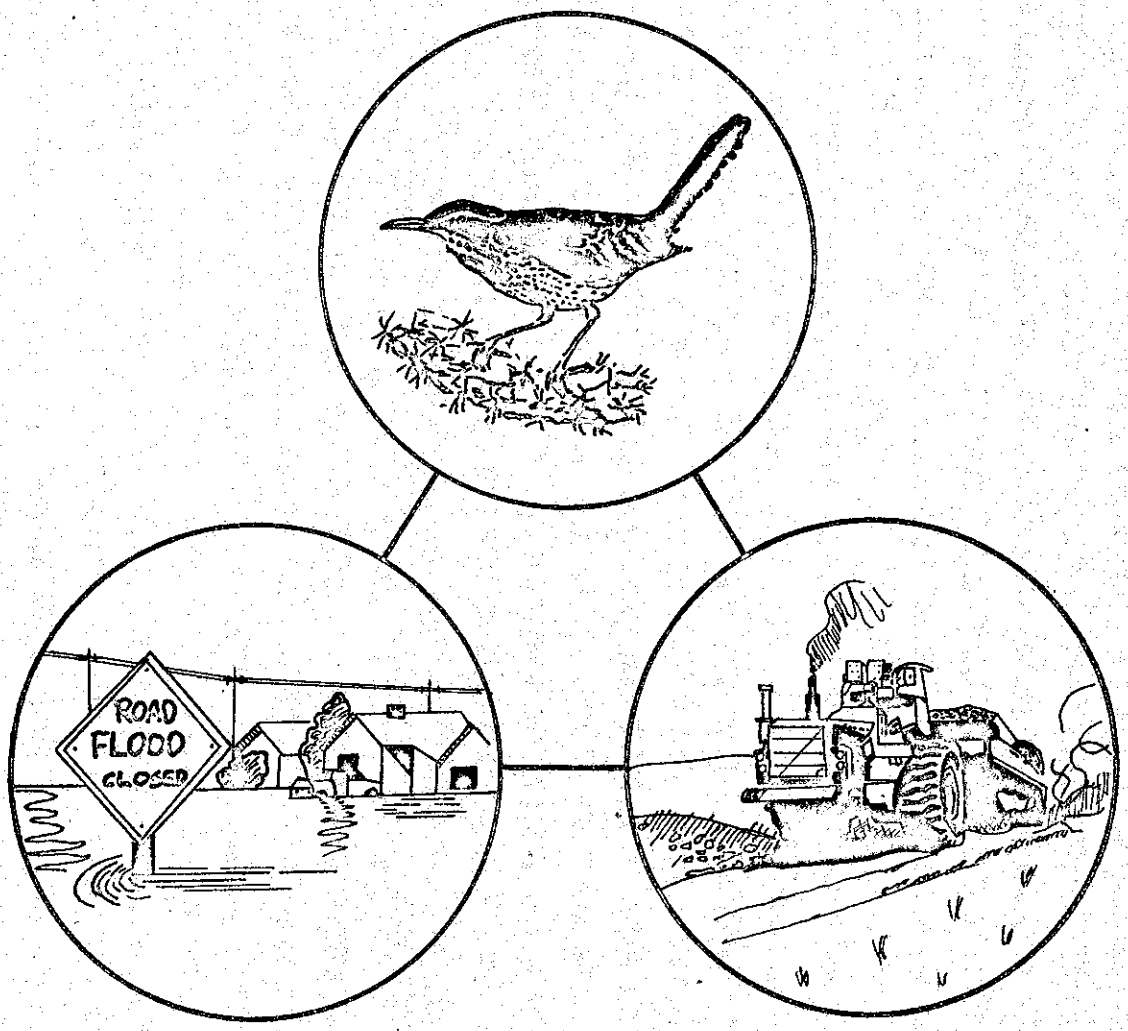
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

ENVIRONMENTAL ASSESSMENT REPORT

WICKENBURG WATERSHED PROJECT
MARICOPA & YAVAPAI COUNTIES
ARIZONA



SPONSORING LOCAL ORGANIZATIONS

WICKENBURG NATURAL RESOURCE CONSERVATION DISTRICT
TRIANGLE NATURAL RESOURCE CONSERVATION DISTRICT
YAVAPAI COUNTY BOARD OF SUPERVISORS
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
TOWN OF WICKENBURG

