in the suburbs, away from the old core. Recent construction in the downtown and successful redevelopment methods there have helped to stem that tide; however, these efforts will not be enough. Rio Salado is the key ingredient, the main attraction for the reshaping of our perception of urban living. Rio Salado would be a magnet drawing first water, then plants, then animals, then people back to the central region. It would provide a wide variety of recreational opportunities including picnicking, horseback riding, bicycle riding and environmental education. It would stimulate development between the river and South Mountain, bring the community together, and most importantly it would rekindle the image of the urban core as the place to be. I would like to commend the Corps of Engineers for the hard work they put into this plan. I have been a member of this community for nearly all my life, growing up around the Indian Bend Wash in Scottsdale. I've seen how with a little foresight and public planning, and combining federal and local resources can have such a tremendous impact on the quality of life in the Valley. The environmental restoration opportunities here are tremendous. Bringing people in closer together will help not only the quality of life, but is also a way for reduction in pollution which, is another very important federal bill as we can finally move further down the road toward providing a mass transit solution. Once we get that core denser incentive. So again, thank you very much, and I urge the wholehearted support of the proposal.

Thank you. Jerry Smith.

My name is **Jerry Smith**. I represent just us ordinary citizens of the city of Phoenix. Colonel Davis, thanks to your Corps of Engineer group because you folks really provided an excellent overview of a very central poor part of our city that's a scar that all of us live with since we moved to the valley in 1975. I think we have an opportunity here, with our desert preserve mountains, to really recreate world class city, with a center of the city that I think you could find nowhere else. We could really create what has been called the Central Core, an ideal for lots of economic developments as well as presenting a passion for a Central city area like this that no one else can find. There are several things I think we should hear. All the people who talked today have been extremely positive, but let's not be so positive that we forget that there are a lots of folks out there who will challenge everything we say. They will challenge where's that 35 percent funding coming from. Is this really the best use of our time? Every talk show host that you can find is going to challenge this immediately. Yes, we need to be passionate, and everybody here has expressed several reservations or thoughts, or just concerns, but everyone has been extremely positive. We need to have such passion to have this go forward because it truly does represent vision, and truly represents a world class status; but without passion--without the absolute overwhelming concern, vision and extreme dedication a lot of the people will try to put this down. We've had a lot of things in front of the voters in this city in the past several years that a lot of us have felt strongly about. It's amazing how quickly things can change. We just have to look at the last vote on urban transit to take a look at how quickly things can change from very positive to unfortunate defeat. Thank you again for your efforts, and I certainly applaud this visionary view of the federal government.

Thank you. It has been recommended to speed things up a little that I also identify the following speaker, so that I can help you all along. If we can have Julian Blum, and the next speaker will be Robert Brophy.

My name is **Julian Blum**. I'm here representing Infill Development Realty Services at 7657 E. Coolidge in Scottsdale, Arizona. I moved to Phoenix from the East Coast in 1933, and it was a community of about 18 square miles. My first residence was at 5th Avenue and Southern in South Phoenix, and I became employed in a real estate office in downtown Phoenix. Every day I drove up and down Central Avenue from Southern to Washington. Along this route were scattered poorly-built residential subdivisions, low end retail stores, unattractive buildings and gravel pit operations. The dry Salt River bed was an ugly scar bordered by all of the above. South Phoenix was considered the rear end of Phoenix, and although its proximity to downtown was excellent for me as my children came along, it was evident that this was not the area in which I wished to raise my family, so I moved to the suburbs. During the past 44 years, I witnessed phenomenal growth in the Valley and experienced Phoenix's expansion to a city of over 450 square miles. Today areas that were impossible to reach with the mule 44 years ago are the centers of residential and commercial growth. I have also witnessed the stagnation along Central Avenue between Southern and Washington. Forty-four years has made very little difference in this area. The citizens of South Phoenix have tried their best to change this situation. It is true that the areas of South Mountain and the areas immediately south of downtown, but the neighborhoods along the Salt River for the part, are much the same as they were then. Now, after almost 30 years of effort by hundreds of people from all over the Valley and the United States Army Corps of Engineers, a feasible plan for the restoration of the river along five miles of the most abused area of South Phoenix is being offered. The Rio Salado Plan will create a riparian habitat and a significant regional open space and recreational corridor to link the north and south sides of the river. Like the Indian Bend Wash flood control project in Scottsdale, this will motivate the development of new residential and business enterprises. I emphasize giving every consideration to the existing residents of the area, it will reshape the region and make many new employment opportunities. I speak in favor of the environmental restoration and incidental recreation along the Salt River in Phoenix and Tempe, and urge the adoption of this plan. Thank you.

Thank you. Mr. Brophy, and the following speaker will be Calvin Goode.

My name is **Robert Brophy**. My wife and I are residents of South Mountain Village. Let me preface my statements by saying my wife and I are wholeheartedly in favor of this project. We do have several concerns. One of these concerns several people tonight have said that it would be hopefully a bridge to the South Mountain area. We're hoping that will be a bridge, and that the trees won't obscure the view of South Mountain from downtown. The second problem, I don't know how many people remember what happened a couple years ago with the State Navigable Stream Judicial Commission, where the State came along the Salt River and was threatening to take 80,000 pieces of property By approving this, I'm hoping it won't bring the State to revisit the Salt River. I just received a letter from them last week stating that they were going after the Gila River, the San Pedro River, the San Francisco River and the Santa Cruz River. They are starting their public hearings all over again. It worries me that they will try to take the properties again if this becomes bait for them. Lastly, a concern we have is with the possibility of disease coming from the river. As we know, there are a lot of dumps along the river. We have heard rumors that down at 91st Avenue and the river that they have found mosquitoes infected with encephalitis. If that is in fact true, can that be spread into our area? How will the government take care of that? Other than that, those are our main concerns. We are totally in favor of the project. We think it would be a boom for South Phoenix and South Mountain Village. We are working very hard on trying to clean up the area. With the influence of this, I think it will make our job at South Mountain Village a lot easier. Thank you.

Notes from sign-in card: To bring up some reservations and questions about the State Land Department and the Navigable Stream Adjudication commission

Thank you sir. Mr. Goode, followed by Don Cassano.

I am **Calvin C. Goode**. My wife and I live at 1508 E. Jefferson Street. I first moved to Phoenix in 1944. I served on the Phoenix City Council from '72 to '94. Certainly I have been in support of some form of revitalization of the riverbed for over thirty years. I have looked through these twenty pages. I have the thousand pages plus technical report that I have not had a chance to read yet. What I see is it seems to be something that, looking at these charts here, they are beautiful and well planned forms and concepts; I certainly hope that what is implemented and will be sufficient funded to get this done and perhaps even more so. There are few questions in mind that folks have raised with me. One was the owners of the land there by the Salt River. Are they going to donate their land in terms of helping with this project? It has been said to me that they would. There has been a question raised about the birds. It is going to produce some birds that will interact with the airlines and cause some problems? There are folks who talked about the airline flight pattern. Is it going to cause more problems all over Nuestro Barrio and the Eastlake Park Association area, and they have told me no. Impact on the residents--on Page 4 there is a statement that there is the potential for great revitalization of nearby neighborhoods and for substantial development, and Arthur Lucera referred to that earlier. Sometimes those who live closest have to be relocated. They are not given the opportunity to participate fully in the economic benefits of it. I think this is certainly a great thing that we ought to consider. Be sure that they're brought into this economic part, whatever it may be. Again, it looks good. I hope construction will be good, and I hope there will be monies available to get it done. Thank you.

Notes from sign-in cards: Need a full briefing on airline flight pattern and fowls.

Thank you sir.

Mr. Cassano, followed by Kenneth Clark.

Good evening. I am here tonight representing Valley Forward Association as its chairman elect. Valley Forward was founded on the basis of promoting and encouraging quality of life projects in the Valley. We view the Rio Salado Project both in Tempe and Phoenix as one of those projects that will truly enhance the quality of life for all the citizens lying in the boundaries of the project, both in Tempe and Phoenix, as well as the Valley as a whole. Valley Forward Association is here offering their assistance in whatever way possible to the City of Phoenix to promote this project and to bring it to completion. I want to say I have been involved with this project since the City Council of Tempe, of which I was a member in 1987, voted to go ahead with our project. I am very pleased as an individual to see that project taking off and this one moving forward as well. I personally offer my own support for this project's completion. Thank you very much.

Notes from sign-in cards: This is vital to the redevelopment and development of a part of the metro area. It will enhance the ugly area along the Salt River and bring citizens to this otherwise avoided portion of Phoenix. I strongly support moving forward.

Thank you sir. Mr. Clark, followed by Diane Brossart.

Thank you. First of all, let me say that being a shameless advocate is something to be very proud of. My name is **Kenneth Clark**, and I am the president of the Park Foundation of Phoenix. Many of you know Dennis Cahill, the Tempe City Councilmen. Dennis and I worked on a couple of other projects including the Irish Cultural Center that we are developing at Hance Park. Dennis has been on my case for about 18 months, talking about the Tonto Lake Project in Tempe, so I am particularly pleased to see this movement now, so we can have further conversations about the plans for development here in Phoenix. The Park Foundation is concerned about the fund-raising and costs of development of projects like this but more importantly, we are concerned with the aesthetic values and usability of the project by the people and visitors that we have to the Phoenix area. I think that is an important thing for us to consider, how a project like this will impact all of the people of the city of Phoenix. The one issue that comes to mind is with regards to the cost of this project and as has been said before, how we lay out the cost of this project to the community is terribly important. What really makes all of this work, of course, is the participation of the citizens of Phoenix, and this is a terrific gathering we have here this evening of people who wish to become involved. Let me say this, for those of you who are coming and making comments for the first time or participating for the first time in a public meeting like this, tell your friends that this is how it works, and there is no excuse to be made six months or a year from now from people who say, "Gee I didn't know this project was going to take place." You're all to be commended for being here. Finally, let me say that on behalf of the Park Foundation, we wholeheartedly support the development process for the Rio Salado, with the provision that if it is laid out to the public in an appropriate fashion so that we continue to garner the support that's needed in order to finish this and make the vision come true--not have lots of changes. The Park Foundation of Phoenix looks forward to working with project staff and make our resources and volunteer staff available also to help with the development process. Thank you.

