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ORIGINAL

BEFORE THE ARIZONA CORPORATION COMMISSION

CARL J. KUNASEK
Commissioner - Chairman
JIM IRVIN
Commissioner
WILLIAM A. MUNDELL
Commissioner

IN THE MATTER OF THE JOINT APPLICATION OF SUN CITY WATER COMPANY AND SUN CITY WEST UTILITIES COMPANY FOR APPROVAL OF CENTRAL ARIZONA PROJECT WATER UTILIZATION PLAN AND FOR AN ACCOUNTING ORDER AUTHORIZING A GROUNDWATER SAVINGS FEE AND RECOVERY OF DEFERRED CENTRAL ARIZONA PROJECT EXPENSES.	)DOCKET NO. W-01656A-98-0577) ~~SW-02334A-98-0577~~))) **NOTICE OF FILING**) **SUMMARIES OF**) **TESTIMONY**)))

The Sun City Taxpayers Association ("SCTA") hereby files summaries of Mary Elaine Charlesworth's and Dennis Hustead's testimony in the above-captioned docket.

RESPECTFULLY SUBMITTED this 15th day of October, 1999.

MARTINEZ & CURTIS, P.C.

By Paul R. Michaud

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The original and ten (10) copies of the foregoing are filed this 15th day of October, 1999 with:

DOCKET CONTROL
Arizona Corporation Commission
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Phoenix, Arizona 85007

A copy of the foregoing is mailed this 15th day of October, 1999 to:

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SUMMARY OF MARY ELAINE CHARLESWORTH'S TESTIMONY

On Behalf of

SUN CITY TAXPAYERS ASSOCIATION ("SCTA")

October 15, 1999

SUMMARY OF MARY ELAINE CHARLESWORTH'S TESTIMONY
DOCKET NOS. W-01656A-98-0577 and SW-02334A-98-0577

SCTA's position is that it will only support paying for CAP costs to the extent Citizens affirmatively demonstrates direct benefits proportionate to the costs ratepayers are being asked to pay. SCTA recognizes it is important for central Arizona to fully utilize its CAP water supply. This public policy, however, does not justify a for profit company, like Citizens, imposing costs on its ratepayers in excess of the actual benefits received. The foundation of the "used and useful" and "just and reasonable" concepts of ratemaking is that ratepayers receive benefits equal to the costs being imposed.

SCTA believes that Citizens has never presented evidence of any direct benefits to its ratepayers from the CAP Utilization Plan presented in this proceeding. Rather, Citizens relies on general statements that overdraft will result in increased pump costs, poorer water quality and/or subsidence. Citizens consistently refuses to provide evidence of the direct benefits of its proposal. SCTA believes such a demonstration is necessary before the Commission authorizes Citizens to commence on a course that is estimated to cost Sun City Water ratepayer over $58 million over the remaining life of the CAP subcontract, with a similar burden for ratepayers residing in Sun City West.

Further, SCTA opposes rewarding Citizens for failing to put CAP water to use for fourteen (14) years. With each passing year, the potential benefits under the CAP subcontracts are diminished. The Commission has steadfastly recognized Citizens' ratepayers do not benefit from the mere existence of CAP subcontracts. Citizens has never presented any credible justification for its inaction. In fact, SCTA believes Citizens would still be simply holding its CAP subcontract but for the Commission's

instance that CAP water be utilized as a condition to recovering CAP related costs. Therefore, SCTA opposes Citizens' recovery of deferred CAP costs.

To the extent Citizens presents evidence of actual benefits to its ratepayers from utilization of CAP water and CAP costs are deemed recoverable, SCTA requests the Commission insist that Citizens present a viable, least cost, alternative for CAP utilization prior to authorizing recovery of any CAP related costs.

To the extent CAP related costs are deemed recoverable, SCTA supports spreading recoverable deferred costs, if any, over the remaining life of the CAP subcontract and collecting CAP related costs through a combination of connection fees and gallonage charges. SCTA generally supports RUCO's rate design for those recoverable CAP costs, not collected as connection fees.

ORIGINAL

BEFORE THE ARIZONA CORPORATION COMMISSION

CARL J. KUNASEK
Commissioner - Chairman
JIM IRVIN
Commissioner
WILLIAM A. MUNDELL
Commissioner

IN THE MATTER OF THE JOINT APPLICATION OF SUN CITY WATER COMPANY AND SUN CITY WEST UTILITIES COMPANY FOR APPROVAL OF CENTRAL ARIZONA PROJECT WATER UTILIZATION PLAN AND FOR AN ACCOUNTING ORDER AUTHORIZING A GROUNDWATER SAVINGS FEE AND RECOVERY OF DEFERRED CENTRAL ARIZONA PROJECT EXPENSES.	DOCKET NO. W-01656A-98-0577 SW-02334A-98-0577

SUMMARY OF DENNIS HUSTEAD'S TESTIMONY

On Behalf of

SUN CITY TAXPAYERS ASSOCIATION ("SCTA")

October 15, 1999

SUMMARY OF DENNIS HUSTEAD'S TESTIMONY
DOCKET NOS. W-01656A-98-0577 and SW-02334A-98-0577

INTRODUCTION

In this case, Citizens requests the Commission to pre-approve the concept for a $15 million dollar golf course plan to put Citizens CAP water allocation to use in the Sun Cities. Citizens did not present any actual evidence demonstrating that the benefits of its proposed plan justify the costs of the plan. Instead, Citizens relies solely on the recommendation of its CAP Task Force to gain Commission approval of its proposed plan. SCTA retained the services of Mr. Dennis Hustead, of Hustead Engineering, to review the technical and economic impacts of Citizens proposed CAP water utilization plan. Mr. Hustead has significant expertise in managing the planning and design of major public works projects throughout Arizona and California. Mr. Hustead's findings are summarized below.

CITIZENS PROPOSED CAP WATER UTILIZATION PLAN

Based on Mr. Hustead's analysis, he believes that Citizens proposed CAP Water Utilization Plan (Golf Course Plan) is not prudent. It is expensive. Total construction costs are $15 million dollars, but the total cost of the proposed plan is even more staggering. For example, Mr. Hustead estimates that over the remaining life of Citizens' CAP subcontract, Sun City ratepayers, alone, would have the burden of paying out a whopping $58 million dollars under the proposed plan.

Mr. Hustead's analysis revealed that Citizens proposed plan is far more costly than it needs to be. For example, the proposed plan includes extra costs for a pump station and a reservoir which simply are not necessary. Mr. Hustead estimates that by reducing the pump station and reservoir and maximizing deliveries to Sun City West, construction costs could be reduced from $15 million to about $9 million. Thus, Mr.

Hustead estimates that the total economic impact on Sun City over the remaining life of Citizens' subcontract would be reduced, from $58 million under Citizens proposed plan, to $40 million under this modification to the proposed plan.

Another problem Mr. Hustead discovered with Citizens' proposed plan is that the entire concept is dependant on the recreational center golf courses taking the CAP water. Mr. Hustead is concerned that if Citizens' speculative anticipation of revenues from the golf courses is inaccurate, the costs to ratepayers would increase by $131,000 annually. This cost increase would amount to about $5.5 million over the 42-year life of the subcontracts.

Mr. Hustead is also adamantly opposed to Citizens' contention that because the "private" golf courses did not participate in the CAP Task Force, they should not be allowed participate in Citizens proposed plan. The record is clear that the private golf courses were not even permitted to participate in the CAP Task Force. It is not clear, however, whether it was Citizens, or the recreation center golf courses, or both, that opposed the private golf courses participation. Also, Mr. Hustead believes that if the concern of the CAP Task Force and Citizens is to leave water in ground, this will be accomplished whether the golf course participating is private or public. Lastly, Mr. Hustead believes that if there is an economic advantage to taking the CAP water, the private golf courses will surely be interested in participating.

JOINT TRANSMISSION PIPELINE

Mr. Hustead's analysis of Citizens' proposed Golf Course plan revealed the possibility that a Joint Transmission Facility could be built with Citizens' Agua Fria Division. Under this alternative plan, all CAP water available to Citizens could be delivered to Citizens' certificated area, in one cost-effective project. Mr. Hustead

estimates that the construction costs under this joint plan would be $10 million compared to the $15 million under Citizens' proposed plan. As indicated above, the advantage of the joint transmission facility plan is that Citizens' Agua Division would also be able to deliver its full CAP allocation, plus a significant portion of the construction cost for the joint facilities could be allocated between Sun City, Sun City West and the Agua Fria Division. Mr. Hustead estimates that the total economic impact on Sun City over the remaining life of Citizens' subcontract would be reduced from $58 million under Citizens' proposed plan, to $34 million under the joint facilities plan.

Citizens does not dispute the fact that there may be significant savings from a joint project with Citizens' Aqua Fria Division. Citizens, however, rejects Mr. Hustead's joint project because Citizens has a separate plan for putting CAP water to use in its Agua Fria Division. Thus, Citizens simply ignores Mr. Hustead's analysis which shows that ratepayers would receive maximum benefits at the least cost by designing a joint system. Mr. Hustead calculates that by treating the Sun Cities separately, Citizens will increase construction costs by millions of dollars. Mr. Hustead believes that common sense dictates that Citizens should not insist on two separate and expensive plans for putting CAP water to use in the Sun Cities and Agua Fria Division, when a single less costly plan is available.