A343.905

Wickenburg Watershed Project
Maricopa and Yavapai Counties, Arizona

ENVIRONMENTAL ASSESSMENT REPORT

George C. Marks, State Conservationist
Soil Conservation Service

Sponsoring Local Organizations

Wickenburg Natural Resource Conservation District
Box 146, Salome, Arizona 85348

Triangle Natural Resource Conservation District
Box 66, Kirkland, Arizona 86322

Yavapai County Board of Supervisors
Court House, Prescott, Arizona 86301

Flood Control District of Maricopa County
3325 W. Durango, Phoenix, Arizona 85009

Town of Wickenburg
P. O. Box 1269, Wickenburg, Arizona 85358

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All information and data, except as otherwise noted, were collected during the watershed planning investigation

by the

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Conservation Service
6029 Federal Building
230 North First Avenue
Phoenix, Arizona 85025

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USDA SOIL CONSERVATION SERVICE

ENVIRONMENTAL ASSESSMENT REPORT

for

Wickenburg Watershed

Maricopa and Yavapai Counties, Arizona

Installation of this project constitutes an administrative action. Federal assistance will be provided under authority of Public Law 83-566, 83d Congress, 68 Stat. 666, as amended.

SPONSORING LOCAL ORGANIZATIONS

The Wickenburg Watershed project is sponsored by the Flood Control District of Maricopa County, Triangle Natural Resource Conservation District, Wickenburg Natural Resource Conservation District, Yavapai County Board of Supervisors and the Town of Wickenburg.

PROJECT OBJECTIVES and PURPOSES

The sponsors of the Wickenburg Watershed project have as their objectives in the installation of this project watershed protection and flood prevention. They propose to provide up to and including 100-year frequency flood protection for developed areas along the Sunset-Sunnycove Wash and to stabilize critical erosion areas.

PLANNED PROJECT

Land Treatment

The land treatment measures and management practices included in the Wickenburg Watershed Work Plan are to be installed on privately-owned land and land owned by the State of Arizona and leased by individual ranchers. The land treatment program will include proper grazing use (grazing at an intensity which will maintain enough cover to protect the soil and maintain the quantity and quality of desirable vegetation), deferred grazing (postponing grazing or resting grazing land for a prescribed period), pasture and hayland management (proper treatment and use of pasture or hayland), brush control (killing, suppressing or managing brush by mechanical means), range seeding (establishing adapted plants by seeding on rangeland), irrigation

water management (the use and control of irrigation water to prevent erosion and water losses), pasture and hayland planting (establishing long-term stands of adapted species of forage plants), planned grazing system (a system in which two or more grazing units are alternately rested from grazing in a planned sequence), water spreading (diverting runoff from natural channels or gullies by means of a system of dams, dikes or ditches, and spreading it over relatively flat areas), ponds (water impoundments made by constructing dams or embankments, or by excavating pits or dugouts), wells (wells constructed or improved to provide water for irrigation, livestock, wildlife or recreation), and grazing land mechanical treatment (renovating, contour furrowing, pitting, or chiseling native grazing land by mechanical means).

These practices and measures are based on present and projected land use. If future land use differs appreciably from that projected in the work plan, alternative treatment practices and measures will be incorporated into the conservation plans of individual ranchers.

About 500 acres in the Sols Wash drainage have been classified as critical areas. These areas will be treated by grazing land mechanical treatment, range seeding and installation of water spreading systems to reduce on-site erosion and downstream sedimentation. Technical assistance for critical area treatment will be provided through the Triangle Natural Resource Conservation District using P.L. 566 funds. The cost of installation of the measures for critical area treatment will be shared 80 percent from P.L. 566 funds and 20 percent from local funds.

Technical assistance required for accelerated land treatment in those areas not classified as critical will be provided through the Wickenburg and Triangle Natural Resource Conservation Districts using ongoing and P.L. 566 funds. The cost of installation of measures not classified as critical will be borne by local funds.

A low intensity soil survey has been completed on all lands in the watershed except for the 32,000 acres of land located in Maricopa County. These 32,000 acres will be surveyed through P.L. 566 funding during the project installation period.

The Bureau of Land Management and permittees will continue cooperative agreements for the land treatment program on the 4,000 acres of the watershed that the Bureau of Land Management administers. Individual management plans will continue to be developed for the allotments involved.

Structural Measures

The structural measures to be installed in the watershed consist of two floodwater retarding structures and 9,005 feet of outlet pipelines. Earthfill floodwater retarding structures will be constructed across the Sunset and Sunnycove tributaries of the Sunset-Sunnycove Wash. Structural measures on other washes in the watershed were found to be infeasible. Principal spillway outlet pipelines will be installed beginning at each retarding structure and ending at the confluence of the two tributaries, where they will discharge into a common pipeline to be constructed to the railroad bridge where it will empty into the existing channel and flow to the Hassayampa River.