Thank you sir. Ms. Brossart followed by John Keck.

Good evening, and thank you for allowing us the opportunity to speak about this project. My name is **Diane Brossart**. I am the president of Valley Forward. You've heard from some of our members already tonight, and I think you'll hear from some others as well. As Don mentioned, we're a 29-year-old organization that we founded primarily with the goal of affording the regional development of Rio Salado, and we have remained committed to that goal today. We represent about 300 business organizations, both large and small, as well as several Valley municipalities, including valley partnerships of the Cities of Phoenix and Tempe, as well as many other concerned individuals. We have a Rio Salado task force, which is very active and is working towards making this dream a reality. On a personal note though, I am a 15-year resident of the Valley. I was here when the election for Rio Salado failed several years ago. I supported it then and I support it now. I have two small children at home that I hope will grow up and make their home here, and enjoy the many benefits that will come from a project such as this. I really believe that Rio Salado is the most meaningful land use project in the Valley and the state. It could be a landmark for Arizona, a place for people to visit from around the world, a point of civic pride and neighborhood revitalization and an environmental demonstration project like literally no other. Valley Forward commended the City of Phoenix for its leadership in Rio Salado. What you have done with Tres Rios, and you showed on the slide, is really a testament to the potential of this project. We were proud to honor Tres Rios with the President's Award, the highest distinction in Valley Forward's environmental awards program in 1996. This innovative project has shown that wetlands can remove contaminants from waste water effluence, improve the ecosystem and enhance wildlife habitat in the Salt River. We all know that the modern history of the Salt River is one of unfulfilled potential. Nearly 30 years after the plan was first proposed by students at A.S.U., the river is still seen as a strong a landscape and an environmental aesthetic detriment to the valley. A successful Rio Salado plan would create a significant regional open space, next to desirable living with business and employment opportunities. It could literally reshape the region, strengthen the historic corridors between Phoenix and Tempe, link the north and south sides of the river, and create a significant riparian habitat. We encourage you to join hands with the City of Tempe, as you have done, and lead the way of transforming the dry riverbed into a flourishing environmental, recreational and economic showpiece. Valley Forward, as you will hear tonight, staunchly supports Rio Salado work done by the Army Corps of Engineers, will continue to advocate this project with the legislative process, both at the local and federal levels, and we applaud your efforts. Keep the dream alive. Thank you.

Thank you. Mr. Keck, followed by Daniel Cleland.

Good evening. My name is **John Keck**. I'm an interested citizen. I view this Salt River differently than most people. It is a sleeping giant which awakens every few years and cleans its bed out completely. Down that river in 1891 there were 290,000 cubic feet per second flowing, which is over 2 million gallons per second. In '78, '79 and '80, three years in a row, between 1 million gallons and 1-1/3 million gallons per second flowed down that river. In 1984 for 260 days water flowed through the Salt, a total of 1-3/4 million acre feet, over 13 million gallons. In 1993 ten inches of rain in three months--4 million acre feet passed over Granite Reef Dam, enough to fill every dam on the Salt River and the Verde River twice. Any of these flows could destroy many of the "improvements" placed in the channel and cause the taxpayers billions of dollars to rebuild. I tried to find out from Scottsdale what it costs to rebuilt the Indian Bend Wash after that flood. They won't reveal what it costs. According to the figures, the total cost of this project to the federal government is going to be $55 million, local $30 million. The Phoenix part of the project, $33-1/3 million for federal government, local $16-2/3 million. We taxpayers know cost overrun on these projects is between 50 and 100 percent, so you can just about double that. Why pump underground water when potable water is available from 91st Avenue, and by letting it filter into the watertable it would dilute and eventually bring that unpotable water unto the river up to potable standards. Output at the 91st Avenue plant is 143 million to 156 million gallons per day. Palo Verde contracts for only for 90 million. There is plenty of water down there. Many of you don't know what 6 million gallons of water is. Imagine a football field with 17 feet of water, or a baseball diamond, the infield with 99 feet of water.

We also talk about clay or a synthetic liner that is to be placed in the bed to prevent filtration. It seems like this message was used at Firebird Lake with a cost overrun of almost 200 percent. Better find out what they successfully used and not repeat an error. What happens when the flood comes? Tempe lowers its inflatable dam on the Salt, and the silt that is behind there pushed by the force of the water scours through the entire Phoenix section of the project. Why should taxpayers foot the bill for this? Why not have the commercial developers who own the land along the river who will profit from this project foot the bill? We, the taxpayers, are tired of affording private enterprise with little or no return to us. The plans to plant cottonwood, willow, mesquite and grasses...where are you going to plant those so they don't impede the flood flows? During floods this river flows from bank to bank across the entire channel, just like it did in that picture you have up there. Forty-nine acres of wetland marshes; boy what a breeding ground for mosquitoes, other insects and all kinds of birds. If there are enough birds, we can once more hear the cry from the airport, and once more soak the taxpayers. With the snowpack in the mountains getting deeper every day, the prospect of an early spring rains from El Nino, you may see the river flow again in the spring. Thank you for your time.

Mr. Cleland, and the next speaker will be Frank Welsh.

Notes from the sign-in card: Water flow. Cost. Pumped water and trees and shrubbery.

Thank you very much. First of all, my name is **Dan Cleland**, I live at 5509 E. Michelle Drive in Phoenix. I am a landscape architect. I am a member of the executive committee for Valley Forward, and I'm also a member of the Arizona Park and Recreation Association, specifically the natural resources committee. My involvement and interest in this project probably began long before anybody even started talking about the project because I grew up in a family. My father was a gas station owner, he is a blue collar worker, and he ran and was a park commissioner for the Parks Department for 18 years. I grew up being educated on the values that parks, recreation and environmental habitat areas have on the quality of life. I grew up under a blue collar worker who taught me that the involvement in this type of project has tremendous amount of impact in pulling a community together. I have worked on projects when I was younger in rehabilitating corner empty lots that were minuscule compared to the size of this project. I think the thing that I've learned in working with people in the Arizona Park and Recreation Association was that a lot is talked about not only in a recreation standpoint, but a quality of life. The people in that organization understand that project like this, and we have one right across town that the Corps worked on and did an excellent project in the Indian Bend Wash, has had a tremendous impact on all levels of economics of persons in the valley that is enjoyed by a number of people. With the background of landscape architecture, I also evaluated the feasibility report from a technical standpoint. My hat goes off to the Corps and the representatives from Phoenix and Tempe that have worked in the planning. From that standpoint, it is probably one of the better products that I've seen in environmental wildlife habitat restoration project. From a design standpoint, has increased the recreational opportunities that will be available to a number of people. More specifically, an area that I have been involved in over the years through the Arizona Park and Recreation Association, is being a speaker even at their national conference. One of the things that has occurred over the years is a better understanding that besides just being an environmentalist and re-creating these areas, we are educating our children to become involved in that. The Valley Forward Association has a festivity called Earthfest that occurs in the spring. There are literally thousands of children who know today what we didn't know on the Green Up America Day over 20 years ago, the importance of adding that to our community. My hat goes off to the Corps and the two cities that are working on this project. My only concern from the standpoint of seeing developments like this is in reviewing the costs in here, I feel very comfortable from a professional standpoint that they are well thought out and they are very reasonable. The only thing that impacts costs like this is if we take too long for the implementation we lose five to ten percent of our dollar every year that it is postponed. I would recommend to going ahead with this project fully and doing the things that I have seen the communities of Phoenix and Tempe do on almost every project like this in the valley, to continue to incorporate the community and involve the people not only in the design but some of the open planning and construction of this. I think that is reflected in projects from Indian Bend Wash to the Margaret Hance Park, and I would promote that you go ahead with it very quickly. Thank you.

Thank you. Mr. Welsh, if I could ask you to wait just a second please.

Sure.

I just wanted to introduce a note that Councilmember Cody Williams has just joined the meeting. I know he came from another meeting to be here tonight, and Councilmember Williams, thank you for being here.

Thank you for acknowledging me, and thank all of you for being here as well.

Mr. Welsh will be followed by Ms. Ethel Lane.

My name is **Frank Welsh**. I am a member of the American Society of Civil Engineers, past president and current member of the Water Resources Committee of the Professional Engineers Society of Phoenix. I am also a member of many environmental groups, citizen taxpayer groups, etc. It looks like the full Corps is finally getting it right. As an former engineer with the Corps of Engineers, I am proud to compliment you on this project. Indian Bend Wash will pale in comparison to this, and Indian Bend Wash was one of its major promotions way back when. We have been in favor of this type of project since the '70's, when the Orme Dam opponents promoted this as a flood alternative to Orme Dam. In fact, finding what I think is a better drawing of this in my 1985 book, of course not in color, but you will see exactly what you are talking about in this book way back in 1985. Unfortunately, the developers got a hold of this project and wanted us to use $3 billion of our taxes to promote a playground for real estate developers in the Salt River bed. We had to oppose it, and we defeated it two to one. I was a leader in that battle. I am very disappointed that in the impact statement this is not noted. The impact statement is a disclosure statement, not a promotional statement. I think that should definitely be noted in there. Way back, decades ago, I lived in the city at 16th Street and Camelback. Several decades ago you would find me many a Sunday morning down in the Salt River at 24th Street. It was amazing. There were rabbits, birds, lizards, flowers and osprey flying over. The cities, the government scraped it clean. It broke my heart. I continually moved downstream as they destroyed more and more of it, and now I down in Gila Bend somewhere looking for something like this. I would definitely be in favor of the maximum amount of the native vegetation including what you call forbs, that's flowers, etc. and grasses. I would also like to maximize the riparian areas. I would like to note, however, that in your impact statement, especially in the Appendix C, the Economics, you make much ado about all these places around the Valley. I know for one this Gila Bend Painted Rock Dam is 80 miles out of town. It's not a riparian area, but you haven't included Sunflower, Seven Springs and places like that which are close to here, and you could show the impact the use of these riparian areas by the public--they'll drive 70 to 80 miles to get to these areas on a weekend day. I notice you haven't included Pinto Creek, which would make much ado about restoring riparian areas here, while up by Superior, 60 miles from Phoenix they are about to issue a permit which will allow the destruction of beautiful riparian areas. As you note in your impact statement, 75 percent of Arizonians are in favor of the environment, especially riparian areas and water areas. I wish you would play that up more. As far as the water goes, let me note that we have a water surplus in this Valley. We are pumping ground water from under Central and Camelback, a high building. That's how far our watertable has come up. You can do us a favor by manning the pumps and putting it in the Salt River. We have a VOC pump out by Motorola and even closer than that, 56th Street. You can do us a favor by pumping that out instead of reinjecting it into the groundwater table, letting it flow down to the Salt River and clean it up. You could add benefits to this like you wouldn't believe. Somebody already brought up the trees and air pollution, I don't believe that was included in there. Somebody else brought up the big floods that we had back in '80. I had friends who kayaked through that flood. There's no benefit for you. You're making much ado about planting trees and all of the pipes and everything that go along with it. May I suggest that the school kids, once you have planted those kids, a baby tree, would love to adopt one of those trees. Have the kids go down. Each would have their own tree. Let them water it once a week or however often it is necessary. You were talking about one of your authorizations, I think that's right in there, and I think that's pretty much my comments at this point. I do thank you for a wonderful project. And by the way, Colonel, I have a postcard for you.