Mr. Hustead's engineering analysis highlights the faults in Citizens CAP Task Force process. It shows that if the CAP Task Force had been given the opportunity by Citizens to consider other options to Citizens proposed Golf Course option, the Task Force would certainly have adopted either one of Mr. Hustead' proposed options over the proposed plan because they provide substantially the same benefits, but a significantly lower cost. By relying exclusively on the recommendations of the CAP

Task Force, Citizens neglected its responsibility to present evidence of any direct benefits to its ratepayers from the CAP Utilization Plan it presents in this proceeding. Mr. Hustead believes that Citizens must show direct benefits of its proposed plan before the Commission can authorize the plan.

RECHARGE PROJECTS

In the course of his analysis, Mr. Hustead looked at the recharge option for putting Citizens CAP water allocation to use by leasing capacity at CAWCD's Agua Fria Recharge Project. Under this option, water would be conveyed from the CAP canal to the recharge facility by gravity via the channel of the Agua Fria River. His analysis showed that the total cost of this option to Sun City over the remaining life of Citizens' subcontracts would be approximately $27 million. The benefit of this option is its relative lower cost to the golf course plan. Unfortunately, this option seems to provide no direct benefit to the Sun City and Sun City West Communities.

Mr. Hustead also analyzed the recharge option for putting Citizens CAP water allocation to use by utilizing the groundwater savings project with Maricopa water District option. Under this option, CAP water would be delivered through an existing distribution system to farms located in Maricopa Water District' service area that have historically used groundwater pumped by the Maricopa Water District. By doing this, every gallon of groundwater not pumped by the Maricopa Water District would be legally available to Citizens to be withdrawn later as CAP water. The evidence will show that the total cost of this option over the 42 year life of Citizens; CAP subcontract would be approximately $20 million. The benefit of this option is its relative lower cost than the golf course plan. But again, this option seems to provide no direct benefit to the Sun City and Sun City West Communities.

DEFERRED CAP COSTS

SCTA believes that Citizens should not be allowed to recover 100% of its deferred CAP water related charges. Mr. Hustead's review of the facts convinced him that these costs have accrued because Citizens, for more than ten years, failed to design a plan to put its CAP water allocation to use. For example, the use of CAP water on the golf courses has been an option for Citizens since it executed its CAP subcontracts in 1985. Citizens, however, opted to do nothing and merely preserve its shareholders' future options rather move forward with a permanent solution. Mr. Hustead believes that to retroactively collect these charges from existing customers, many of whom may not have resided in Sun City during the period the charges were incurred, is simply not equitable.

Mr. Hustead also disagrees with Citizens proposed method of recovering deferred CAP costs. His analysis shows that the best method to recover the cost for utilizing CAP water is from customers entering the system today. For example, rather than charge current ratepayers, Citizens could charge a connection fee to all new developments and new existing service connections.

However, to the extent that the Commission allows CAP costs to be recovered from existing customers, Mr. Hustead believes that CAP costs should be recovered based upon usage, thus placing the greatest burden on those using the most water. He believes that this would encourage conservation and protect persons on fixed incomes. Also, if the Commission were to allow Citizens recovery of some percentage of the deferred costs, he agrees with both Staff and RUCO that under no circumstances should Citizens be allowed to earn any rate-of-return on the deferred CAP costs because it is contrary to Commission precedent. Finally, in regard to the length of period for recovery of deferred costs, Mr. Hustead recommends that if any of the

deferred costs are deemed recoverable, these costs should be spread over the remaining life of Citizens' CAP subcontracts, as opposed to just 42 months under Citizens' proposal.

RECOMMENDATON

Mr. Hustead testifies that he now has a good understanding of the costs under Citizens proposed plan. He also testifies that, from an engineering standpoint, his analysis clearly shows that there are more effective alternatives available rather than the plan recommended by the Task Force and proposed by Citizens. However, Mr. Hustead cannot, at this time, recommend any one option to use CAP water over another. The reason for this indecision is simple, Citizens has failed to provide substantial evidence demonstrating that it proposed plan, or other CAP water use option, provides benefits at least equal to the costs ratepayers must bear to support the plan. Instead of presenting a viable, least cost option, supported by a thoughtful and thorough cost/benefit analysis, Citizens strategy has been to rely solely on the recommendations of the CAP Task Force Report. Mr. Hustead disagrees with this approach. Mr. Hustead concludes that a cost/benefit analysis is necessary before the Commission authorizes Citizens to commence on a course of action that is estimated to cost Sun City Water ratepayers in excess of 58 million over the remaining life of Citizens subcontract.

AGUA FRIA RIVER RECHARGE PROJECT

The Agua Fria Recharge Project (project) is being developed by Central Arizona Water Conservation District (CAWCD) as a State Demonstration Recharge Project constructed for the benefit of the State of Arizona and funded by property tax revenues collected by CAWCD in its capacity as a tax-levying public improvement district of the State. The primary purposes of this recharge project are to replenish the severely over drafted aquifer in the West Salt River Valley and create an opportunity to more fully use Arizona's unused Colorado River allocation.

The project will utilize the natural channel of the Agua Fria River and constructed spreading basins to recharge up to 100,000 acre-feet per year of Central Arizona Project (CAP) water and replenish the aquifer in the west Salt River Valley. The project area extends from the CAP Aqueduct-Agua Fria River Siphon, downstream within the Agua Fria River channel for approximately 4.5 miles to a series of infiltration basins to be located north of Hatfield Road and west of 107th Avenue. The project area includes portions of Sections 17, 20, 29, 31 and 32, Township 5N, Range 1E, and Section 6, Township 4N, Range 1E. CAP water will be discharged from the siphon and flow downstream within the natural channel to a small earthen diversion dam located near Jomax Road. From this point the water will be conveyed to the recharge basins.

As a State Demonstration Project, authorized by statute, the project will benefit the state in the following ways: 1) protect the general economy and welfare of the state and its citizens by encouraging the use of renewable water supplies instead of continued reliance on limited groundwater supplies; 2) store currently unused CAP water for future needs through recharge and replenishment of over drafted aquifers; and 3) provide an additional source of water for times of serious water shortage due to a substantial reduction in the supply or a prolonged interruption of deliveries of CAP water.

Benefits resulting from recharge will be most notable within the West Salt River Valley that includes portions of Phoenix, Glendale, Peoria, Sun City, El Mirage, Youngtown and Surprise. Decades of groundwater pumping for agricultural irrigation in this area has resulted in lowering of groundwater levels by over 350 feet directly south of the project area and this trend is projected to continue. Groundwater overdraft in the West Salt River Valley has resulted in increased energy costs to pump groundwater from greater depths, deterioration of water quality by withdrawing poorer quality water from deeper in the aquifer and geologic hazards such as land subsidence, earth fissuring and aquifer compaction.

The project is located at the margin of an area where groundwater declines have been most severe and where recharge will directly replenish aquifer water levels and mitigate the negative impacts of overdraft. The Arizona Department of Water Resources (ADWR) supports this project for its hydrologic benefits and has issued the necessary permits to authorize construction.

A number of state and municipal entities are dependent on recharging CAP water in this project to achieve their respective mandates. The Arizona Water Banking Authority (AWBA) was created by the legislature in 1996 to recharge CAP water in order to firm existing water supplies for municipal and industrial users for future shortages; to help ADWR meet the water management objectives required by state law; and to assist in the settlement of Indian water rights claims. Unfortunately, the lack of available recharge facilities currently limits the AWBA ability to achieve its goal of recharging 500,000 acre-feet annually. The AWBA strongly supports the project and has committed to storing at the project because: 1) AWBA is required by statute to utilize state demonstration recharge projects; 2) the 100,000 acre-feet of storage capacity will bring the AWBA much closer to realizing its annual goal and 3) recharge at the project will achieve significant water management benefits by replenishment of the West Salt River Valley's over drafted aquifer.

The Central Arizona Groundwater Replenishment District (CAGRD) will use the project to help fulfill its groundwater replenishment obligation for the Phoenix Active Management Area. The CAGRD must replenish the aquifer to replace excess groundwater pumped by municipal providers. Recharge at the project will allow the CAGRD to achieve maximum water management benefits by allowing it to replace groundwater pumped by West Salt River Valley municipal water providers through recharge in the same geographic region that is was withdrawn. Without the project, the CAGRD will have to settle for recharge at projects in less desirable locations that may not directly replenish the effected aquifer.

West Valley cities that elect to recharge all or a portion of their CAP allocations at the project will receive significant economic benefits. CAP water stored underground at the project can legally be recovered by municipalities using existing service area wells, even if located far from the recharge project, thereby eliminating the need to construct expensive water treatment plants and pipeline distribution systems in order to take delivery and use of their CAP allocations. Cities that recharge and recover CAP water will also benefit by reducing their dependence on limited groundwater reserves by taking advantage of currently available excess CAP water at subsidized water rates.

