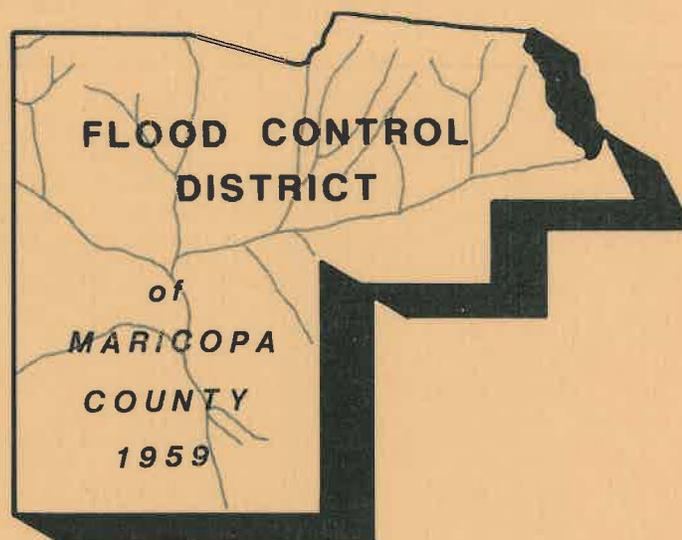


GROUNDWATER RECHARGE FEASIBILITY INVESTIGATION

Executive Summary



Submitted by

CHM HILL

in association with

ERROL L. MONTGOMERY & ASSOCIATES

and

L. G. WILSON, RECHARGE SPECIALIST

APRIL 1988

805.012

Property of
Flood Control District of MC Library
Please Return to
2801 W. Durango
Phoenix, AZ 85009

GROUNDWATER RECHARGE
FEASIBILITY INVESTIGATION

EXECUTIVE SUMMARY

Prepared for

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
PLANNING & PROJECTS
MANAGEMENT DIVISION

Property of
Flood Control District of MC Library
Please Return to
2801 W. Durango
Phoenix, AZ 85009

by
CH2M HILL
In Association With

Errol L. Montgomery & Associates, Inc.
and
L. G. Wilson, Recharge Specialist

April 1988

This Document Has Been Prepared Under the Direction
of a Professional Engineer Registered in the
State of Arizona



Copyright © 1988 by CH2M HILL, INC.
Reproduction in Whole or in Part Without the Written
Consent of CH2M HILL is Prohibited

N22984.A0

PREFACE

This document briefly summarizes the study approach and findings of the Groundwater Recharge Feasibility Investigation for the Flood Control District of Maricopa County. An Executive Summary Report is available which contains excerpts from a series of technical memoranda that were prepared during the investigation. These technical memoranda are bound separately and are shown as appendices to the summary report. For additional information and details of the investigation, the reader should consult the summary report and appended documents.

EXECUTIVE SUMMARY

STUDY PURPOSE

The purpose of this study was to determine which facilities of the Flood Control District of Maricopa County (FCD) have potential for conducting artificial groundwater recharge. Emphasis was given to conjunctive use of flood control facilities for recharge of both stormwater runoff and supplementary water sources (i.e., CAP water and reclaimed wastewater). Permitting requirements for operating a recharge project were to be identified. The potential for enhancing natural recharge of stormwater runoff at existing and proposed flood control facilities was also to be determined.

STUDY APPROACH

The work completed during this study was divided into five major tasks. The study objectives for each of these tasks are described below:

- o Perform an initial screening of the FCD facilities using previously defined site suitability and evaluations criteria to determine which sites are suitable for groundwater recharge.
- o Select three sites from the most feasible sites identified and prepare conceptual facilities plans. Prepare cost estimates for construction of recharge facilities and estimate annual costs for operations and maintenance. Identify the additional data required for detailed evaluation of these three sites, including the appropriate methods and costs for obtaining the data.
- o Review the rules and regulations of state and federal agencies with regard to permit requirements for recharge. Identify pertinent procedures and requirements and estimate the time required to obtain the needed permits.
- o Evaluate selected projects currently planned or proposed by the FCD for potential changes in design and/or operations which could promote incidental, beneficial recharge.