Ms. Lane followed by Cody Williams, please.

I am **Ethel Lane**, owner and manager of Shante Beauty Supply at 730 S. 15th Avenue, that is in the neighborhood of the area we speak of. I'm amazed that everybody is so excited about the Rio Salado Project. The gentlemen talked about the kids planting a tree--their children who are lucky to see grass. I mean, let's be realistic. Have you been in the area recently? Then you would know, is the restoration of that habitat more important than the restoration of a neighborhood so the children can grow? Which comes first, the chicken or the egg? The Rio Salado Project is a beautiful idea. I love it; but to watch...and by the way, the area I speak of doesn't even have representation on your Downtown Village Planning Committee. We have nothing. We sit there, and we wait, and we hope, for tomorrow. I have been in the area at least 35 years. I was there when the Salt River flooded. I have a husband, also a colonel, at home. We are still looking for a leg that belongs in Germany. Even though he lost that leg, we were not able to get a SBA loan, so we have paid cash into this business from the beginning, and we've said nothing. Now, we have. Oh yes, I live in the South Mountain Village. I live past Baseline, but I've worked in this area so long that I have an interest in the citizens and your project will go nowhere until you clean your shelters out. We're constantly getting them out of the bushes. In the summer it gets kind of warm, so you have a lot of homeless people in that area. You have a whole lot of work before you are able to even think about a Rio Salado Project. Just come down and take a look, and see what you're getting ready to put where, and what will happen tomorrow behind your Rio Salado Project. Thank you.

Notes from the sign-in card: The impact on the community nearest the river.

Thank you ma'am. **Cody Williams**, followed by William Werner.

First of all, I want to say thank you to Mr. Werner for allowing me to step in front of him just a second, and secondly to the colonel and all the members of the Corps of Engineers who are part of the process, Sheryl and all of you who are coming out this evening. This shows that there is a real issue that we all care about. As I was trying to pose at the meeting that I just left, and I was explaining where I was going and why I had to leave this meeting to be somewhere else. I explained we were talking about the Rio Salado. The community happened to be the Hermosa Neighborhood area, which is about 2-1/2 miles from the southern edge of the river. I was reminded to tell the Corps by one of the gentlemen there that he wanted a place where he could fish and have a boat. So if that's not happening, then we all need to go home. Somewhere in this five-mile stretch he wants to be able to catch a fish and to maybe put a boat somewhere. He's not a skier. He's about 72 years old, and he wanted to be able to fish somewhere close to his home. Now that I've said that, hopefully he will see it on TV and know that I have taken care of that. More than anything else, I do want to say that I grew up at 21st Street and Roeser, which was less than a mile from this body, and beauty is in the eye of beholder. I grew up in the area, and I never knew it was ugly. It was a place where I played and friends hung out and people around that community used to go to the floods. This is when 24th Street did not go over the river. We used to go to the floods with chairs, in our cars, and sit on the roofs and watch the flood go through because we couldn't drive. There were only two access roads; the Central Avenue and Tempe bridge. So, the river has meant different things to different people. I heard this gentleman speak about the things that he would like to see and would be willing to drive 85 miles to go visit if he could see them again in this community. He talked about children and that opportunity. When you talk about impact study, this river has had an impact on people who have lived there for 40, 50 years and beyond that. When the area was a rural community to the time that it has become an industrial community, there have been people who have refused to leave under any circumstance because this is their home. So the expectation is that there is an investment of time and commitment by those individuals and they expect to be there when this all occurs. My hope is that we will create an environment where they can even live in a more healthy environment because under today's circumstances, no one currently resides near this river that is not very close to industrial properties that impact them negatively, no matter where they fit in that process. It is my hope that we can establish in the future, once we start to talk about the Rio Salado restoration project beyond the boundaries. That's the second step, that we will be able to handle those things. The first step, the most important thing, is to bring life back to the river. We talked about neighborhood preservation. We talked in the past about the properties that we have protected like our mountain parks and all of the other open space conversations that we're having. There is not one resource in this city more important than the Salt River. Why? Because if it were not for the Salt River, the city of Phoenix would not be here. If you remember back, the commerce that was here when the Hopi Indian and the other Native peoples to this community used that river as their source of commerce, and this city built itself up around the existence. Once it was dammed up and it became something that people found out this community, the river slowly died. It is most critical, folks, that no matter what your view of the world is, the beauty that you remember most or you'd like to feel, or you know doesn't exist right now. If we don't bring life back to this river through these efforts, through a riparian restitution restoration process, that whatever we think we need to do beyond the banks just can't happen. That's why I've appreciated the relationship that we have had here in the city of Phoenix with the Corps of Engineers. We have had a strong effort with our federal delegation to make sure we receive the necessary funding to make this happen. The other thing I want to say is there is no project like this in this country. When you think about the Corps of Engineers and know of some of the big dams and wetlands and all the stuff you hear about in Tennessee, the Tennessee Valley, and all the other places where water runs freely. We're talking about an alive desert river. There are people all over this world watching what we do here. There is an expectation that if we are able to pull this off, then there is nothing that cannot be achieved. The technology that we will be using will be the newest technology available to us, and that's why in part I think some of us appreciate the fact that we do have a chance like this, given the fact that Rio Salado Project vote, when it was countrywide, did not happen. It would have cost us billions and millions more dollars than what we are being able to do now for simply $85 million. I certainly know that there are a lot of people; I see some heads nodding that remember that process. What was going to cost us billions we can do for less, and that gives us the ability to gather other resources to do the other things we think would be necessary. This is the city of Phoenix's five-mile stretch. It's not South Phoenix's or South Mountain's stretch. The problem before is we could not get the people in Sun City to appreciate what restoring this river meant. This is something that is beautiful and part of this whole community. If we are successful in taking care of what is now looked upon in some cases as scoff, then we won't be able to be successful in a lot of things that we need to do as a region. Once again I thank the Corps for the amount of time and energy, both the local office with Joe, certainly with the people from California who made this place home and appreciate the fact that members from the Corps in Washington have come out to Phoenix and have gotten in helicopters, and looked down on this place as once was suggested. Finally, my first opportunity to go to the Pentagon happened last year when I went to visit the Corps of Engineers, and they were already knowledgeable about this project. Your leadership in Washington was very excited about what was being said. Before I could say anything they were telling me about the project, what it meant and how the other states and their legislators were hearing about this project. Everybody's eyes and ears were open about what was happening in Phoenix, Arizona. I think this is something for us to be proud of. I look forward to a continued relationship, and I know I'll be spending a few hours on long plane trips going to Washington to make sure our delegation does everything it can to help us get those resources to make this happen. Thank you very, very much for all of you for being here this evening, and this is going to happen.

Thank you. Mr. Werner followed by Michael Goodman.

Good evening. I am **Bill Werner** from Arizona Game and Fish Department. Game and Fish has a keen interest and role in the protection and restoration of aquatic and riparian ecosystems. Under Arizona law, the Game and Fish Commission and Department have a trust responsibility for all wildlife inhabiting the state. The Commission has given the Department policy directions, specific to riparian habitat. Planned activities along the Salt and Gila Rivers, including this Rio Salado Project, would help us achieve those ends. Game and Fish is pleased to have participated in the Rio Salado feasibility study with the cities of Phoenix and Tempe as we explore opportunities for environmental restoration. Based on lessons learned on the Bill Williams and Lower Gila Rivers working with the Corps and on the Colorado River, we recommended an approach which worked with and utilizes the processes which naturally regenerate riparian vegetation. By understanding of these processes, we can replicate or mimic ecosystem functions. In that regard, this project is much more than simply re-vegetating an area, but moves for ecosystem restoration while maintaining actual river functions, including passage and flood flows. The project will provide many opportunities for environmental education by providing an outdoor classroom. There will be opportunities for students from preschool to graduate school as the project matures and we learn better how to maintain such an ecosystem. We look forward to working with Phoenix, Tempe, the Corps and others on this and other projects along the Salt and Gila Rivers. With specific regard to fishing opportunities, on this drawing behind me there are a number of areas that are marked as permanent water bodies. The Department is always interested in looking at opportunities to include new areas under our Urban Fishing Program, and if these opportunities present themselves we would be happy to work with the City. We have an ongoing program with the City of Phoenix which is quite successful, and we would be happy to explore opportunities to include additional areas. Thank you.

Mr. Goodman followed by Jerry Gass.