CENTRAL ARIZONA PROJECT
P.O. Box 43020 • Phoenix, Arizona 85080-3020 • 23636 North Seventh Street (85024)
(623) 869-2333 • www.cap-az.com

April 22, 1999

Arizona Department of Environmental Quality
Engineering Review Desk, Second Floor
3033 N. Central Avenue
Phoenix, Az 85012
Attn: Mr. Kurt Harris

Re: Central Arizona Project - Agua Fria Recharge Project; US Army Corps of Engineers Public Notice/Application No.: 9640-27800-LSF

Dear Mr. Harris:

Enclosed please find ADEQ Application Form 404-015 for State 401 Water Quality Certification for the referenced Army Corps of Engineers 404 permit. As you requested, this letter provides additional information to aid in your review including a description of the recharge project activities within the ordinary high water mark of the project area and surface water quality information. In addition, we have enclosed a response to ADEQ policies for protecting water quality during facility construction (ADEQ Form 404-003).

Project Description

The Agua Fria Recharge Project (AFRP) will utilize the natural channel of the Agua Fria River and constructed spreading basins to recharge up to 100,000 acre-feet per year of Central Arizona Project (CAP) water and replenish the aquifer in the west Salt River Valley. The project site is located along a 4.5 mile stretch of the Agua Fria River beginning at the Central Arizona Project Aqueduct-Agua Fria River Siphon which crosses the Agua Fria River approximately 5 miles downstream of New Waddell Dam. From the Agua Fria River Siphon the recharge project will extend downstream within the Agua Fria River channel approximately 4.5 miles to a series of infiltration basins to be located north of Hatfield Road and west of 107th Avenue. The project area includes portions of Sections 17, 20, 29, 31 and 32, Township 5N, Range 1E, and Section 6, Township 4N, Range 1E.

Proposed activities within the project area involve building structures to convey, control and impound water, and to establish and maintain a channel for operational flow in the normally dry Agua Fria riverbed. Construction activities will require excavation and placement of native fill from the riverbed and use of imported materials such as earthfill, riprap and concrete. Earthwork will be accomplished using typical earth moving equipment and methods. Scrapers, graders, loaders and dozers will be employed.

For ease of discussion, the project is divided into five features; Blowoff Area, Flow Channel,

Headworks Area and Conveyance Canal, Basin Area, and Floodway Channel. The nature of activities in each is discussed in more detail below.

Blowoff Area

In the Blowoff Area construction activities will consists of building an energy dissipation/fish containment structure, small dike and channel, and road improvements. The Blowoff Dissipation Structure is a concrete walled basin filled with riprap to dissipate energy of water exiting the CAP siphon blowoff. Metal grating at the outflow of the structure serves to contain grass carp that are stocked in the CAP canal in order to comply with Arizona Department of Game and Fish requirements. Road improvement include raising the road grade and installing four CMP culverts on the Maricopa Water District (MWD) Road, and raising the grading of the Access Road. Fill material will come from required excavation for the Blowoff Channel and borrow site.

Flow Channel

The Flow Channel extends from the MWD Road Crossing to the Headworks Area. This area is used for in-channel groundwater recharge and to convey water to the basins. It will be necessary to contain operational flow within Flow Channel boundaries. Therefore, a flowage easement will be acquired from landowners for the existing low flow channel. Maricopa County's HEC-2 floodplain delineation model was utilized to establish easement boundaries that accommodate project operational flow. Initial spot grading and future maintenance of the Flow Channel may be necessary to further define or reestablish the shallow alluvial channel. No material will be removed or filled from outside the Flow Channel.

Headworks and Conveyance Canal

The Headworks Area consists of a short embankment and two radial gate structures to capture and control operational flow. Embankment material will come from required excavation in the headworks area. Riprap will be primarily imported from a local off-site source (several companies mine riverbed material within 1 mile of the project area).The Conveyance Canal is a shotcrete lined embankment structure that conveys water from the Headworks Area to the Basins. Embankment material will come from required excavation in the Basin Area and Floodway Channel. Riprap will be primarily imported from off-site. A twin-box culvert will be constructed at Jomax Road and a Broad-Crested Weir flow measuring device will be constructed within the canal near the outlet to the basins. The Jomax Road Crossing will require imported fill to ramp-up and over the canal.

Basin Area

The Basin Area consists of seven infiltration basins covering 115 acres, a distribution channel and control structures. Basin embankments are constructed of material excavated on-site and locally processed or imported riprap. Excavated material will be used to build the Basin Area and Conveyance Canal embankments.

Floodway Channel

The Floodway Channel is located along the east side of the Basin Area and is designed to mitigate effects of the project on the 100-year flood in the Agua Fria River. This is required by the Maricopa County Flood Control District, Floodplain Use Permit. A Floodplain Use Permit has been issued by MCFCD for this project. Excavated material will be used for construction of the basin embankments and

used for Basin F and G fill.

Post-construction activities will primarily involve routine maintenance of recharge basins and the flowage channel. Approximately annually, basins will be allowed to dry and accumulated fine grained sediments will we disced or plowed using agricultural type field cultivators pulled by a small grading tractor. Approximately semi-annually, vegetation established on basin berms, canal banks or the flowage channel will be removed by manual or mechanical methods or by the application of Rodeo herbicide. Mechanical removal will utilize mowing tractors. Application of Rodeo will be accomplished in accordance with criteria already approved by ADEQ's APP unit for other CAP recharge projects. All mechanical equipment will be stored, fueled and maintained outside of the project area.

CAP Water Quality

CAWCD evaluates the quality of water in the CAP aqueduct on a regular basis. Samples are obtained at numerous locations along the CAP system and analyzed for general minerals and other constituents including metals, VOC's, SVOC's, herbicides, aldicarbs, algae counts, bacteria and selected parasites. In addition, samples are analyzed for compliance with state water quality standards at all CAP's recharge projects on a quarterly basis. Sampling results indicate CAP water meets state numeric aquifer water quality standards except for bacteria. Since recharge will be accomplished by surface spreading, bacteria will be removed through the soil-aquifer-treatment process and filtration within the vadose zone. Recharge facilities storing CAP water are exempted from state Aquifer Protection Permit requirements (A.R.S. § 49-250) because the risk of aquifer degradation in negligible.

Please call me at (623) 869-2107 if you require additional information or if you have any questions regarding this project.

Sincerely,

Tom Harbour
Supervisor, Water Planning

cc: Rob Genualdi, CAWCD

ALTERNATIVES ANALYSIS
SECTION 3

Introduction

The Agua Fria Recharge Project (AFRP) will utilize the natural channel of the Agua Fria River and constructed spreading basins to recharge up to 100,000 acre-feet per year of Central Arizona Project (CAP) water and replenish the aquifer in the west Salt River Valley. The project site is located at the extreme northern boundary of the Salt River Valley alluvial basin and adjacent to the Deer Valley-Luke cone of depression, an area that has experienced severe groundwater level declines exceeding 350 feet in recent decades. The need to replenish the aquifer and mitigate the effects of groundwater overdraft in this area guided the selection of the proposed recharge project location and dictated project design criteria.

The AFRP will consist of two distinct recharge areas, the recharge basin area and the in-channel recharge area. The recharge basins are ponds, enclosed by low berms, that contain the CAP water while it infiltrates through the basin bottoms. The in-channel recharge component has two primary functions, aquifer recharge and water conveyance. Water released to the river from the CAP aqueduct will infiltrate through the stream bed alluvium and recharge the aquifer over a four mile river reach between the CAP aqueduct and the recharge basins. When CAP water releases exceed the infiltration capacity of the stream alluvium, surface water flows will progress downstream a sufficient distance to be captured and diverted into the spreading basins. While the majority of the volume of water recharged will occur within the spreading basins, a significant volume will be recharged in-channel. The in-channel segment has the additional benefits of increasing overall recharge capacity of the project and providing a mechanism to transport water to the basins eliminating the need to construct costly and environmentally damaging pipeline distribution systems.

The combination of spreading basins and in-channel recharge is necessary to achieve the design recharge capacity of 100,000 acre-feet per year. Groundwater flow models indicate that this design capacity is hydrologically feasible and that recharged water would flow toward and mitigate groundwater declines in the West Salt River Valley. The Arizona Department of Water Resources estimates that groundwater overdraft in the Salt River Valley will exceed 400,000 acre-feet in the next 25 years without increased water management efforts. Municipal pumping by West Salt River Valley cities is projected to increase by over 200,000 acre-feet/year during the same period. The full design capacity of 100,000 acre-feet/year is necessary to achieve the project goals of mitigating groundwater overdraft by offsetting groundwater pumping and to meet the recharge capacity demands of the Arizona Water Banking Authority and the Central Arizona Groundwater Replenishment District.

Recharge Methods

The Arizona Department of Water Resources regulates all recharge activities within the state and authorizes two distinct types of recharge projects, direct recharge and indirect recharge projects. Direct recharge involves the direct addition of surface water to the aquifer through surface spreading, streambed recharge or well injection methods. Indirect recharge, also know as in-lieu recharge, is a method of conserving groundwater that does not physically add water to the aquifer. Instead of

physically recharging the aquifer, a recipient (agricultural irrigation district) who would otherwise pump groundwater, receives an alternative supply of renewable water (CAP water) and uses this water in-lieu of groundwater creating a groundwater savings.