The work product resulting from each of these tasks was presented in a technical memorandum. The technical memoranda, numbered 1 through 5, were reviewed by the FCD Review Committee and finalized in accordance with the committee's review comments. The study findings are summarized in a final report. The technical memoranda are appendices to the report.

INITIAL EVALUATION OF SITES

A total of 34 potential recharge sites associated with FCD flood control facilities were identified and evaluated. The initial screening identified fatal technical flaws which eliminated 19 of the 34 potential sites from further consideration. Reasons for rejecting sites included unfavorable hydrogeologic conditions for recharge, existing groundwater contamination, and a general lack of stormwater runoff or supplemental sources of recharge water. From the remaining 15 sites the FCD Review Committee selected nine feasible sites for further evaluations.

EVALUATION AND RANKING OF THE MOST FEASIBLE SITES

The nine potential recharge sites chosen for evaluation during this task were located near Saddleback Dam and Centennial Wash west of the Palo Verde Nuclear Generating Station, McMicken Dam west of Youngtown, Cave Buttes Dam near Deer Valley Airport, New River south of Bell Road, Agua Fria River south of Glendale Avenue and north of I-10, and Queen Creek west of the Central Arizona Project (CAP) aqueduct.

The criteria used to evaluate these sites included:

- o Recharge Water Availability. The availability of stormwater runoff and/or supplemental water for recharge.
- o Flood Control Considerations. The potential for adapting existing structures or modifying operations to accommodate or enhance recharge.
- o Water Quality Impacts. The potential for negative impacts on groundwater quality due to movement of contamination from landfills or existing contaminate plumes.
- o Hydrogeologic Conditions. The ability of the aquifer to accept, transmit, and store recharged water for later recovery.
- o Soils and Infiltration Rates. The suitability for recharge and estimated infiltration rates.
- o Land Ownership and Use. Compatibility of recharge operations with current land ownership and use, and with future land uses.

The ability to derive flood control benefits from recharge projects was addressed during this task. It was determined that flood control benefits can be direct benefits from reducing flood damage costs or indirect benefits from

contributions to the local economy, improvements to the environment, and contributing to the social well-being of the citizenry. While recharge projects have the potential to provide flood control benefits, it was determined that the direct benefits would probably be small in comparison to other economic factors when considering project feasibility.

Following the evaluations and ranking of the nine sites, three sites were chosen for conceptual facilities planning.

CONCEPTUAL FACILITIES PLANS AND COST ESTIMATES

As a result of prior evaluations it was determined that spreading basins would be the preferred recharge method for the candidate recharge sites. Therefore, design criteria were developed and conceptual layouts prepared of spreading facilities for the three candidate recharge sites previously chosen. The designs prepared for each site include the configuration of basin levees, interbasin spillway and drain structures, conveyance facilities and hydraulic structures, pump stations, and river channel diversion facilities. An operations plan with estimates of the annual recharge capacity was developed for each site. The requirements for a monitoring program for each site were also developed. Estimated capital costs were annualized and estimates of annual and operations and maintenance costs were prepared. From these cost data the cost per acre-foot of water recharged was developed for each site. The facilities plans were developed using readily available data; therefore, many uncertainties remain, particularly site-specific hydrogeologic conditions. Additional data collection and field investigations are needed at these sites prior to final determination of project feasibility. Required data collection and field investigation efforts for hydrogeology, soils and infiltration rates, land ownership and use, floodplain impacts, water sources, and other site-specific data needs were developed. Where feasible, costs for individual data collection tasks were estimated.

McMicken Dam Recharge Site

This 200-acre site is located within the McMicken Dam detention area just south of Bell Road as shown on Figure 1. Depth to water is about 490 feet. There are five soil types characteristic of the site. The estimated composite infiltration rate is 1.7 ft/day. All of the property is currently owned by the Maricopa Water District. For this project, CAP water is delivered to the site for recharge via the Beardsley Canal and pumped upgradient to the spreading basins. Major features of the facilities plan include spreading basins covering 200 acres, canal turnout and pump station, transmission pipeline, hydraulic structures, and monitor wells. Project costs are summarized below:

<u>TOTAL PROJECT COSTS</u>	<u>\$2,621,000</u>
Annualized Capital Costs (including Land Lease Costs)	\$389,000
<u>Annual Operations & Maintenance</u>	<u>\$342,000</u>
Total Annual Cost	\$731,000
Cost per Acre-Foot For 56,000 ac-ft/yr Recharge	\$12