I'm **Michael Goodman**, 9001 S. 47th Street, and I have been involved in this project since Valley Forward first took this on. Tonight I am speaking on behalf of the South Mountain Coalition of Neighborhoods, which is a group of neighborhoods that go between 32nd Street and 35th Avenue, and approximately Baseline Road to the Mountain Preserve. I am here to tell you that we support this project, and I would like to see this begin as soon as possible. One issue we would like to bring to your attention is that over the years, South Mountain Village Planning Committee has built a trail system that would move people between the preserves and the river bottom, and we hope that as you are proceeding with designing this project you keep in mind the connections that we need to make this trail system happen. Thank you.

Notes from the sign-in card: Support as much riparian area as possible. Provide trail connections between this area, Tempe Project and the South Mountain Village trail plan.

Mr. Gass followed by Martin Johnson.

My name is **Jerry Gass**. I come to you this evening as a citizen and as a third-generation Phoenician. I have grown up hearing a lot of stories about the Salt River from my family, and what I think is happening this evening, and I hope to see happening in the future, is a wonderful opportunity for everybody and a chance to sew that scar across what will soon be the third largest city in the whole United States is a great thing. Thank you.

Thank you, sir. Mr. Johnson followed by Anthony Abril.

Hello, good evening. My name is **Martin Johnson**, and I'm your opposition. I'm against you. I know what the region is. This doesn't make sense, and this plan is incomplete. You are missing Page 61 in your General Plan of 1985 to 2000. I know it. I've studied it for 2-1/2 years, and sir, I have great respect for the United States Army and was in the United States Navy. The Corps of Engineers, in my opinion, specialize in and makes the finest bridges in the world; however, this plan and the general plan overshadows and controls it, is that. That's what it is. The property land owners, money and is shameful. I'm afraid the wealthy people will wake up and see what this is. I've been here since 1977, and Phoenix is my home. I have no place to go. Please don't allow this to happen. It's your homes too. It's your cars, your families that is all up for grabs. You may not believe it now, but you'll see. I didn't like that plan, but I ended inside and out. I found it by accident at the library, and you can find it there too. It's no secret. It's just not discussed. Thank you very much.

Notes from the sign-in card: This is Proposition 200 all over again.

Thank you. Good night, sir.

Mr. Abril followed by Paul Berumen.

Corps of Engineers and the City of Phoenix and its colleagues, ladies and gentlemen, my name is **Anthony Abril**. I am represented with the Neighborhood Spirit Associations. I know I had mentioned earlier I live at 1109 E. Hilton, Phoenix, Arizona, and I classify myself as South Phoenix because I've been there almost 45 years. I have seen the discrimination of the development not occurring in the south side neighborhoods compared to the north, east and west, and maybe south of South Mountain. My father was a former state representative 14 years at the state capital. I grew up in a political environment, watching our councilman, Calvin Goode, and other people and governors as well. When I go to meetings with the city itself, I have told Mr. Williams that I wanted to be on the task force for the Rio Salado, and he said there was no task force. I, as a citizen, want to be involved because the Salt River used to be my playground as a kid. It's about 500 yards from my house. I used to go fishing when the floods came in, and enjoy myself. It was fun because my uncle and I went fishing. To see it dry, black and nothing but imbedded with rocks, which you have to get the rocks out of there, because we can have over a ton of cement that we have now. In fact, I want to mention, I was going on the bus to Fry's earlier, and as I passed over Seventh Street bridge, my father helped with most of the bridges on the south side, Central, 24th Street, 16th Street, as a legislator in the House of Representatives...anyway, I was going on the bus when all of a sudden I saw all these white things and I thought they were cups and sticks. When I came back from Fry's on S. 7th Street, I decided I'm going to get out of the bus and go to the river to find out what the white cups are. As I drifted, I thought maybe they were cranes...there were over 100 of them. I was shocked and tried to get closer to them. They were huge, and they were flying and they were all between 7th Street and Central. The habitat is happy. It's been happening for years, it's just that the dam seems to allow the water released so that the river can run freely, and maybe at the same time we can dig into the ground to the underground water table, utilize that water and develop this area. Even now I remember we went before the Civic Plaza, under the navigable streams, and here's the appropriations before for fiscal years June 30, 1998 to June 30, 1999, State of Arizona, which I want to quote direct: Our state has a lot of money, but each developed in other counties and in City of Phoenix is always overlooked. The other one that I have is the State of Arizona proposed budget for fiscal 1996 to 1997 in joint legislative budget committee. These documents have a lot of money, but our area is considered demographically low income minority. The demographics for San Francisco and for all the non-profit Corporations that adopt the revenue to benefit themselves, that they are there with the credit to use by Chicanos Por La Causa and a lot of other self-monitored, non-profits, but they don't give that to the community. So, I'm just saying on my part is that there needs to be that public, myself as a citizen, be able to be on these task forces like the other gentleman that mentioned earlier. I fought against it in '87 when we helped defeat it because they wanted to charge us 25 cents per hundred for the next years, plus we don't belong in the community. We have lived here all our lives. My father was not an architect, was not a Frank Lloyd Wright, but he was a Representative and he built the house that we live in, which is a three-bedroom house of brick. It might not look as fancy as it did when I was a kid, but it is our community and if the residents will stand up, this is my neighborhood. You people, this is Mrs. Block, this is Ernie Gamez, his daughter, his friend. I'm just trying to say for years I've come for the Mayor, Skip Rimsza, and tell him our neighborhood needs this. Is this the goal for Rio Salado? I'm all for it, OK, but tell industry like I talk to economic development, Elliot Pollack is someone who does know people here on the 20th floor. Tell international, tell the world, come and build your businesses around it. Let the river be developed, but give it your businesses. I welcome them to South Phoenix because anything you give a child in the future, a position of wages, earning and look to our community, and see if there's an opportunity instead of the bare...we're seeing a bridge, but a future. Knocking the discrimination and getting the people. We are all country, diversity, together, and that we'll get out of the time our part in developments. Make sure that this Rio Salado talks about relocation assistance. I want to know where are the eminent domain condemnation on us because the beds of the river is pretty wide, but we have embedded it with walk, and that all needs to be replaced and give us our natural sand for the beautification because 7th Street to 16th Street was a lot wider before the past, and that used to be my playground. Therefore, I want to say to democratize the laws of the State of Arizona that our so-called governor reference to water funds, water quality. I'd to go up before the Natural Resources, Agriculture Board of 1996 where I got this article. I said to the Natural Resources that we are overtaxed with virtual industrial properties, but then again they won't develop them. They don't build their communities, but you can talk about each amendment, you can talk about Carefree, you can talk about all the immediate North neighborhoods, and they have all the beautification and all the revenue and we don't, so that's all. Thank you.

Thank you sir. Mr. Berumen followed by Sharon Goolsby.

Good evening. I'm **Paul Berumen**, Assistant to the Mayor. Like Councilman Willliams I have stories about visiting the river since am a native, but let me say how pleased I am to see such a great turnout this evening, and I want to thank everyone for coming. On behalf of Mayor Rimsza, I would like to welcome everyone, and he truly wishes he could be with us this evening. The Mayor truly recognizes the importance and significance of Rio Salado. It is not only the immediate community, but all of Phoenix. The Mayor would like to thank the U. S. Army Corps of Engineers for the support and commitment, and he applauds the hard work and dedication of Sheryl Sculley and all the city staff. The Mayor is extremely excited about the significant progress that has been made, and is enthusiastic about the potential of Rio Salado. In closing, Mayor Rimsza gladly joins the distinguished members of Congress and those citizens present in supporting the recommendation and pledges his commitment. He looks forward to the hard work ahead and moving this project along. Thank you.

Thank you. Mrs. Goolsby followed by Ron Tatasciore.

Mr. Delatori

T-A-T-A-S-C-I-O-R-E.

Correct. Thank you. I might have butchered it.

Thank you, sir, and will be followed by Winifred Green.

My name is **Ron Tatsciore**...and I'm a landscape architect. I am in strong support of this project. I bring my own personal view of it, I suppose, being a student at A.S.U. College of Architecture back in the '60's. There was a dream in those days and having gotten involved with the Indian Bend Wash more than Rio Salado at that time, I am proud that the Corps has really done an incredible job on this particular project. I was one of those outrageous students that was interested in getting rid of that 100-foot wide concrete ditch in the Indian Bend Wash. Having slowed that water down is a manageable feat, and here in this particular scene we have gone one step beyond, which I am very pleased about myself. I must say I am representing three groups here too. First of all, Valley Forward. I sit on the task force for the Rio Salado within Valley Forward. I am pleased to donate my time to do whatever we can to bring it forward and make this a reality. Secondly, my company is a landscape architectural firm, and certainly recognizes the importance of a natural resource in this valley that has regional significance. The Salt River is something that affects us all; not just any one particular community, but many communities. Thirdly, the A.S.L.A., the American Society of Landscape Architects, of which I am a member. I represent the Arizona Chapter of the American Society of Landscape Architects here, and I would like to speak on their behalf that they are in strong support of this particular project. I have spoken with a number of people from our board members to our trustee, to our president and our past president, and they wanted me to bring forward their comments that they believe, as a regional landscape, this is a very significant and import project they support. Thank you.

Notes from the sign-in card: Support concept and interested in the on-going process

Thank you sir. Winifred Green, followed by Myrna Kalember.

Winifred Green left. Myrna? Myrna Kalember. K-A-L-E-M-B-E-R?

Steve Estes? Steven Estes, followed by, it looks like Gutierrez, I'm sorry, I can't read the first name.

Hello, my name is **Steven Estes** and I am a resident in the area of 24th Street and Broadway. I would like to say that I am in support of the project. I think it would create a natural recreational area for the community, as well as stimulate business in that community. I also believe that the project would have positive community, environmental and economic impact in the area. Thank you.

Notes from the sign-in card: In support of the project.

Thank you, sir.

I think I recognize Gutierrez as the last name on West Mohave? OK. Leo Rendon, followed by Ramon Velasquez.

Cipriana Gutierrez?

Yes, I'm sorry. Yes ma'am, followed by Leo Rendon.

My name is **Cipriana Gutierrez** and I live at 317 W. Mohave. I have lived in this residence for the past 25 years. My question is, what is best in our community? There are a lot of houses with the name of Gutierrez, and I need to know what is the impact this is going to our families. I am very interested. I am happy for this progress. I think of my home. To go on, this progress has to be done. This is all I have to say.