Indirect recharge is not a practical alternative to the direct recharge proposed for the Agua Fria Recharge Project for several important reasons. First, indirect recharge fails to directly mitigate effects of groundwater declines because no water is physically added to the aquifer. Agricultural pumpage is temporarily reduced, however, this groundwater savings is not reserved and can be utilized by others resulting in no net benefit to the aquifer. Second, there no economic disincentive to develop such projects because indirect recharge is ineligible for funding from the State Water Storage Fund and the Arizona Department of Water Resources precludes indirect recharge for assuring long term mucicipal water supplies. Finally, no potential recipients of in-lieu water have been identified in the West Salt River Valley.

Direct recharge projects utilize two primary techniques to add water directly to the aquifer, surface spreading and well injection. Surface spreading is by far the most common and successful recharge method used in Arizona. Surface spreading is reliable, proven technology capable of efficiently recharging large volumes of water at low cost wherever favorable hydrogeologic conditions exist. Well injection is typically considered a reasonable option only for small scale recharge projects where consolidated, impermeable surface soils restrict infiltration or retard downward migration of water and where high-quality treated water can be delivered to the well head. Well injection is not a practical or reasonable alternative to surface spreading at the proposed project site due to the following limitations:

1) Prohibitive Construction Costs

Approximately 83 large diameter injection wells at an estimated cost of $1,200,000 per well would be required to recharge 100,000 acre-feet per year. Total well construction costs alone would be approximately $99,600,000 not including canal-side pump stations and piping to deliver CAP water to each individual well.

2) Limited Recharge Capacity

The recharge capacity of an individual injection well is small necessitating construction of many wells to achieve similar recharge rates as surface spreading basins. Injection recharge rates of 1,000 gallons per minute (1,600 acre-feet per year) are a reasonable estimate based on the average of 49 injection wells operated by the Las Vegas Valley Water District. At an operating efficiency of 75% to account for maintenance and reduced capacity caused by well clogging, 83 wells each capable of recharging 1,200 acre-feet per year would be required to recharge 100,000 acre-feet per year.

3) Well Clogging and Maintenance Requirements

Injection wells are extremely susceptible to clogging and unlike spreading basins, the clogging layer is not easily or completely removed. Common causes of well clogging include: 1) formation of biofilms (bacterial clogging) that clog well screens, 2) air bubbles entrained in injection water plugs the formation near the well borehole, 3) chemical precipitation

causing encrustation of the well screen, 4) fine suspended sediment in the injection water collecting in the formation. Clogged wells require periodic redevelopment to rejuvenate injection rates, however, over a period of time the well may require abandonment and replacement. Well redevelopment typically involves pump removal, brushing or swabbing, acidization, superchlorinization, pump re-installation and surge pumping. The estimated cost of well redevelopment is $300,000 per well every two years ($12,450,000 annually for 83 wells).

4) Water Treatment Requirement

Water injected into the aquifer through wells must be treated to primary drinking water standards to reduce problems associated with clogging and to comply with state aquifer water quality protection standards. Alternatively, recharge through surface spreading does not require pretreatment due to the process of natural filtration through sediments (soil-aquifer treatment or SAT). CAP water recharged through spreading basins is exempt from Arizona Department of Environmental Quality Aquifer Protection Permit requirements.

A conservative estimate of the cost to treat CAP water to aquifer water quality standards prior to injection is $50 per acre-foot. Water treatment costs alone would add $5,000,000 to the annual operating expenses of the recharge project assuming direct injection of 100,000 acre-feet per year. However, this estimate only includes labor, chemicals and energy costs and does not include the costs associated with developing treatment plant capacity. The additional costs of constructing a water treatment facility and water delivery system would be economically infeasible.

Project Siting Requirements

Site selection focused on the need to satisfy the following siting criteria: proximity to the Luke-Deer Valley cone of depression and ability to mitigate groundwater overdraft, proximity of the recharge area to the CAP canal, the presence of permeable soils capable of high recharge rates, lack of urban encroachment, lack of soil or groundwater contamination and favorable hydrogeologic conditions (e.g., sufficiently thick alluvial aquifer and the absence of shallow bedrock). Recharge feasibility studies concluded that only the proposed project site satisfies all siting criteria necessary for a successful surface spreading project.

There are no practical alternative locations for the recharge basins other than the proposed location within the Agua Fria River channel when considering cost, existing technology and hydrologic feasibility. A 1986 feasibility study conducted by the Arizona Municipal Water Users Association concluded that the Agua Fria Recharge Project site was the best remaining site in Maricopa County for development of a large-scale recharge project because: 1) the flood plain contains highly permeable stream alluvium, 2) infiltration rates are very high, 3) ambient groundwater is good quality, 4) residential and industrial encroachment has not occurred, 5) a lack of subsurface impermeable zones (aquitards) to restrict downward migration of recharge water, and 6) no landfills or known contamination in the vicinity. A subsequent study commissioned by Central Arizona Water Conservation District (CAWCD) in 1997 confirmed the findings of the earlier study and concluded the project, as proposed, was hydrologically feasible.

Opportunities for spreading basin recharge do not exist on the adjacent upland terraces which are composed of Pleistocene age alluvial deposits. Unlike the permeable alluvial deposits within the river channel, the upland terraces are composed of predominantly low permeability, fine-grained soils containing calcium carbonate cementation (caliche) which precludes the use of surface spreading methods. As described earlier, alternative recharge methods such as well injection are cost prohibitive.

Hydrologic constraints also preclude recharge upstream (north) of the proposed basin area due to the presence of shallow bedrock which severely limits recharge capacity. Recharge would also not be practical downstream of the project area due to the presence of several active sand and gravel mining operations which could potentially be affected by recharge water seepage into the excavations.

From an economic perspective, spreading basins can only be located at the proposed location for the project to be viable. The presence of caliche and low permeable soils on the terraces would require, in the best case, additional land for construction of spreading basins to achieve comparable recharge capacities as the proposed location. In the worst case, if caliche deposits are widespread, basins would not function regardless of area. The project design includes 100 acres of basins that is projected to accomplish up to 100,000 acre-feet of recharge per year. The present basin area is located on Bureau of Land Management lands for which CAWCD was granted a right-of-way at no cost. A conservative estimate of basin area required on adjacent terraces would be 300 acres. Even if a single parcel of sufficient size is available for purchase, land acquisition would increase project costs by approximately $1,000,000. Additional cost considerations would be the increased construction costs associated with a larger basin area, increased evaporation losses due to reduced infiltration rates and additional maintenance requirements due to algae growth and related basin clogging. Finally, relocating and increasing the size of the basin area would result in a greater disturbance area and additional impacts to native vegetation and to cultural and historical resources.

Conveyance Alternatives Analysis

Historically, Arizona's recharge statutes necessitated the use of constructed delivery pipelines or canals to transport water from the source of supply to the point of recharge. In recent years, however, statutory changes have recognized the utility and allowed the use of natural stream channels for both recharge and conveyance. As a result, projects such as the Agua Fria Recharge Project that were formerly considered uneconomic due to excessive water conveyance costs, are now economically feasible.

Following the Arizona Municipal Water Users Association feasibility study in 1986, the City of Phoenix initiated plans to develop the Agua Fria Recharge Project. By 1990, basin construction designs were completed, aquifer recharge and aquifer protection permits were acquired and a 404 permit application was submitted. However, prior to 1993, Arizona law did not recognize the use of a natural stream channel for recharge purposes. Therefore, use of the Agua Fria River channel to transport water to the spreading basins without the added ability of accruing recharge credits was impractical due to extensive water losses resulting from stream channel infiltration. As a result, a pipeline was deemed necessary to convey water from the CAP canal to the recharge basins. After completing pipeline designs and the associated cost opinion, the City decided to abandon the project due to the excessive construction costs associated with the pipeline.

In 1993, legislation was passed that allowed the use of a natural stream channel as both a recharge facility and a conveyance mechanism. This statutory change, along with additional statutory authority

granted to CAWCD specifically for construction of state demonstration recharge projects, prompted CAWCD to pursue the project.

Because the use of spreading basins is considered the best method to recharge large volumes of CAP water in this area, and considering land and construction costs, existing recharge technology, logistics and environmental and cultural impacts, the current basin location is the only practical location for a construction of infiltration basins. The in-channel recharge area is an integral component of the project design that will account for an estimated 20,000 acre-feet of recharge capacity and will allow CAP water to be conveyed to the basin area.

The following alternatives analysis considers six alternatives to transport up to 425 cubic feet per second of CAP water from the CAP aqueduct to the inlet of the recharge basins and a no action alternative (Alternative No. 1). Alternative No. 2, the recommended alternative, uses the Agua Fria River channel as a conveyance mechanism and recharge facility. Alternatives No. 3, 4 and 6 incorporate various pipeline designs to transport CAP water. Alternative No. 5 uses Caterpillar Tank Wash, a small ephemeral tributary to the Agua Fria River to transport water only. Unlike Alternative No. 2, this alternative does not have the ability to combine recharge and conveyance. Finally, Alternative No. 7 would up size the existing MWD Canal and presumes a water transportation agreement between CAWCD and MWD could be executed. Figures illustrating the alignment of each alternative are attached. Table 1 provides a comparison of the water conveyance alternatives considered in this analysis.