Agua Fria/New River Recharge Site

This 590-acre site is located at the confluence of New River and the Agua Fria just north of the river crossing at Camelback Road as shown on Figure 1. Depth to water is about 160 feet. There are four characteristic soil types with an estimated composite infiltration rate of 2.0 ft/day. Approximately one-third of the property is privately owned and the remainder is owned by the State Land Department, the City of Glendale, and the Bureau of Land Management. CAP water is delivered to the site for recharge via the Salt River Project (SRP) Grand Canal. Stormwater runoff from New River and spills from Waddell Dam can also be recharged. Based on fourteen years of historical stream flow data, it was estimated that an average of 4,400 ac-ft/yr. could be recharged from the flows in New River. Computer modeling of the New River watershed and existing system of flood control facilities demonstrated that modifying the outlet structures to increase the detention time of stormwater flow could provide a 14 percent increase in recharge potential. Modifying New River Dam showed an average 600 ac-ft/yr increase in recharge. Assuming favorable operation of additional flood control and joint use storage at the proposed New Waddell Dam, it was estimated that average of 5,100 ac-ft/yr of Agua Fria River flow could be recharged at the proposed recharge site and an additional 12,600 ac-ft/yr could be recharged in the river channel.

Major features of the facilities plan include both in-channel and off-channel spreading basins totaling 318 acres, an inflatable dam and intake structure on New River, a conveyance channel, hydraulic structures, and monitor wells. Project costs are summarized below:

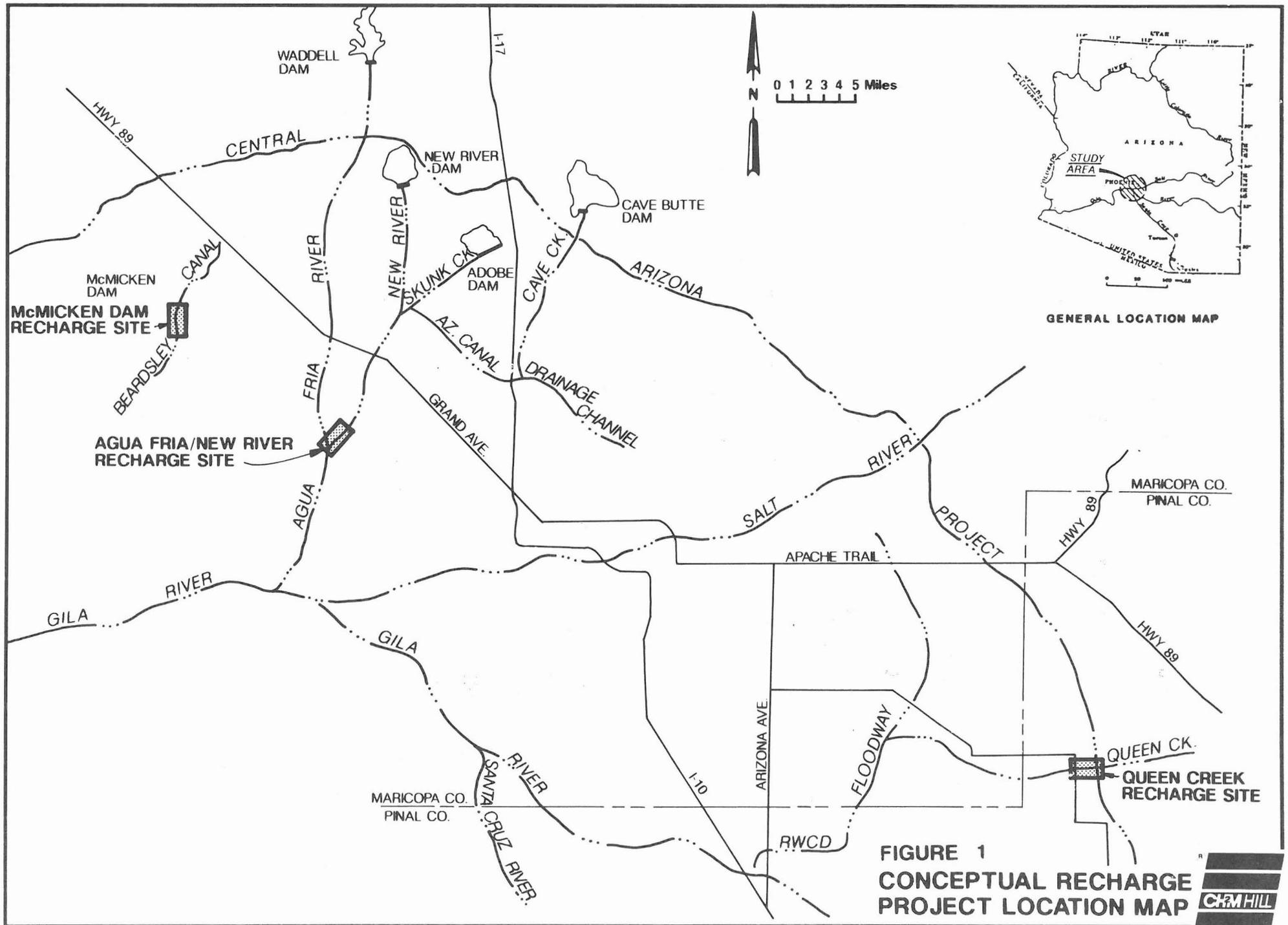


FIGURE 1
CONCEPTUAL RECHARGE
PROJECT LOCATION MAP



<u>TOTAL PROJECT COSTS</u>	<u>\$5,191,000</u>
Annualized Capital Costs (including land lease costs)	\$754,000
<u>Annual Operations & Maintenance</u>	<u>\$320,000</u>
Total Annual Cost	\$1,074,000
Cost per Acre-Foot For 116,000 ac-ft/yr Recharge	\$9

Queen Creek Recharge Site

This site is located on Queen Creek just west of the CAP aqueduct near Queen Creek Road as shown on Figure 1. Depth to water is about 540 feet. There are six characteristic soil types with an estimated composite infiltration rate of 1.0 ft/day. This project plan consists of two parcels about one mile apart. The west 230 acres is private land held by six different owners and the east 600 acres is owned by the State Land Department. CAP water is delivered to the site for recharge via the Salt-Gila aqueduct and pumped to the spreading basins near the aqueduct and conveyed via the Queen Creek channel to the west basins. Major features of the facilities plan include spreading basins covering 702 acres, canal turnout and pump station, conveyance channel, transmission pipeline, hydraulic structures, and monitor wells. Project costs are summarized below:

<u>TOTAL PROJECT COSTS</u>	<u>\$7,914,000</u>
Annualized Capital Costs (including land lease costs)	\$1,147,000
<u>Annual Operations & Maintenance</u>	<u>\$572,000</u>
Total Annual Cost	\$1,719,000
Cost per Acre-Foot For 128,000 ac-ft/yr Recharge	\$13

RULES AND REGULATIONS FOR RECHARGE

Specific legislation and permitting requirements for implementing an artificial groundwater recharge project were reviewed, including: (1) federal legislation, (2) state legislation, (3) rules and regulations of cooperating agencies (SRP, Maricopa Water District, CAWCD, etc.), and (4) planning and permitting activities for the FCD recharge project. It was determined that the more complicated and time consuming permits will be those required by the State Groundwater Recharge Act and the Dredge and Fill Permit required by the

Army Corps of Engineers (COE), assuming stream channel modifications are needed.

Dredge and Fill permits generally require 60 to 90 days, provided that the environmental assessment completed by COE does not identify significant impacts. If an Environmental Impact Statement is required then a minimum of one year is usually required.

The permit application required by ADWR and ADEQ under the Groundwater Recharge Act are filed simultaneously. It is anticipated that a Recharge and Recovery Permit and Aquifer Protection Permit can be obtained within the same time frame. Permits for a demonstration project could be obtained within two months. Short-term permits will require four to six months and long-term permits will require six to eight months to obtain.

EVALUATION OF PLANNED AND PROPOSED PROJECTS

Several planned and proposed flood control projects were given a cursory review to identify potential changes in design and/or operations which could promote incidental, beneficial recharge of groundwater. Suggestions were made for ways to increase channel infiltration rates, wetted area, and opportunity time for infiltration to promote the natural recharge of stormwater runoff.

TSR11/006