Thank you ma'am. Leo Rendon? No? Ramon Velasquez? John Hart? Brian Kunkel, I'm sorry. Is there a John Hart? Followed by Brian Kunkel.

Good evening. My name is **John Hart**. First of all, I am a native of Phoenix, a businessman in South Phoenix in South Mountain Village. I am the Chair of the South Mountain Village Planning Committee. I am also one of the kids that use to sit on the cars and watch the river come down to what we called the river bottom years ago, the Salt River. I guess I've walked up and down that river many, many times from Tempe all the way to 19th Avenue and watched the snakes, we hunted, and we did all kinds of things in the river bottom. I would like to say, as a member of the South Mountain Village Planning Committee, we have discussed this so many times. Years ago until now we have been treated like a stepchild because we are with the south. Years ago we were not annexed to the city. There's a perception problem with the South Mountain area. We are trying to develop our community. We have problems with the melting pots of the city in the South Mountain Village. We're the southern part, like the southern border of this Rio Salado restoration. The opportunities that would come from the economic development of the area, and we're talking about our residents that live there, we're talking about the Enterprise Zone, Target B, the Four Corners reception plan. We have many, many concerns about the Rio Salado development. I see Peter Atonna was there, and he's always coming to our meetings and showing us the pictures and answering questions, and I must give you credit, Peter, because you have been doing a good job. Also, the City Council because we were talking about this a few minutes ago. It's progress, people. It's about time. We are the sixth largest city in the United States, one of the best run cities in the world. It takes money. We are talking about $85 million when we are looking at billions of dollars that come into our city. This river bottom has been a scar to us. Right now I am also affiliated with Cody Williams out of Arizona State University working on a project called the Media Image of South Phoenix or the South Mountain Village. This is one of our biggest concerns because when people (and my business is less than a mile from the Rio Salado). I guess we have been back and forth across the river thousands of times, and every time I come across that river it is like, and I've been here a long time, it's like what are we going to do with this. We need to develop it. I'm very proud of what Tempe is doing with their plan, and they're beautifying the river, the Rio Salado, their part. Phoenix has to step in and do the same thing. If we just sit here and argue...I know we have seen the floods as this gentlemen mentioned, and I am concerned about the impacts on the environment that are coming out here. We talked about the commercial and landowners, and questioned are the taxes going to go up for the property owners. There are a lot of issues that come out of this, but who can we turn to but the Army Corps of Engineers to come down and take a look at this. We are trying to do our part as citizens in the South Mountain Village, central city and all over the city of Phoenix to try to do something with the river bottom, the Salt River or the Rio Salado. We need to get it back to its natural habitat. We need to beautify it. I think with that it will progress in beautifying the central part of Phoenix, as we straddle both sides of the Central City and South Mountain Village. People will be really proud to come into our village. When people come into Sky Harbor Airport, they are right on 24th Street. If they decide to come south, they have to come across the Rio Salado, and what do they see but a big scar, a dried up river bottom with bricks, trucks and gravel pits--no trees, no cacti, no type of vegetation. It's like a wasteland. I am almost embarrassed to bring my relatives into my home in South Phoenix because when we come across the bridge, and I'm talking about the Central, 7th, 16th, 24th all the way to Tempe, it is kind of embarrassing. It's almost the year 2000. We are putting in a beautiful stadium here. There are going to be millions of people coming to the valley, and our portion of the city would like to see the Rio Salado cleaned up, beautified, put back to where it used to be, and also help the kids, like the person mentioned earlier. They can plant trees and take pride in where they live. Right now, as you mentioned, it's a pride thing. We really love our city. People have been born and raised here. When I go out to Scottsdale, west of the Indian Bend Wash, I'm saying man, this is beautiful. It is green, people are playing, ducks and all these kinds of things...Then I come out to the river, the Rio Salado, and I look at this and I think what's going to happen. What are we going to do? I know it takes a lot of dollars, it takes a lot of time, a lot of discussion, but as the chairman of the South Mountain Village Planning Committee, I would encourage our committee members, as well as our council people, our citizens, our business people to put our effort into this, to support it. Because 20 years from now when our children grow up or when we come back and we're old and we're watching the same problem and it would cost us much more than $85 million for a feasibility study. We'll be very sorry if we don't take this chance and bring it about. Thank you very much.

Thank you, sir. **Brian Kunkel**, followed by Gail Knight

Good evening. I am a resident of Arizona. I'm not from north Phoenix, south Phoenix, east or west. I came here with the Arizona vision, and my main point is how can we dump $85 million--don't get me wrong, I'm for the project, but how can we dump $85 million into fixing up this problem that we created 50 years ago by sucking up the water and dumping our effluence in there when we have other habitat areas that need to be protected now like Spur Cross north of Phoenix. The last running creek in Maricopa County, and we're battling it right now trying to save it. What we're doing is dumping $85 million into a clean up project, is what it is, something we created. I've heard the words vision and foresight tonight, and I have to wonder where did those two words come into this whole project. That should have been something 50, 60, 70 years ago we should have had vision and foresight. I don't believe this is anything to celebrate. I don't think anyone should be celebrating. We should be ashamed of ourselves really. The big city has grown with our river. Last Saturday I canoed on the Verde River. Honest to God, and I fell in up to my neck. That's how deep it is, and that Verde is a relatively small river compared to the Salt, they both meet before the city of Phoenix and they dry out before. It is nothing to celebrate. I do think we should do $85 million to clean it up, and then I think you need to do your job and save some of these other wetlands before we ruin those also. Thank you.

Notes from sign-in card: $85 million for a dried up river, but nothing for Spur Cross and Cave Creek.

Thank you. Ms. Knight, followed by Greg Brownell.

Good evening. I am **Geneva Farthing**.. I live in South Phoenix, and I'm interested in knowing something that I've heard- -that they're planning to recycle sewer water as part of the water that is going into the Rio Salado is going to be recycled sewer water. Is that true? Does anybody have the answer to that?

Colonel Davis: No, that's incorrect.

If you don't have the answer or it's not true?

Colonel Davis: It's not true.

I hope it's not. So, it's food for thought. If you're planning on doing that, then the whole project will be less because if you think you can take the stench out of the sewer water and use it in the river, then you are sadly mistaken because right now what you have in the clean up yards, your sewer. When you go around the bend down the freeway, that is the first thing you smell. I hope that's not true. Thank you.

Thank you ma'am. Now, Miss Knight followed by Greg Brownell.

Good evening, I'm **Gail Knight**, Executive Director of the Community Excellence Project located at 2457 E. Broadway Road. We are at the corner of 25th and Broadway. Our boundaries are 24th to 32nd Street, from the Salt River bank to Roeser Road. I represent the residents of that area who organized Community Excellence Project in the 1990's. We were the first Fight Back organization in the city of Phoenix, and their mission is to revitalize Southeast Village. Our goals are reduction in crime, housing and economic development, enhancing the infrastructures, blight elimination, and positive programs for youth and their families. The Phoenix Rio Salado Project was identified by the city staff to the board of directors for this organization, and they received support of the following: They see it as a means to reduce the blight in the area, to support, compliment and enhance the current economic and housing development project underway. You have heard tonight the mention of our proposed conceptual plan, and have you have seen support from the City of Phoenix. It moves right to that area of where the banks of the river project are and will be a definite enhancement to that. You've heard people talk about the need to be focused on houses, and we have the affordable housing program that is supported by the city in progress funding, so we see them and ask them to the community as well. They will increase the potential to urge the development for that area, as well as employment opportunities.
So much needed there. However, they do want to make sure that in the development of this property there continues to be sensitivity towards the residents who live there. You heard tonight how long some of them have lived there--30, 40 and 50 years. They have chosen to stay here because it is their investment and their land. Where they are building needs to be, and they want to make sure that community is not become industrialized, does not become commercialized, and that they get out of the community. That is why they have been devoted to this revitalization of the area. They want to make sure too that there is not any thought about the employment opportunities that may arise out of the development of this project, and that there is some attention given to the residents that reside the riverside from 19th over 32nd Street. They get some consideration in employment for the area, and above all that their influence and their concerns are always heard as this development is brought on line. The residents of this community applaud the

efforts of the city to bring us forward, of Councilman Williams and his continued commitment to assisting them in revitalization of this area because they feel that all of these types of projects will all improve and benefit the quality of life for the residents in that area. Thank you.

Notes from sign-in card: It is a positive development for the South Phoenix community area and will help to enhance our agency's housing and economic development projects for the area.

Thank you. Mr. Brownell, followed by Michael Dollin.

Hi. My name is **Greg Brownell**. I went to South Mountain Village Planning Committee, have been a past president of the South Mountain Chamber of Commerce, and I have lived in the area since 1977. I deliberately moved there, and I have deliberately stayed there, raised my family there. I have had the amazing opportunity to sell new homes there in one location for the last 11 years, and I have a pretty good idea about what works there. I have watched Rio Salado for years, and I want to put the rumor to rest immediately about Cody Williams' proposal to have tunnels built underneath the river. That's not going to happen. I think this is a much, much better idea. One of the things that I have noticed in selling homes, is that when you sell in one place for along time, you learn from the people that are coming in the door. I love the South Mountain Village. This thing about the riparian, you are experts at that, great speakers on that, and people have watched that. I'm sure that you know that there's a river that runs through there periodically. One gentlemen had a pretty good presentation there. When I first came there, I come from an area that has the Niagara River, and the Genesee River in it. I have seen floods. I kept asking where the river was, and they kept telling me that it didn't really run. Now I know you guys know that, right! So, I'm sure that this is going to work, and this is going to take care of itself. It's a great investment of taxpayers' money, and I've seen few that match this. This is an excellent idea because what we're going to do is to take all the commercial things aside. They will take care of themselves. The south bank already has. There is development that has already occurred, really the first Rio Salado development. It has been successful even during a recession. That's going to take care of itself, but what's amazing to me is the fact that by doing nothing more than putting something back, old timers in the area have told you about, we are going to do a miracle. We are going to bring what is a gash that separates the community into something that will join the community. I think that is excellent. One other thing is for the people that are making commitments into the community by buying homes. I have learned that the north-south area idea that we're South Phoenix and that there is a North Phoenix, that kind of thing is really something the newspapers keep alive. I think sometimes people keep alive. But the people that are new and the people that are looking at our area, they don't really see it that way. They see a central corridor that runs from one beautiful mountain, our mountain, to the northern mountains. They see a beautiful downtown, and that's what they see. Then they see suburbs that are way east and suburbs that are way west. We are different than that. What we're doing here is really pretty inexpensive for such a huge thing. I mean, this is like the biggest golf course in the world with no holes in it, and it is done for $85 million. Most Golf Courses would love to do something like that for so little money. It's just a marvelous thing. The people outside, when they come and look where we live, they don't see what maybe those of us who have been here have been subjected to by the newspaper and TV over the years. What they see is all one central corridor with an unfortunate thing in the middle. That unfortunate thing in the middle is where the river is now, and sometime in the future that's not going to be there. When we talk about being Southsiders and we talk about being proud of being from South Phoenix. What's happened is we are no longer Southsiders; we're really Central Corridors. Other people see it and eventually everyone will see it. Thank you.