	Alt 1 - No Action	Alt 2 - River Channel	Alt 3 - Low-Head Pipeline	Alt 4 - High-Head Pipeline	Alt 5 - Caterpillar Tank Wash	Alt 6 -West Side Pipeline	Alt 7 - MWD Canal
Cost: Construction ($1,000)	-	1,840	10,960	9,660	3,050	9,850	5,920
Cost: 20-Yr O&M ($1,000)	-	320	-	-	200	-	6,000
Cost: Mitigation ($1,000)	-	-	-	-	60	-	-
Cost: Total ($1,000)	-	$ 2,160	$ 10,960	$ 9,660	$ 3,310	$ 9,850	$ 11,920
Jurisdictional Area Impacted (Acres)	-	17	90	80	15	5	5
Construction Time (Months)	-	6	18	18	12	18	18
Recharge Capacity (1,000 acre-ft/yr)	-	20	-	-	-	-	-

Table 1. Comparison of Water Conveyance Alternatives.

ALTERNATIVE NO. 1 — NO ACTION

The no action alternative is interpreted to mean that the Agua Fria Recharge Project would not be constructed within the floodplain of the Agua Fria River. This alternative would result in abandonment of the project due to unfavorable geologic, economic and environmental conditions

existing outside of the river channel that would render recharge infeasible. The no action alternative would result in no impacts to Waters of the United States, however, selection of the no action alternative would preclude the significant benefits that would result from implementation of the project such as mitigating groundwater overdraft in the West Salt River Valley.

ALTERNATIVE NO. 2 — RIVER CHANNEL OPEN FLOW

Water would be released from the existing CAP blowoff structure located on the Agua Fria River siphon into a blowoff dissipation structure. Water released into the river bed would infiltrate the stream bed alluvium recharging the aquifer as it travels the four mile stretch between the blowoff structure and headworks. The constructed headworks would consist of an earth and rock embankment and two gated control structures. From the headworks, water would flow by gravity into the upper recharge basin via a shotcrete lined conveyance canal. This alternative would require a crossing over the conveyance canal at Jomax Road and a culvert river crossing at the MWD maintenance road. An estimated 20,000 acre-feet per year could be recharged in the river channel using this alternative. Cost for operation and maintenance would come from control of vegetation and improvement and maintenance of the low flow channel to promote an even and non-spreading flow. There is no cost associated with mitigation for this alternative. Disturbance would be primarily in the main Agua Fria River channel where habitat functions and values are low and periodic grading would only temporarily affect the disturbance-adapted vegetative cover, which would rapidly re-establish.

ALTERNATIVE NO. 3 — LOW HEAD PIPELINE — 96 INCH RCP

From a constructed energy dissipation structure at the CAP siphon blowoff, a pipeline within the selected boundaries or adjacent to the Agua Fria River would be extended directly to the upper recharge basin. The pipeline would have 15 feet of cover where constructed in the river bed for protection against scouring during flood runoff. Total length of this pipeline would be about 22,000 feet. There is no cost associated with mitigation for this alternative. Disturbance would be in the main Agua Fria River channel where habitat functions and values is low and grading would only temporarily affect the disturbance-adapted vegetative cover, which would rapidly re-establish. There is no opportunity for recharge in the conveyance reach using this alternative.

ALTERNATIVE NO. 4 — HIGH HEAD PIPELINE — 72 INCH STEEL OR PRESTRESSED

This pipeline would be physically attached to the existing CAP siphon blowoff structure with a by-pass provision. Location of the pipeline would be the same as for Alternative No. 3.

ALTERNATIVE NO. 5 — CATERPILLAR TANK WASH

Caterpillar Tank Wash is an ephemeral drainage that crosses beneath the CAP canal just west of the Agua Fria Tunnel. A turnout and metering structure would be constructed in the canal at this location. Water would be released into this wash and would flow by gravity to the Agua Fria River. This wash has a very steep grade, which would require construction of many erosion control structures (drop structures) within the wash. At the Aqua Fria River, a headworks with an embankment and gated control structures would be constructed similar to Alternative No. 1. Water would be transported to

the recharge basins via a short lined canal. The entire length of the wash would be fenced for safety purposes. Mitigation cost would be associated with construction of erosion control structures. Operation and maintenance costs would include periodic grading of
erosion control structures and vegetation control. Recharge capacity for the conveyance reach is severely limited due to the geologic setting.

ALTERNATIVE – NO. 6 — WEST SIDE PIPELINE — 72 INCH STEEL OR PRESTRESSED

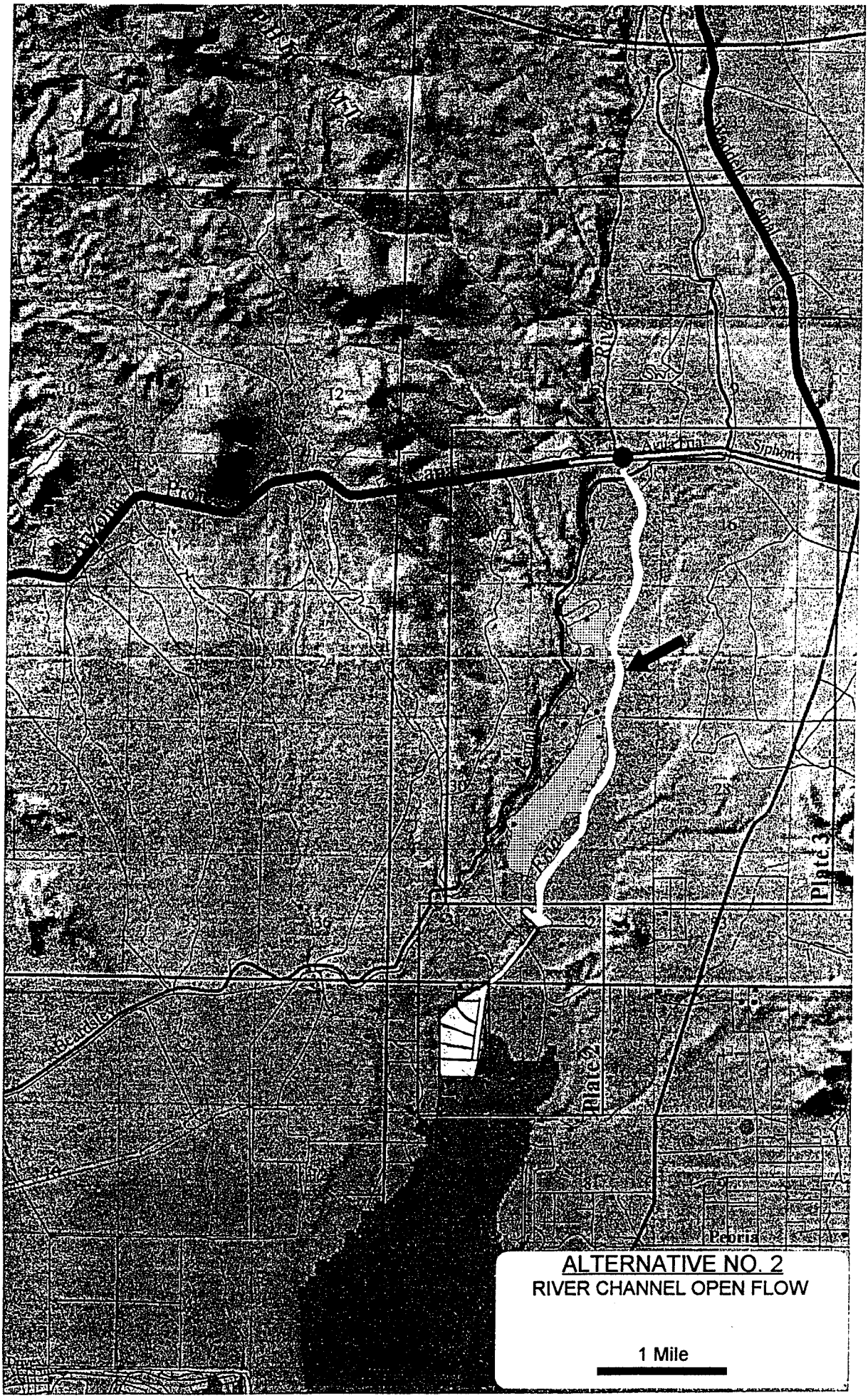
This pipeline would be located in the vicinity of the Caterpillar Tank Wash. A new turnout and metering structure would have to be constructed in the CAP Canal. The pipeline would be constructed to the upper recharge basin. The length of this pipeline would be about 21,000 feet. There is no opportunity for recharge in the conveyance reach using this alternative.