Each floodwater retarding structure is designed to control the runoff from a storm occurring on the average of once every 100 years (one hundred year frequency flood). Each structure will store, in addition to floodwaters, the sediment expected to be deposited in the reservoir during the 100 years following construction. Each structure will have both a principal spillway and an emergency spillway.

The structures are single purpose flood prevention dams. The sediment pools will be drained after each storm by low-stage ports in the principal spillway risers. The reservoir basins and borrow areas will be graded and shaped to prevent areas of trapped water.

The land upon which all of the structural measures are to be constructed is in private or city ownership. At the present time, the land required for the dams, spillways, and reservoirs is predominantly idle. Occasionally it is used for grazing or other low intensity uses. The outlet pipelines will follow the existing washes or city streets.

The vegetation found at the structure sites is limited in amount and extent. Both sites are occupied by mesquite, palo verde, catclaw, creosote bush and a few annual grasses and forbs. The plants are widely scattered and the percent ground cover is low--about 5 to 15 percent. The vegetation at the Sunnycove structure site is in better condition due to less human disturbance and slightly better growing conditions. None of the mesquite or palo verde trees are large, with a maximum height of between 10 and 15 feet. The vegetation found in the channels below the structures consists mainly of larger mesquite trees (15 to 30 feet) growing alone or in small groups along the channel's edge. All areas where the vegetation is destroyed during construction will be reseeded with adapted plant species.

The wildlife found at the proposed structure sites and along the channel consists of several species of song birds, mourning dove, Gambel quail, several species of small mammals such as ground squirrel,

mice, rabbits, and various species of reptiles and amphibians.

The Sunset floodwater retarding structure will have a height of 30.5 feet and a maximum temporary storage pool of 63 acre feet. During the one percent chance flood event, the reservoir will inundate 9.6 acres, four acres of which are presently in the flood plain. In total, 16 acres will be required for the dam, spillway and reservoir. The drainage area above the structure is 0.6 square miles. The principal spillway will be a 30-inch concrete conduit located on the valley floor. It will have an average discharge rate of 5.5 cubic feet per second and an evacuation period of 7.6 days for the 100-year event. The emergency spillway will be a concrete chute 40 feet wide and located over the center of the dam. Flows greater than those expected on the average of once in 100 years will pass through the emergency spillway and will be discharged back into the wash at the same location they would occur without the structure.

The foundation and abutment materials at the Sunset site consist of four to six feet of silt, sand and gravel over a caliche material. A cutoff core will be constructed into the caliche material to provide a positive cutoff. Materials excavated from the foundation area will be silt, sandy gravel, and silty sand. Borrow material for construction of the embankment will be excavated from the reservoir area immediately upstream from the structure.

Sunnycove floodwater retarding structure will have a height of 47.0 feet and a maximum temporary storage pool of 226 acre feet. During the one percent chance flood event, the reservoir will inundate 18.5 acres, six acres of which are presently in the flood plain. In total, 25 acres will be required for the dam, spillway and reservoir. The principal spillway will be a 30-inch concrete conduit located on the valley floor. It will have an average discharge rate of 6.0 cubic feet per second and an evacuation period of 15 days for the 100-year event. The emergency spillway will be excavated on the left abutment. It will be 250 feet wide and of a very erosion-resistant cemented fanglomerate material. Flows greater than those expected on the average of once in 100 years will pass through the spillway and be discharged back into the wash about 500 feet below the dam.

The foundation and abutment material at the Sunnycove site consists of silty, gravelly sand and poorly graded sand over a fanglomerate base. A cutoff core will be constructed to provide a positive cutoff into the fanglomerate. Borrow material for construction of the embankment will be excavated from the left abutment and channel bank both above and below the structure.

The principal spillway outlet pipelines are planned to carry the expected release from the structures during passage of the 100-year event. Flows originating downstream from the structures will be carried in the existing channel system. The pipeline between the Sunset structure and the confluence will be a 12-inch diameter concrete pipe with a capacity of 5.5 cfs. Between the Sunnycove structure and the confluence, the pipeline will be a 12-inch diamter concrete pipe with a capacity of 6.0 cfs. Between the confluence and the Hassayampa River, the pipeline will be concrete, 18 inches in diameter with a capacity of 11.5 cfs.