Notes from the sign-in card: Very positive. Paradigm for area is changing from a North side/South side Model to an East side/West side Central Corridor.

Thank you. Mr. Dollin, following by George Young.

Thank you. My name is **Michael Dollin**. I am here as a citizen, a landscape architect and also a representative of Arizona State University and their Join Urban Design Program. It truly is remarkable to be here tonight. This is such a great event in the life of this city, and I think we have really turned a corner. I think a lot of Daniel Burn, the great planner, who said, "Make no small plans, for small plans do not have the ability to stir the hearts of men". It is pretty clear that the hearts of the citizens of Phoenix have been stirred, both with supporters and those critics as well. It is so important that we do this because the great cities of the world really have one thing in common, and that is they paid attention to their great open spaces and to the common ground that brings us all together. The Salt River restoration project proposed for the Rio Salado has that power and potential. It is clear that we are at the beginning of a very long process in terms of implementing this, but there is a long history to this project, as you well know. About 30 years ago or more there were a group of people who had the dream in their hearts to envision the Rio Salado. I would like to recognize Dean Elmore, who has been sitting here, whose work at A.S.U. was perhaps the initial inspiration for the Rio Salado Project. I want to thank you for sticking with it all these years, and here we are now. I do want to say a couple quick things. I commend the ecological approach. I think it is totally appropriate. One of the basic principles of ecology is that everything is connected to everything else and I think that this being a start. We have to really think not only about the natural ecology, but also the human ecology. Refer to buying up neighborhoods in the communities, I think the next set of efforts in front of us, the work in front of us really needs to take careful look at what happens to adjacent to the river corridor, and also what happens in the watershed. Finally, I'd like to urge the City of Phoenix and the Army Corps to look at the local talent here. There is tremendous knowledge and talent in this community that can help support this project into its physical realization and implementation. I would like to, on behalf of the University, to offer the talent and knowledge based at the University and also as a professional. I think there are many professionals here in the community of citizens who are ready to offer their help and assistance in seeing this into reality. Thank you for your work.

Thank you. John Nichol followed by James Aylmer.

I am **John Nichol**, and I live in Northwest Phoenix. I am very interested in many things. I was interested in a park that developed near the house that we moved into a few years back and worked with the City of Phoenix Parks Department in developing this and making what our community wanted. Block Watch developed from that, and our community in that area is very strong. I see this as another way of developing community. Since my kids are older now, I am still interested in children and adults. Looking at what's happening in our neighborhoods, I see this as a chance for Phoenix to show the world that there's something here besides the same kind of ice cream and the same kind of green grass and parks that everybody else has. I think homogenization is taking over in a lot of places. I especially like the idea of getting back to trees, plants, animals and birds that were here before. I would like to see as much of that as possible restored, and I think this is a great project. Thank you.

Notes from sign-in card: I would like to see trees, bushes and birds in this riparian restoration. Not grass to be mowed in parks.

Thank you. Dr. Aylmer, followed by Lawrence McCall.

There is so much that I would like to say, but I put it on a piece of paper, and would like to read it in 2-1/2 minutes. I read it last night in Tempe. I'm **Jim Aylmer**, Dean Emeritus, the College of Architecture and

Design at A.S.U. As dean I established the college-wide, year-long studio program for 1966-67 saying, "Let's do something with the river". I was moved partly by the consent of our just completed college-wide, year round program, Valley Focus '66. It was 16 fifth-year students, under their critic-mentor, Bob McConnell, who first defined the possibilities and named the project Rio Salado, going on the plan. Bob McConnell, incidentally, is now Dean Emeritus of the College of Architecture at the U. of A., living in Tucson. This semester following, and for the next two years others studies expanded on the idea until it moved up to the real world, to be advanced by the just forming Valley Forward association. Valley Forward shepherded the project during the decade of the '70's, and was instrumental in bringing about the legislation to create the Rio Salado Development District. We are asked to proceed develop the proposal if put before the Maricopa County voters in 1987. The voters turned it down. They said no to the proposed method of financing, building and appropriating this, but not to its ideals or concept. Now Rio Salado is happening through the normal processes of city growth. You know, excuse me, but Tempe is the town lake and the related projects. You will see tonight what Phoenix and Tempe and the Corps can do upstream from the Town Lake. Putting some eleven miles of river bed on course towards realization of it's potential. Probably no comparable city in the whole world could have just a reservoir of open space right in the heart. Space can provide a unique and rewarding amenity, while attracting regional infill development, which is very important. What you see tonight is a monumental step forward. I hope and believe that it will be universally approved, adopted, built and enjoyed. Thank you sir.

Mr. McCall followed by Mr. Juan De La Torre.

Colonel Davis, my name is **Lawrence McCally** and I trained at sky Harbor 1940-1941 and I could see a conflict here with an operational airport for a fast growing city that has something in conflict with what I see as air transportation, passengers and cargo. During the meeting this evening, no doubt, you have heard some of the aircraft going over and perhaps as time goes on the noise will be cut down with those types of engines. One problem that I have quite concern with going back to February, 1941, I was training at Sky Harbor and we have a situation what we call high tide. At that time, we had one runway that probably was about 38 by 3,500 feet long called north runway, but there wasn't anything much else. Hide tide as we called it came up within two hundred feet of that one runway. Historically it seems like the river just doesn't know where it's suppose to be. I've seen high tide repeatedly over the years. One example was mentioned I believe in the last seventies, perhaps '77-'78, and back before the eighties that came up before the river. I made some personal inspections and gee whiz that was a real sad situation. We have a south runway now and time and time and time again the east end of the south runway goes down to Gila Bend. Now you say, "Well they got the north runway". Have you ever tried to control small aircraft with the jet airliner's on one runway?. They were all using one runway. Phoenix is a very, very fast growing city along with the Salt River Valley, neighboring town, Peoria, Glendale, Chandler, Gilbert, Mesa, Scottsdale and I could go on and on. Perhaps I should include all Maricopa County. It's growing very, very fast and it cannot survive this growth rate if we are going to wall in Sky Harbor. I have made observations of my own over a period of time, and I can tell you right now when somebody uses the word impact I'm not sure anybody in this room who is not a pilot understands what I'm talking about. I'll try to describe something to you. Most of the jet aircraft, I'm going to use the word launch. I'm going to describe Sky Harbor's two runways, that is what they have been using since gosh knows when. They have two runways and they launch projectiles. At the end of the runway they're suppose to be airborne. We have a temperature problem here. Many of you were here a few years ago when the National Weather Service recorded official 123 degrees Fahrenheit, by golly it's a dry heat though. Well, as far as density goes, its no case yet. Those aircraft weights don't lift the plane off until it takes on additional speed. You cannot imagine how the guys up on the front seat, how they look down at a barrier - 1-10 inner loop.. 1-10 inner loop elevated and if they had the in's and out's maybe it's easy to them and want out and the other one on the same side goes haywire. They are going to use all the runway down there and over run. Here's about a 20 foot plus maybe 25 foot elevated 1-10 inner loop, sometimes called Squaw Peak Corridor. We have 747's, the heavy one. DC 10's are heavy too. We the people, citizens of Phoenix, must realize if we are going to take care of the air requirements, air couriers and transportation for passengers cargo, we're going to have to look out for a growing airport. With everything I hear here tonight it seems to me there about as compatible as Socks and his new playmate. They just don't go together if your going to build elevated barriers at the west end two runways. I call them, well, rifle. In other words two rifle ranges down there with, with heavy projectiles the weight of a heavy 747, and a third runway built right on the edge of the river. It doesn't make any sense to me, and I had a career in aviation in the military after I finished up my instructing at Sky Harbor. I also was a flight facility inspector for the Air Force checking military bases from Davis-Monthan to Great Falls, Montana at the western area of the U.S. So it seems to me if this planning is complete, you better figure the movement of Sky Harbor to a new location, because as far as I can see, the planning is not keeping up with the demand for air transportation. I thank you kindly. Thank you.

Notes from sign-in card: Not compatible with Sky Harbor traffic patterns approaches and departures.

Mr. de la Torre followed by Kevin Clark.

My name is **Juan Manuel de la Torre**. I'm doing business as Precision Auto Dynastic Inc at 1024 E. Broadway. I won't hold you people too long, but if any person has to move out it would be me because I am close to 1024 E. Broadway. I would like to make two comparisons. One, Highland, years ago in 1940, I was there using that place as a rifle range and, of course, today they would know what had happened to Pilot Highland. That's a beautiful place. The other place would be River Walk. This river, Rio Salado, compared to River Walk is like a little canal. You look at the River Walk. How many people go there. I think that this is the best thing that ever happened to Phoenix and I think this would be the more beautiful place in the whole world. Thank you.

Thank you, sir. Mr. Kevin Clark. Mr. Clark's not here? William Colbert? Helen Brock followed by Kay Shepard. Kay Shepard is gone. Followed by Filomena Durazo.