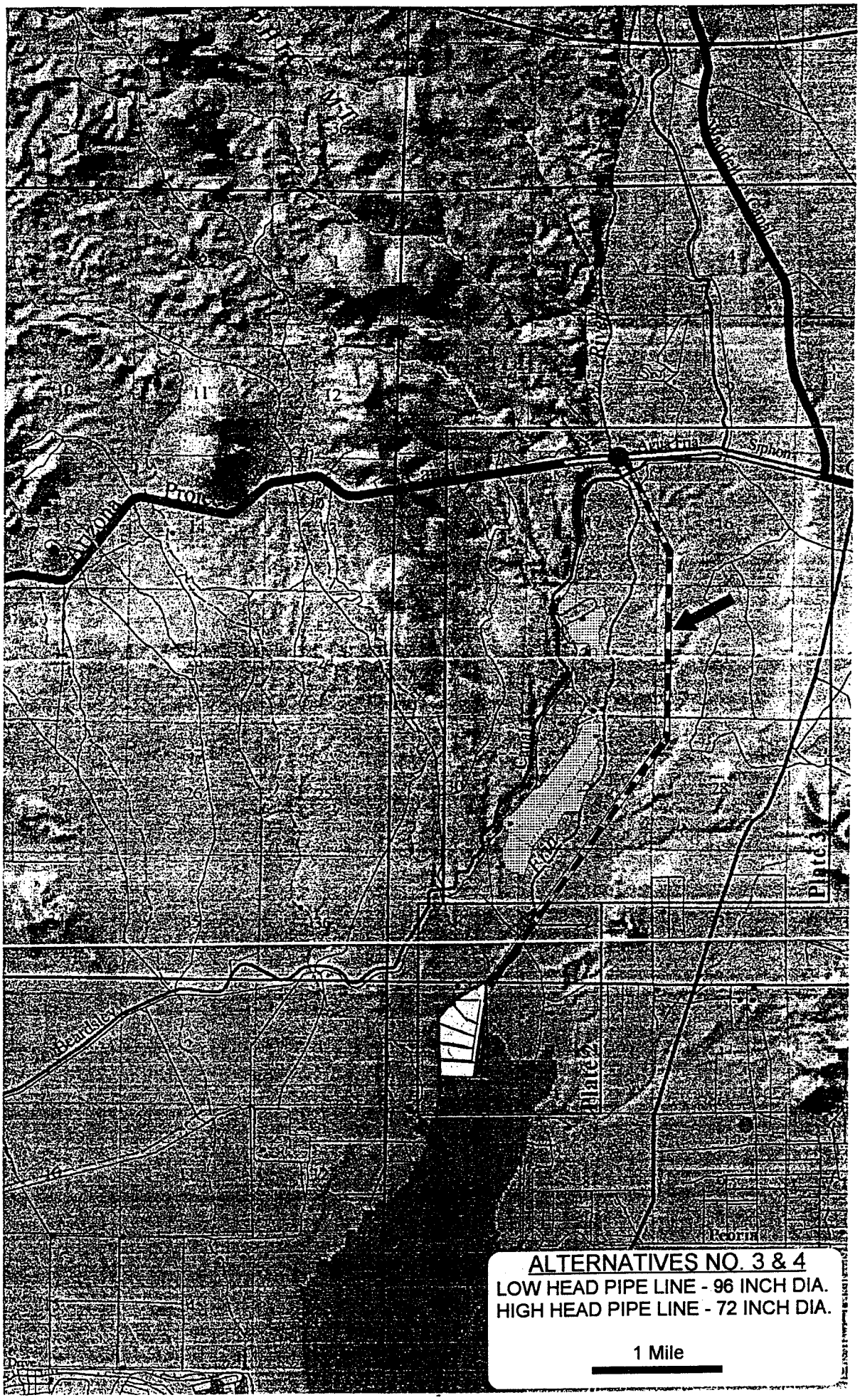
ALTERNATIVE NO. 7 — MWD CANAL — JOINT USE

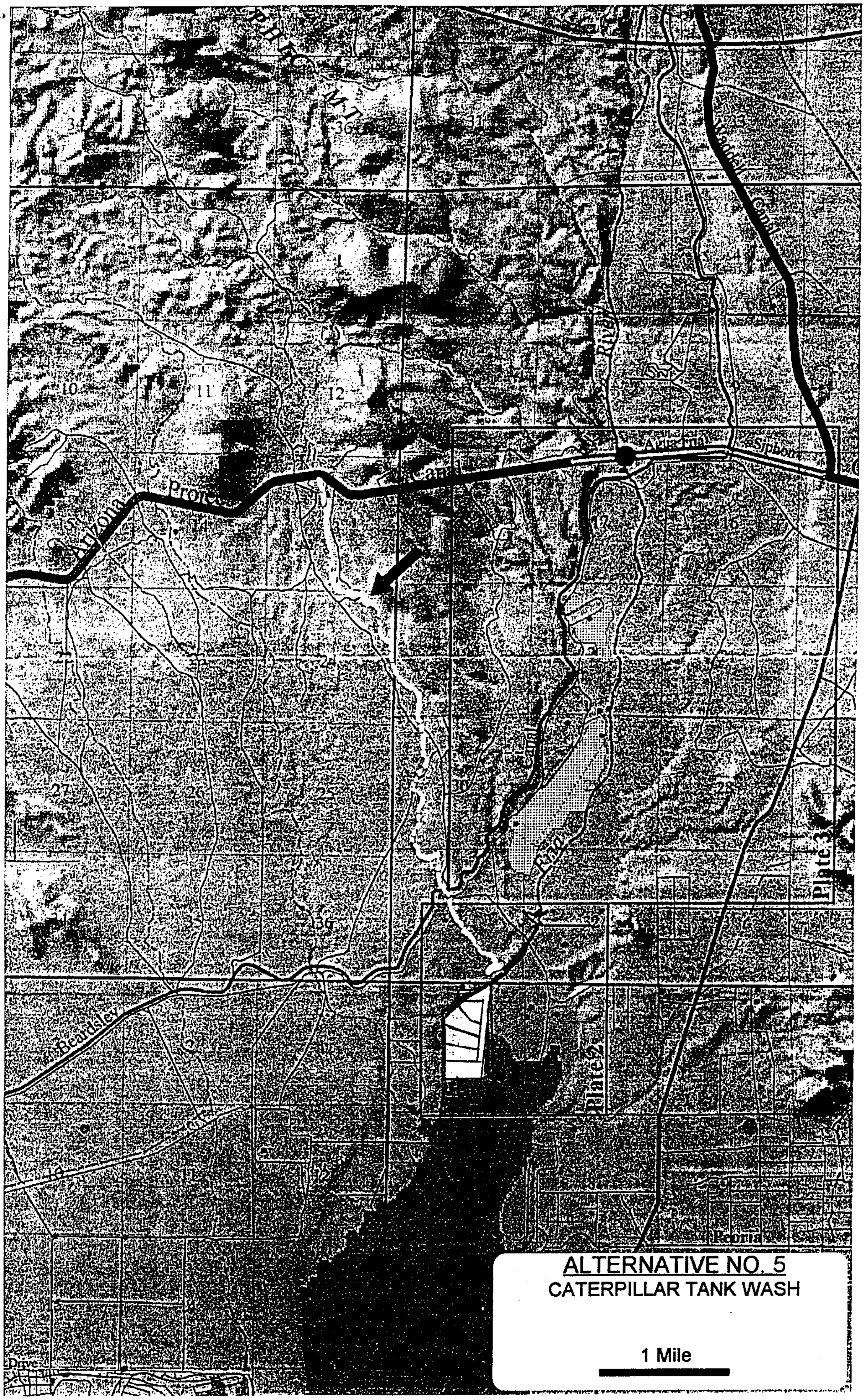
This alternative would require modification of the existing MWD turnout and discharge line, or adding another to the CAP system. It would also require the modification and up sizing of 3.5 miles of MWD canal, a new flume or siphon, a drop outlet, about 3,500 feet of pipeline to the recharge basins, and a water transportation agreement with MWD. Cost of operation and maintenance is associated with water wheeling fees and shared maintenance. There is no opportunity for recharge in the conveyance reach using this alternative.