Nonstructural Project Measures

Flood plain zoning and flood insurance were considered as alternatives on all washes studied in the watershed. On washes where structural measures were found infeasible (Sols and Casandro) these alternative nonstructural measures were recommended as a way to reduce the damages and hardships of flooding. It was also recommended to use these nonstructural measures in conjunction with the structures proposed in the project.

Land Use Changes

Most of the land below the proposed structures is in residential use. The area above the structures is rural and range land that is being urbanized at a fairly slow rate; this trend is expected to continue. The land use along Sols and Casandro Washes is similar to that along Sunset and Sunnycove. The banks of the washes, just before they empty into the Hassayampa River, are urbanized with the upper reaches in range land. This land use is expected to continue with very little urbanization occurring. The proposed project should have little effect on present or future land use, except that the land occupied by the two floodwater retarding structures and pools (41 acres) will be excluded from further development. The rate of urbanization below the two proposed structure sites is expected to increase.

Operation and Maintenance

Landowners and operators cooperating with the Wickenburg Natural Resource Conservation District and the Triangle Natural Resource Conservation District will be responsible for the maintenance of land treatment measures installed on their property, including state leases.

Land treatment measures on federal lands will be maintained by the Bureau of Land Management or the lessees.

The Flood Control District of Maricopa County will be responsible for the operation and maintenance of all structural measures after installation. The District will obtain all necessary funds for operation, maintenance, and replacement from tax or assessment levies.

A sponsor's representative and the Soil Conservation Service will make a joint annual inspection of the structures during the first three years after installation. After the three year period, annual inspections will be made by the sponsors and a report will be sent to the Soil Conservation Service. An inspection will also be made after each unusually large flood.

An operation and maintenance agreement will be entered into between the sponsors and the Soil Conservation Service prior to the signing of a land rights or project agreement.

The total average annual operation, maintenance and replacement cost of structural measures is estimated to be $1,160.

It is agreed that representatives of the federal, state and county governments shall have free access at all times to the structural works of improvement for official activities.

All phases of operation and maintenance of these facilities shall comply with applicable local, state and federal regulations.

Items considered necessary for proper operation and maintenance of the structural works of improvement shall include, but are not limited to, the following:

The structural measures for flood prevention are automatic in operation. The principal spillways of both dams are ungated and will allow the floodwaters to begin discharging into the outlet works and into the Hassayampa River as soon as the floodwater enters the reservoir area.

Proper functioning of the structural works will require periodic maintenance.

All structures are to be maintained by making repairs or replacements as needed.

Trash and obstructions are to be removed from the principal spillway inlet during and after storm events. Repairs to structures or structural features damaged by floods will be made promptly.

A drainage gradient through the reservoir basin will be maintained so no local impoundment areas are formed.

Project Costs

Project costs will be $371,260 P.L. 566 funds plus $182,300 other funds for a total cost of $553,560.

The project cost can be broken down as follows:

Land treatment costs are $71,510 of P.L. 566 funds which are to be spent for critical area treatment ($48,000) and technical assistance ($23,510) and $120,870 of other funds with the greatest share ($101,135) to be spent on rangeland management and treatment. Thus, the total of funds to be spent in the project on land treatment is $192,380.

Structural measure costs are $299,750 of P.L. 566 funds, most of which will be spent on the construction of the two floodwater retarding structures and accompanying facilities ($230,580) and $61,430 of other funds most of which will be spent on land rights ($57,560). Thus, the total funds to be spent in the project on structural measures are $361,180.

ENVIRONMENTAL SETTING

Physical Resources

Wickenburg Watershed is in west central Arizona in Maricopa and Yavapai counties between the Vulture and Date Creek mountains. That part of the watershed within Maricopa County is in the Wickenburg NRCD and that part within Yavapai County is in the Triangle NRCD. The 100,000 acre watershed is within the Gila Water Resource Subregion of the Lower Colorado Region.[1] The Lower Colorado Region includes the State of Arizona and parts of Nevada, Utah and New Mexico. The Gila River, the largest surface water system in the Region, rises in western New Mexico and flows generally west through Arizona to the Colorado River at Yuma. The largest tributary to the Gila is the Salt River, which provides water for the Region's largest population center, Phoenix, Arizona. Other principal tributaries are the San Pedro and the Santa Cruz rivers in the south, and the Agua Fria and the Hassayampa rivers in

1/ All footnotes are listed in Appendix A

the north. Drainages in the Wickenburg Watershed are tributary to the Hassayampa River.

The physical characteristics of the Region vary from the broad open expanses of the Sonoran Desert to high rugged mountains. Within the Gila Subregion there are the principal irrigated desert valleys of Arizona, and high mountain areas, offering a variety of crop-producing climates.