Good Evening, I'm **Helen Brock**. I'm a citizen, a property owner, a business owner. I live at approximately at 12th Street and Maricopa Freeway on the north side, which is very close to the river. This is a project that I have hoped for, for many years. I've lived here for fifty years at the same address and have watched the river changed. My children played, hunted, fished and we enjoyed the river. We horseback ride almost every afternoon when my boys got out of school-- that was something that entertained them. They hunted, they caught all kinds of animals, found pets. I missed it and I hated to see it deteriorate by the city that used it for a dump ground. I watch them dump at 7th Street, 16th Street and 24th Street by the tons. Because my next door neighbor managed the one at 16th Street and 7th Street, it was a sad day to watch this occur. I would like to see it to natural habitat where children could go play, enjoy the natural vegetation and see what the desert and river is all about. The river, at one time, flowed most of the time. It was when we had super dry heat it did not have water the rest of the time, it had trickle of water that you could take your shoes off and walk around in the water. The fish were clean and you could catch them and eat them. I have some concerns, thought, our taxes. We turned it down once before because of the property taxes. We cannot afford any more property taxes in the area. We are already head over heels living with taxes since they have torn down most of the neighborhood. We cannot carry on any more burden of them, and I would like to just state that I support the project if it doesn't have too big an impact on property owners. Thank you.

Notes from sign-in card: It is about time we clean up the mess the city has made. Dump ground from 1946 that I have seen with my own eyes. No property tax increase. We voted against it. once because of taxes. In 1946 their was a green belt with wildlife, swimming, fishing and hunting was destroyed by city landfills, etc. Horseback riding, bike paths--we had horses and our neighbor did also. That was our children's entertainment after school. There is nothing they can do anymore.

Thank you. Ms. Durazo followed by George Brooks.

My name is **Filomena Durazo**. I live at 1531 E. Corona and I was there yesterday and at Tuesday meeting. I want to ask again how many wells of ground water is this going to use. Six? One? How many wells of ground water is Phoenix going to use? Eight? Six? I heard eight last night. Six? I heard eight last night. Six. O.K., since I recorded it I will check on it. But anyway, I'm still going to use sewer water as ground water and filter it.

Colonel Davis: No, no sewer water. The water source is going to be ground water extracted from shallow water underneath the river.

You are not going to use sewer water from Mesa or 91st? No, O.K. another thing. I heard one of the guys say here that in 1960 they defeated it, but I know in 1975 it defeated the Rio Salado and 1987 on November 7 was defeated 2 to 1 and yet by two weeks later Terry Goddard just keep working on the River Salado thing and he never let it die. I just want to know why there wasn't their respect from the voters when they voted it down in 1987. It should of been voted down and maybe five years or ten years later put it back to the tax payers and bring it back. But it just never died it just took it has they wanted. Another thing there are at least 64 landfills in the river bottom. This I one of them on 770, you can see how it is. Right here, there is a little fame on 770 landfill. There are at least a dozen landfills there burning and yet that is where you are going to have your Rio Salado. O.K, I not against the project, but I am against moving people out, like they did the Sky Harbor people, six thousand people they were moved out there. O.K. South side is this. There are over 43 thousand people. Can you guarantee that not one single house will be moved out of there, because I don't want if you built Rio Salado. It's nice but if we have to pay a price to get our home because I don't think they will buy us out. Another thing, I have been through a lot of floods myself. In 1964, the closest flood that went to my house was right across the neighbor's and they came to us early in the morning to be sure to be ready to move just in case it hits hard. It's hard to tell when they say 100 year flood or 200 year flood when we get it every five to ten years in Arizona. Mother nature will fix it better for us than you guy will. I hope it is written down that nobody will move out of the area because I love to live in South Phoenix. My house is no better then the north house. We like to live on the south side. We like to have our same neighbor, but guarantee us that we won't move out.

Thank you, Mr. Brooks. Followed by Mary Orton.

Good Evening. My name is **George Brooks, Jr.** You heard from my father earlier. I am a life long South Phoenix resident. I live at 5012 South 21st Way. Born and raised in South Phoenix, I lived here forty two years. I'm also an environmental scientist by profession. I have watched what has happened to South Phoenix in the name of progress. I've watched what has happened to the river. My grandfather use to bring home barrels of fish and I watched it turn to a waste dump. I didn't see it, but I know the history of them, dammed up and put out for agricultural in the name of progress. Also, in the name of progress, we let ourselves gained in wisdom and in wisdom of bringing back what we lost. Bring back that quality of life where we could take off our shoes and walk through the river. I was a little one watching the floods go by. I also know if you control your water source carefully, you can avoid those floods. Perhaps we have learned how to do that better over time. You need to speak to that more. People are concerned about seeing those floods, but can you control them. I believe you can if your willing to do so. I'm wholeheartedly in support of this project. I'm also wholeheartedly in support of having benefits to the current people in South Phoenix. The business, the contractors, all those people who have been there through the bad times, make sure they are there during the good times that you have planned as well. As always to say, Thank you.

Notes from sign-in card: Greetings. I am a life long South Phoenix resident and an environmental scientist by profession. I plan riparian areas. I strongly suggest you do not use the plastic liners. Otherwise I fully support the plan.

Thank you sir. Ms. Orton , followed by Brian Knox.

Hi, my name is **Mary Orton** and I'm Southwest Regional Director for American Rivers. We're a national conservational organization whose mission is to preserve and protect rivers and to help understand how to support this. We are yet to take a formal position on Rio Salado, but I will tell you that we do in general believe that in rivers they should have water in them and so this is a good thing to do in general. Personally, as a almost 28 year resident of the City of Phoenix, I am thrilled at the idea of this kind of regeneration. I would like to suggest that I would prefer to see water releases from the dam rather than ground water pumped in general. I'm looking forward to learning more about that and why we're not talking more about that. We will be looking further at the project and looking for ways to work together. I was particularly struck by one women's comments that the city is going to have to do something about the homeless people living in the river bottom if this project is through. I might be ready uniquely qualified to help with that project as well with the restoring of the area. So don't hesitate to call on me. Thank you very much.

Thank you. **Mr. Brian Knox**. Followed by Kevin Clark.

Thank you very much with a chance to speak again to you tonight. I come with a rather unique prospective tonight than the stories you heard earlier. I chose to come to Phoenix several years ago based on the quality of life with the potential I see here. I chose to make my living as an environmental consultant, and I like to make three requests tonight. The first one is thank you, City of Phoenix and Corps of Engineers. You heard the word "vision" come up. For having the vision to commit funds, to do the study. We heard some fifty two odd studies. I know from participating in EIS projects. The quickest way to railroad it is continue to study it perpetually. We're to the point where we need to move beyond the study. Mike brought it up to me earlier and I had forgotten. Thank you for expediting this, by well over six months, in order to get it to Congress on time to get federal funds available for this project. The second point that I wanted to make to you tonight is to assist with the vision that we are all lacking about. I was born and raised tin Los Angeles County near the Storm Water Reclamation Project, Santa Fe Dam. As a child growing up, I did not know that was a control flood project. We went fishing, we went frogging, we went hunting. We took the opportunity to stay off the streets and were able to ride more than thirty-five miles from my community to the beach and back, simply as the result of the project being implemented. So when you hear about vision and what this might represent, those are the types of things that we are talking about. The third point, is the one of value. I've heard many opponents tonight and you can boil it all down to what we are really talking about in opposition is either monetary or some other value. The value of someone's home. The value of someone's time. I come to you from a generation that is being forced to deal with the value issues of those generations before us. The projects that we clean up are the results of one of three things. Either ignorance, deliberate mischievousness or lack of vision. What is being presented here is vision. It's not perfect. It's a study, its a plan. I hear people throwing like a gauntlet that in '87 this was defeated 2 to 1 by the voters. I look at that as a positive. The voters come forward and told you no, we do not agree with the plan you laid out. Go back to the drawing board and bring us a new plan and while that is always a coming because of the complexities of this issue. Thank you, once again and I'm coming to you tonight not behalf on Black and Veatch not behalf of Valley Forward, but on behalf of myself as a citizen to say please proceed as quickly as possible. Thank you.

Notes from sign in card: We support the EIS.

Mr. Clark. Is Devin Clark still here? Is there any one else that wishes to make a comment? Yes ma'am, please come up.

My name is **Geraldine Schmidt** and my husband and his mother own at 134 and 140 West Elwood, just south of the river. For the lady that owned this property prior, I don't know if you remember her, but she was always at everything at the city. She died in '93 and the Rio Salado Project was very important to her . She had hoped she could see it before she died. But she died in 1972 , I believe it was. She never got to see the reality. This project has been a vision since the '50's. I would be very happy to see it being worked on now on the board. Being a property owner, my husband is in the area and we do have a tax concern. Our property is very small, our house is like 600 square feet. It is very small and our taxes are $900 a year, which is extremely high. We have been paying this for several years now. If this project goes through I don't know if taxes will go up any higher. I don't know what we will do because we borrowed on the Visa card for several years just to pay the taxes. So far we pay through payments throughout the year just to cover them. But I do hope very much that this project does go through and I do hope it doesn't add any more taxes to our homes because they are very over-taxed right now. I don't know why I remember, but when we first got the property they were $34.00 a year for each lot. Now they are $900 for two lots combined, which it is a real burden. I just want to tell you this was her vision and she really looked forward. Patty and Ed Harrington of the "Republic and Gazette". I have his old newspaper batch even, and he died in the streets in front of the "Republic & Gazette" with an infected tooth. This was also a dream of his, too, I love seeing it. My husband and I have been watching it closely and my mother -in-law. We are real excited about it and I hope this goes through. Thank you for letting me speak.

Thank you, ma'am. Would anyone else like to speak?