RECOMMENDATIONS

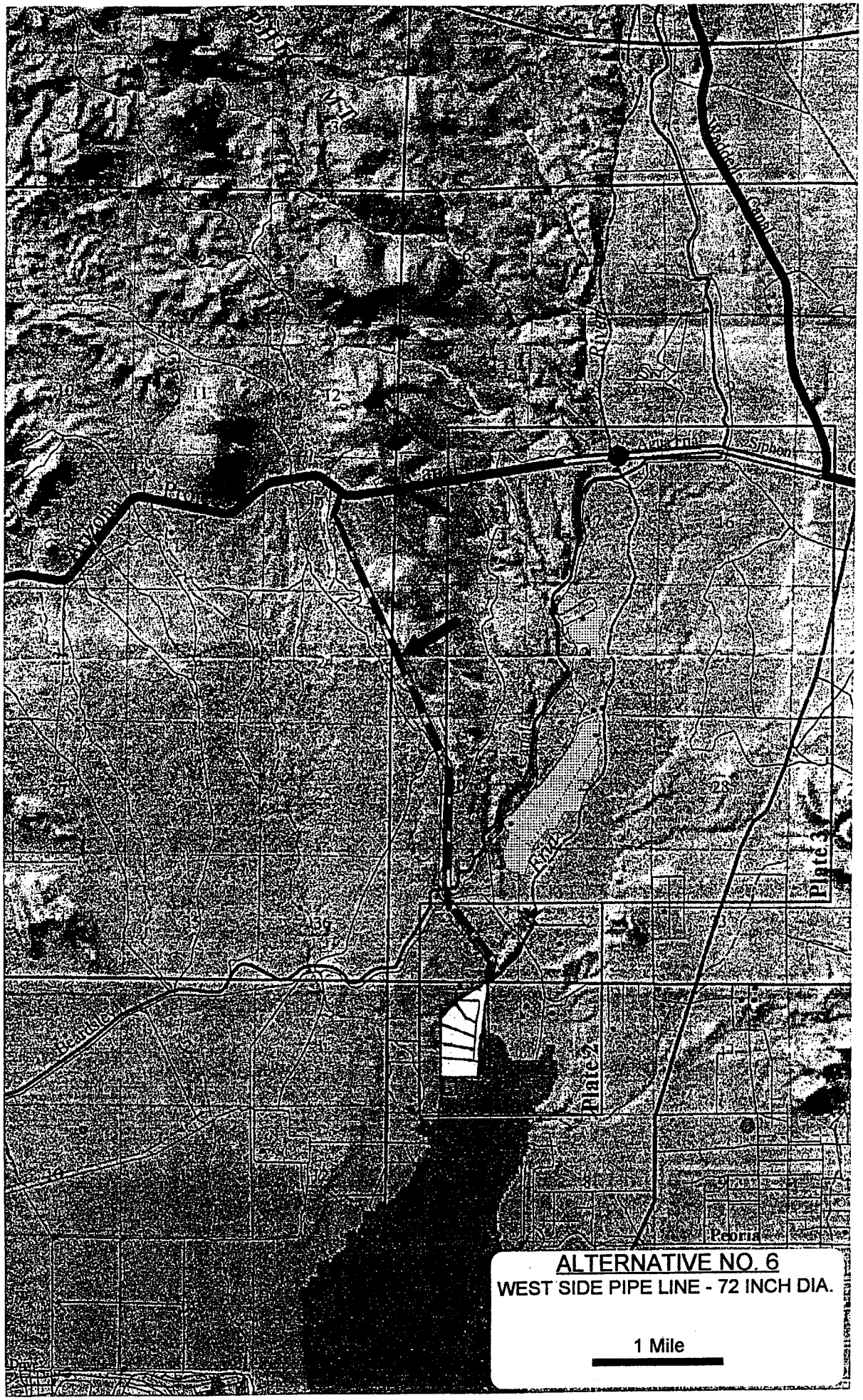
The conveyance alternatives analysis considered six alternatives to transport up to 425 cubic feet per second of CAP water from the CAP aqueduct to the inlet of the recharge basins. Alternative No. 1 is a no action alternative. Alternatives No. 2 and 5 use existing surface drainage to transport water to the basins. Alternatives No. 3, 4 and 6 incorporate various pipeline designs to transport CAP water. Alternative No. 7 increases the capacity of the existing MWD canal for joint use. All pipeline alternatives approach or exceed $10,000,000 to construct. This is three to four times the cost of other alternatives and is considered cost prohibitive. Alternative No. 7, the MWD Canal-Joint Use alternative, is also high in cost and would require a transportation agreement, which would limit operational flexibility of the project and does not allow for recharge of the stream bed. Of the remaining alternatives, Alternatives No. 2 and 5 both utilize surface drainage to transport water to the basins. Alternative No. 2 utilizes the existing CAP siphon blowoff, construction of an energy dissipation structure and a minimal amount of maintenance of the river channel to release water to the Agua Fria River bed. Alternative No. 5 requires construction of a turnout, metering structure and numerous erosion control structures to release water to the Caterpillar Tank Wash. The cost for implementing Alternative No. 5 is approximately 50 percent higher than Alternative No. 2. Finally, Alternative No. 2 allows for a significant amount of in-channel recharge of the aquifer. Therefore, **Alternative No. 2 is the preferred alternative.**

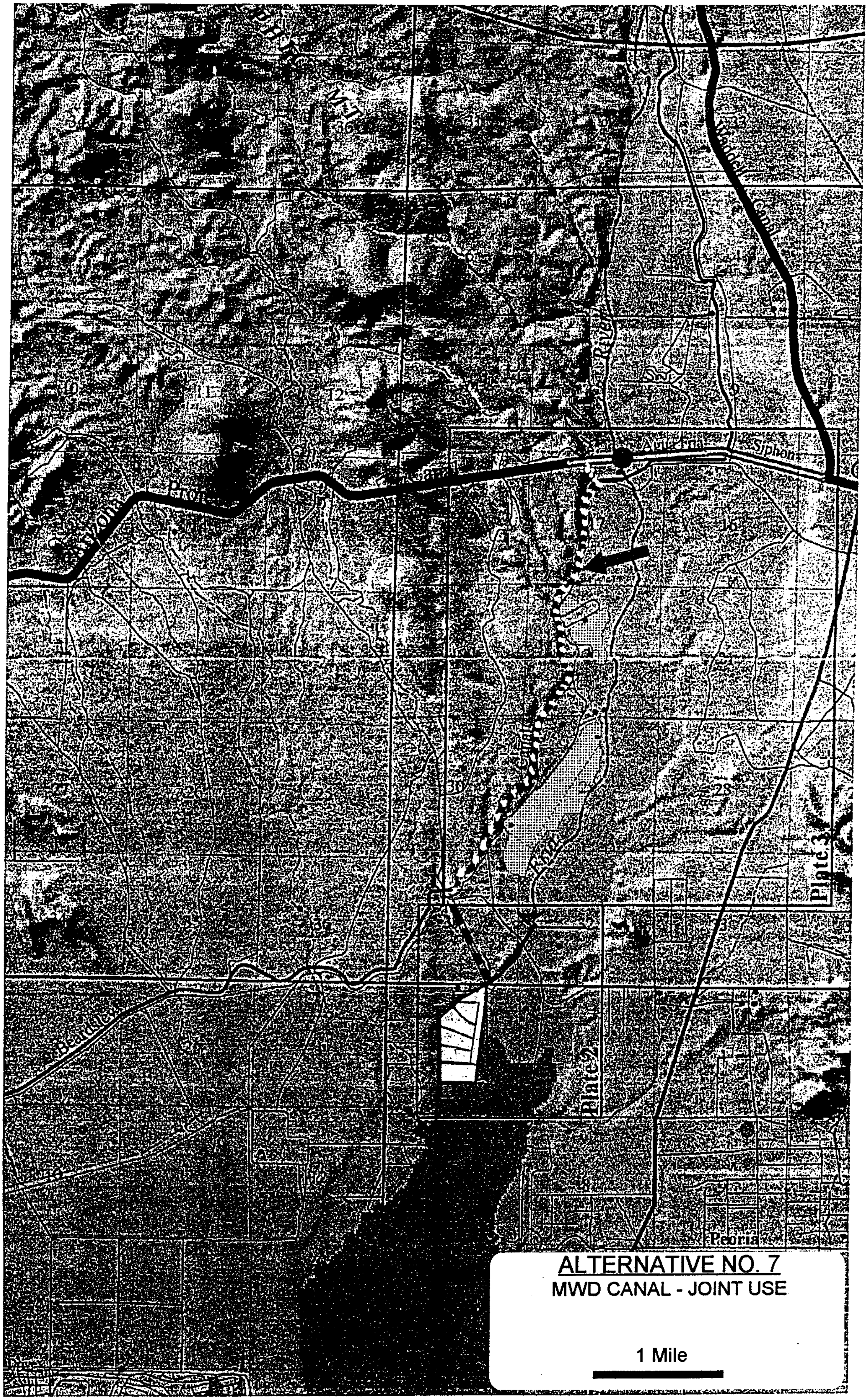

Aurora
Siphon
Canal
Peoria
Plate 3
Plate 2
Beardstown
ALTERNATIVE NO. 2
RIVER CHANNEL OPEN FLOW
1 Mile


Illinois River
Peoria
Pipe 3
Pipe 2
ALTERNATIVES NO. 3 & 4
LOW HEAD PIPE LINE - 96 INCH DIA.
HIGH HEAD PIPE LINE - 72 INCH DIA.
1 Mile