Yes, I would like to speak. My name is **James Sanders**, I live in South Phoenix and I'm homeless. I've been in this town since 1935. I've seen a lot of changes. I'm also a minister and I condemn the church for it's position. The church has been calling me. The nation is only as strong as its leader and as strong as its church. Bother of these, the country, was based in the beginning of this nation is base on what is written in the Scriptures. I see a real serious matter here that is not being dealt with spiritually. Everybody is looking at the money and I know money has a place but it's not first place. If anybody is a man and they go back to the Scriptures, they will find who the man is. I am a man. I don't have a place to rest my head and I am concerned about my children, your children, too. I think we better get on our knees before it is too late. The church is at fault, the leadership is at fault, everybody is accountable. It is going to take some blood shed to get it right. Somebody has got to die and somebody has got to live. Who is going to judge it? A man will judge it. I am a man. The me add this. I love you but I don't love sin.

Thank you sir. Anyone else?

Yes, sir. Hi, my name is **Jesito West**. I live in South Phoenix. First of all thank you for giving me chance to speak because I know it is running late, and you have been very patience and been very open to people speaking. I just want to say that there has been a lot of talk about the concern about what the impacts are going to be. One of the things I've noticed throughout my life, every time a new project comes to a place, especially if there is a place somewhat oppressed or down a little, it economically it gets to the people real hard because they don't have any voice in it and they also don't have any participation in it. Start with this project as soon as possible. If it does take place people, local people, there is a lot of talent and creativity in the local people. A lot of local people would like to be involved and they want to be involved because it affects them a lot directly. Start off by getting some of their input on how to do a particular part of this project once it starts. Also, have local talent do some of the work that will help bring up some of the economic stuff that is there. Just maybe a few more of those people can bring their status up to where it would be a proud thing to everybody. There is a lot of pride personally in people. I am a very proud person. I could live anywhere in Phoenix, but I chose South Phoenix and I'm proud to be there. I'm looking forward to the neighborhood being developed and I think this is a wonderful start, this type of project. Just make sure that it doesn't do more harm to the people that live there. We're talking about the birds and we're talking about the wildlife. There is also human life and make sure there is no harm to them. I really commend the effort of the City and the Corps of Engineers to continue to try to bring this project about and I know how hard it is to do something like this. But please keep in mind of the people, the local talent that can be of help. They have a lot of good ideas they have lived there and watch that all of there life. They have some good thoughts about it. Thank you.

Colonel Davis: Thank you. Anyone else? I would just like to make a couple of comments. I applauded the commitment of everybody who has come by here tonight to speak to us and share your ideas. I applaud the stamina of those of you who are still with us, as we reach the end of this hearing. We have heard both last night and tonight a lot of praise for the project a lot of support, but it's equally important that we hear from the folks that have concerns of the project so that we just don't go down with blinders on and pursue and do something that is not right for your community. We are getting near a final product; we are not at the final product, yet. We've recorded all your comments and all your thoughts tonight. We will incorporate those in a final document. We appreciate the chance to hear your input and have you participate in what is a joint effort between, not just the federal government and the local government, but the community as well. Sheryl.

Sheryl Sculley: Now just to say that on behalf Councilmember Williams, who is still here, Mayor Rimsza, and the entire City Council and the City staff team that worked on this project with the Corps of Engineers, I would like to commend the Corps for their diligence in keeping this project on target and getting us to this moment tonight. I especially want to thank all the public who participated in this public hearing tonight. Thank you very much.

2109801

RESPONSES

To issues raised at the Phoenix Rio Salado Public Meeting
January 8, 1998

Celeste Minzikah:
Costs: The project will not go forward unless the City of Phoenix will be able to contract with the Corps to assume their local share of construction costs and for operation and maintenance of the project, once completed. The City has indicated that it will be able to do so.
Impacts on adjacent areas: Construction of the project will require acquisition of no homes and only a portion of one business. The City is proposing a planning effort during the PE&D phase to deal with the community planning issues raised by the project.

Felipe Zubia:
Funding: The City of Phoenix has stated that they will make the required commitment for funding the local share of construction and to assume the long term operation and maintenance costs. They have not indicated to the Corps the source of their local match requirement, they have indicated they are considering several sources including a pending request to the Maricopa County Flood Control District.
Environmental issues: The project EIS is examining all known environmental issues and the public comment period was provided to give citizens the opportunity to address any issues not covered in the report.
Water consumption: Cottonwood and willow trees were specified for the project because they are the actual trees found in desert riparian habitat areas. Although these are relative high water consumers, the extent of these trees and the project water budget take this into account. The total water demand was scaled to meet cost and feasibility expectations by the City of Phoenix.

Arthur Luera
Costs: Detailed costs for construction, operation and maintenance are contained in Section VII of the summary report portion of the Draft Feasibility Report. The cost table referred to by the speaker was contained in a public summary report distributed at the public meeting.
Neighborhood Impacts: Construction of the project will require acquisition of no homes and only a portion of one business. The City is proposing a planning effort during the PE&D phase to deal with the community planning issues raised by the project.

Daniel Gann
Water source: In response to using mountain runoff as a water source for the project, all waters in the state are controlled through either the watercourse in which they run or as groundwater. In the case of mountain runoffs, water coming into the Phoenix area, through the Salt River, is controlled by the Salt River project and is available to their members located on member lands. The Rio Salado is not on SRP member land and therefore is not eligible for that water. The project did investigate the purchase of CAP water as well as available underground water sources and recommended the shallow wells as being both feasible and the least costly source.

Jerry Smith
Local funding: The City of Phoenix has stated that they will make the required commitment for

funding the local share of construction and to assume the long term operation and maintenance costs. Although they have not indicated to the Corps the source of their local match requirement, they have indicated they are considering several sources including a pending request to the Maricopa County Flood Control District.

Calvin Goode

Land acquisition: The responsibility for acquisition of the project land is with the local sponsor. The Corps does not determine the method in which is it acquired. However, we have been informed by the City of Phoenix that they have worked with the two dominant land owners, two sand and gravel companies, to donate their portion of the project lands to the city. The city will be required to acquire any remaining privately held lands for the project before signing the final contracts with the Corps.

Bird Strikes: The study took into account the current FAA circulars on bird strike potentials. No open water areas or the stream were located within the 10,000 foot radius recommended by the FAA. Further, aircraft and bird flight patterns were reviewed to assess if there would be a potential danger from the flight patterns crossing the project. It was the assessment of this information that the potential would be minimal.

Neighborhood impacts: Construction of the project will require acquisition of no homes and only a portion of one business. The City is proposing a planning effort during the PE&D phase to involve the community and to deal with the planning issues raised by the project.

John Keck

Flooding: The project design anticipates the flood releases coming from the Roosevelt Dam flood management plan as well as historic flood data from the Verde River watershed. The design of the project specifically minimizes the impacts from flood releases on the project. Notably, all infrastructure is placed out of the 100 year floodway and the low flow channel is sized to accommodate the frequent, low volume releases. The channel will contain grade control structures to minimize flow velocity, reducing loss of plant material and liners will be placed below the scour line. Even after major flood events, the operating plan recommendation is to allow natural regeneration of plant materials to the extent possible, so that restoration costs will be primarily that of removing silted areas, replacing clay liners on ponds, regrading paths and replacing signage within the channel portions of the project.

Michael Goodman

Trail connections: The Rio Salado project will not be making any of the trail connections to trails existing or proposed outside the project. However, the linear trail along the length of the project can be linked to the city trail system planned for the entire length of the Salt River through the metropolitan area. The existence of the project will also offer the city the opportunity to link north-south trails to the project trail.

Geneva Farthing

Water source: All water proposed to be used in the project would be obtained from wells drilled into the shallow aquifer lying under the river. No reclaimed water is proposed to be used in this project.

Lawrence McCally

Airport interference: The Rio Salado project is not adjacent to Sky Harbor Airport, nor will it in any way interfere with operations or expansions at that facility. Design of the project followed all applicable FAA circulars with respect to bird strike potential.

George Brooks, Jr.
Flood control: The project design anticipates flood releases coming based on the Roosevelt Dam flood management plan as well as historic flood data from the Verde River watershed. The design of the project specifically minimizes the impacts from flood releases on the project. Notably, all infrastructure is placed out of the 100 year floodway and the low flow channel is sized to accommodate the frequent, low volume releases. The channel will contain grade control structures to minimize flow velocity, reducing loss of plant material and liners will be placed below the scour line. The project must maintain the current 100 year storm level of flood protection, but is designed to minimize the losses to the project from major flood events.

Mary Orton
Water source: The speaker questioned why water releases from the Salt River dam cannot be used as the water supply rather than the proposed wells. The Salt River Project was federally authorized as a water supply and power generation entity to support water and power users located on specifically defined lands. The Rio Salado is not located within those boundaries, and therefore has no rights to releases from the SRP system. Of the alternatives studied, shallow wells proved to be the most feasible and lest expensive as a water source for the project.

Denise Coyle
Commercial activities: There will be no commercial activities associated with this project, although lands nearby could be developed in new commercial, or other uses, as a result of having the project nearby. All activities within the project will be to maintain the habitat or to allow public access for recreation or environmental/ecological education purposes.

Terrence Colver
Water sources studied: All possible water sources were studied. The three available and potentially cost effective sources were analyzed. The feasible alternatives included: purchase and transport of CAP water to the project and drilling either shallow or deep wells into the aquifer lying under the river. Drilling into the shallow aquifer proved the most cost effective source.

Myrna Kalember
Trails: The Rio Salado project will not be making trail connections to Phoenix trails, existing or proposed, outside the project. However, the linear trail along the length of the project can be linked to the city trail system planned along the Salt River through the metropolitan area. The existence of the project will also offer the city the opportunity to link north-south trails to the project trail.

Davis Fellows
Flooding: The project design anticipates flood releases coming based on the Roosevelt Dam flood management plan as well as historic flood data from the Verde River watershed. The design of the project specifically minimizes the impacts from flood releases on the project.

Notably, all infrastructure is placed out of the 100 year floodway and the low flow channel is sized to accommodate the frequent, low volume releases. The channel will contain grade control structures to minimize flow velocity, reducing loss of plant material and liners will be placed below the scour line. The project must maintain the current 100 year storm level of flood protection, but is designed to minimize the losses to the project from major flood events. The existing channel between the Phoenix and Tempe portions of the project also can carry the 100 year storm flow, and both portions of the project will transition to this area so that they do now affect the present channel capacity.

2069801