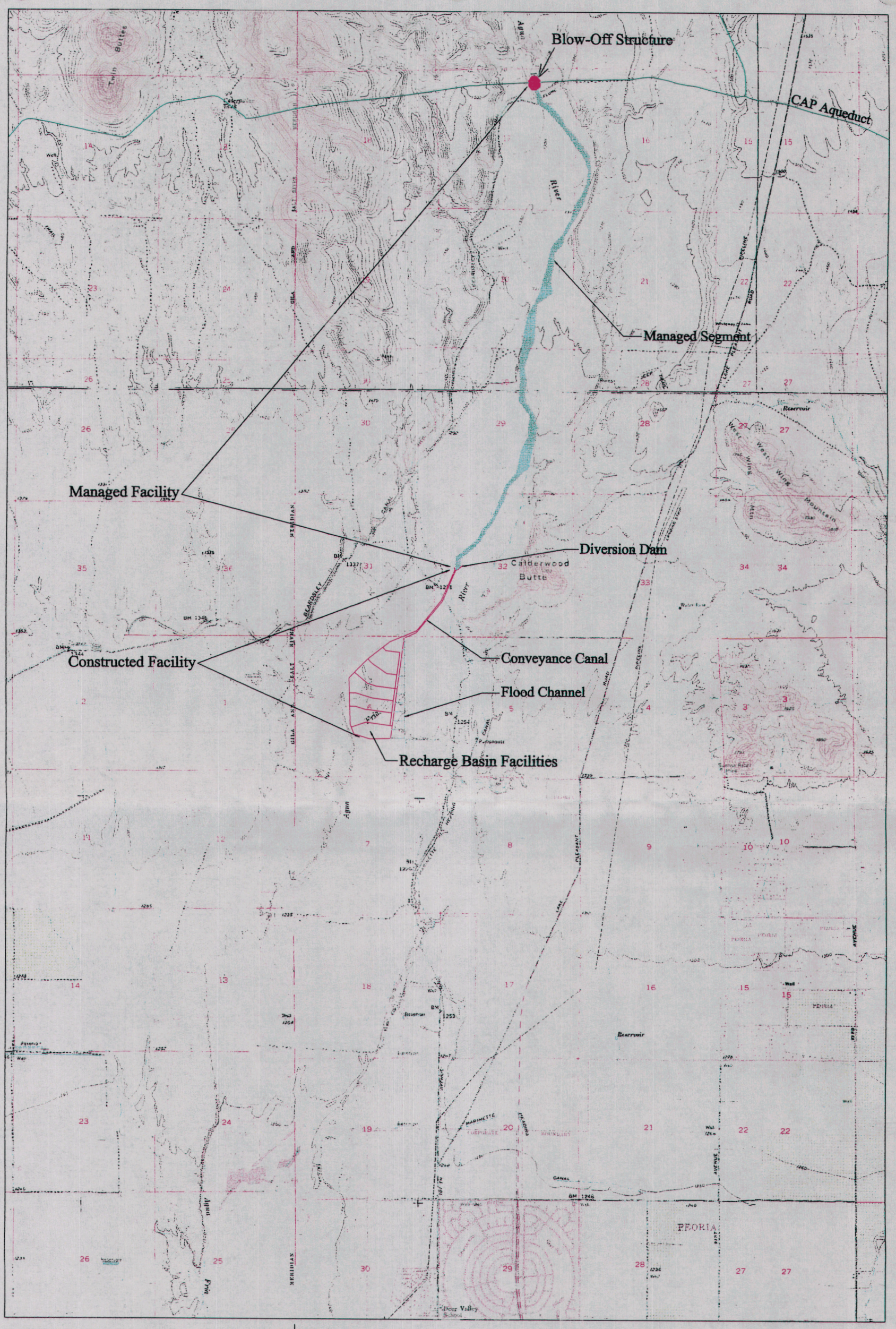


ALTERNATIVE NO. 5
CATERPILLAR TANK WASH
1 Mile
Arizona
Beardsley
Plate 2
Plate 3
Peoria


Illinois Canal
Rock River
Siphon
Peoria
Plate 3
Plate 2
ALTERNATIVE NO. 6
WEST SIDE PIPE LINE - 72 INCH DIA.
1 Mile



Siphons
Peoria
Plate 2
Plate 3
ALTERNATIVE NO. 7
MWD CANAL - JOINT USE
1 Mile



HydroSystems, Inc.
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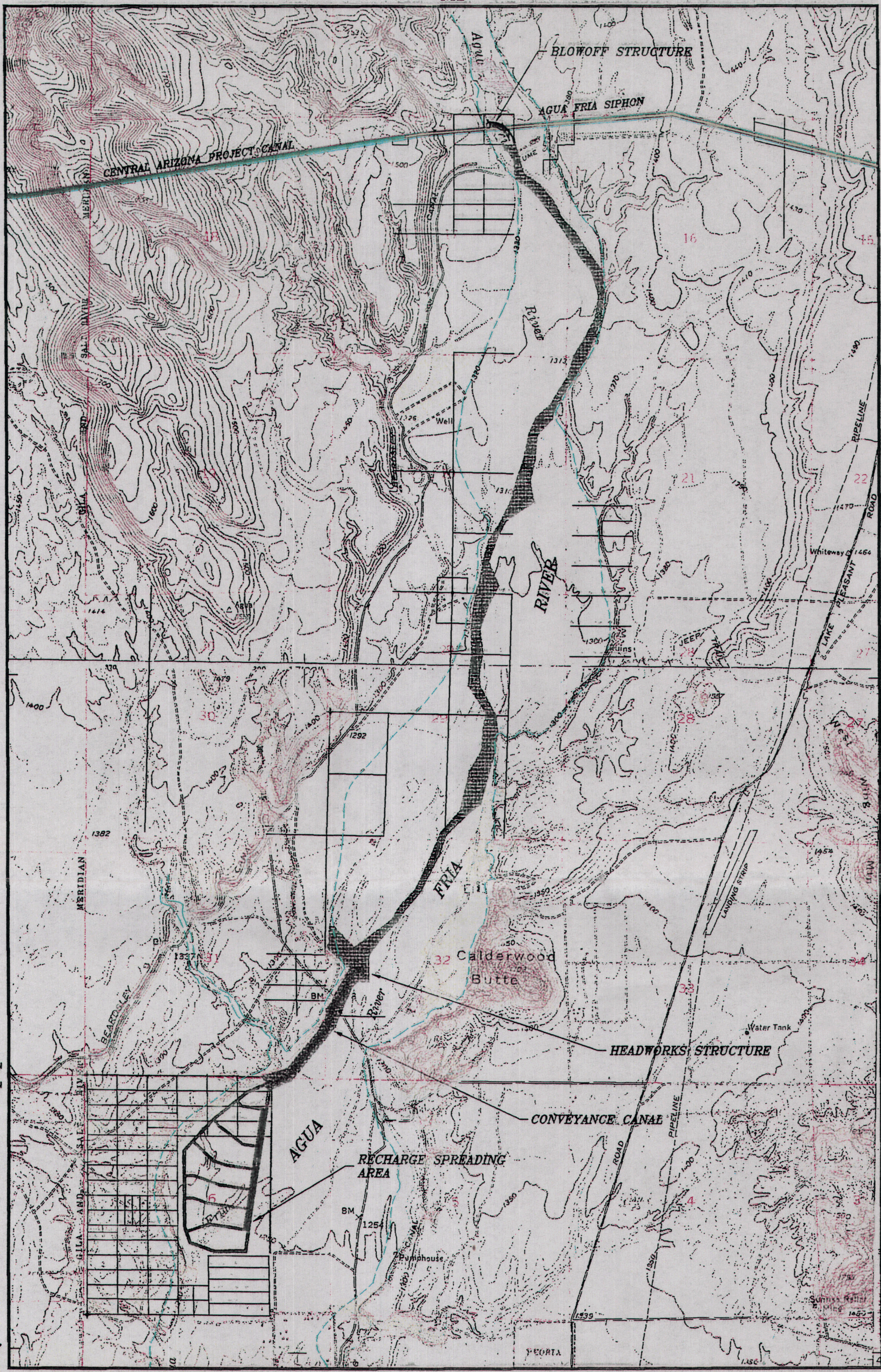
1220 S. PARK LANE, SUITE 5 TEMPE, AZ 85281
TELEPHONE: 602-517-9050 FAX: 602-517-9049

Project Location Map
Agua Fria Recharge Project

Figure 1

R1W R1E



R1E

LEGEND

MISC. PRIVATE OWNERSHIP	JARRETT
U.S. LIFE TITLE COMPANY OF ARIZONA /A.T.I.	DTHC - ARIZONA
U.S. BUREAU OF RECLAMATION	STATE OF ARIZONA
U.S. BUREAU OF LAND MANAGEMENT	DAY FAMILY TRUST
MCMWCD #1	RECHARGE PROJECT EASEMENT/ROW
	FLOODPLAIN BOUNDRY

AGUA FRIA RECHARGE PROJECT

LAND OWNERSHIP MAP

1000 0 1000
SCALE OF FEET

DIVISION ENGINEERING

CENTRAL ARIZONA PROJECT
23636 NORTH 7th STREET - PHOENIX, ARIZONA 85024

AGUA FRIA RECHARGE PROJECT
LAND OWNERSHIP MAP
GENERAL LAYOUT

APPROVALS		DATE
DESIGNED	T. HARBOUR	8-31-99
DRAWN	J. MULVIHILL	8-31-99
CHECKED	T. HARBOUR	8-31-99
DRAFTING APPROVAL	K. MITCHELL	8-31-99
SUBMITTED	T. HARBOUR	8-31-99
DEPT. APPROVAL	R. RANDOLPH	8-31-99

SIZE	FSCM NO.	DWG NO.	REV
D		AFP-C-C01923	
SCALE NTS		AutoCad Map 3.0	SHEET 1 OF 1

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