The Wickenburg Watershed includes all of the drainages (in Arizona called washes) that flow through the town of Wickenburg from the north and west. Wickenburg, the principal town in the watershed with a 1970 population of 2,375, is located at 33° 58' latitude and 112° 44' longitude. The unincorporated community of Congress is located in the watershed about 16 miles north of Wickenburg. The total population of the watershed is 2,550, with about 75 people living outside of the communities of Congress and Wickenburg. Many people living in these communities own or manage rangelands in the watershed.

The watershed can be divided into two physiographic units characterized by particular combinations or patterns of topography, soils, climate, water resources, land use and vegetative cover. A hills unit and a plains unit exist in this watershed as shown on the Land Status Map.

The hills unit, 12.1 percent (12,140 acres) of the watershed, is primarily hills and mountains with slopes ranging from 10 percent to 75 percent. The soils, land capability class VIIs, generally have a severe root limitation that makes them unsuited for cultivation.

The plains unit makes up 87.9 percent (87,860 acres) of the watershed and is primarily alluvial fans with some low hills.

The majority of the plains unit soils are in land capability class VIIc or VIIs because of climate or soils limitations. The area presently irrigated is land capability class IIs and IIIs. By supplying water the climatic limitations of the class VIIc is altered to the point where crops can be raised on the land with some restrictions to type of plants.

The watershed elevation ranges from 2,070 feet at Wickenburg to 4,500 feet above mean sea level in the Date Creek Mountains near the town of Congress. The average annual temperature at Wickenburg is 64.7° with a mean minimum of 46° and a mean maximum of 82.2°. The average growing season is 226 days.[2]

The average annual precipitation at Wickenburg is 11 inches. Annual rainfall is usually about equally distributed between the winter months of November, December, January and February, and the summer months of July, August and September. Daily precipitation of over three inches has been recorded.[2] The area is characterized by high intensity, short duration local thunderstorms during the summer months with low intensity, long duration general storms usually occurring during the winter months. Snowfall is generally limited to trace amounts.

The present land use in the watershed is 93,610 acres (93.6 percent) rangeland, 100 acres (0.1 percent) pastureland, and 6,290 acres (6.3 percent) of urban and built-up land. Included in the urban and built-up lands are the airport and roads.

Known mineral resources within the Wickenburg Watershed include iron, titanium, silver, copper, gold and lead.[3] At the present time, there are no mining operations being conducted in the watershed.

The only surface water impoundments in the watershed are those stockwater ponds constructed by ranchers. There are no perennial streams in the watershed.

The drainage pattern in the watershed consists primarily of Sols Wash and its tributaries, of which one is Casandro Wash. Sols Wash is a tributary to the Hassayampa River. A smaller tributary to the Hassayampa River, Sunset Wash and its tributary Sunnycove Wash, drains the eastern part of the watershed.

Sols Wash originates in the Date Creek Mountains in the northern part of the watershed. There the wash flows in an unmodified, well-defined natural channel with ephemeral flow (Type NE).* As the wash flows south, it enters the alluvial fan of the plains unit. There the channel has, at best, a poorly defined channel (Type OE). The course of the wash changes from one period of flow to the next. The wash leaves the alluvial fan about 15 miles northwest of Wickenburg and

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*SCS classification of the stream channels prior to any project activity:

Type NE - an unmodified, well-defined natural channel or stream which flows only during periods of surface runoff, otherwise dry.
Type OE - none or practically no defined channel where flows occur only during periods of surface runoff, otherwise dry.
Type ME - man-made ditch or previously modified channel where flows occur only during periods of surface runoff, otherwise dry.

again becomes well defined (Type NE). As the channel passes through Wickenburg, it has been modified by man at various locations in an attempt to prevent flooding of the developed areas (Type ME).

Casandro Wash originates near the Vulture Mine Road west of Wickenburg and south of U. S. Highway 60. It flows northeasterly in a well-defined channel (Type NE) to Highway 60, where it enters Wickenburg, then through two subdivisions located above the Atchison, Topeka and Santa Fe Railroad. In the area of the subdivisions the channel has been modified by man (Type ME) to direct the flows into a constructed channel for a short distance and then down Mohave Street. The wash passes under the railroad and enters Sols Wash about 500 feet northeast of the tracks.

Sunset and Sunnycove washes originate southwest of Wickenburg. Sunset Wash has its origin near the Vulture Mine Road two miles southwest of Wickenburg. It flows northeast through a small tract of homes in a well defined natural channel (Type NE) until it reaches the Sunset Drive area. Here the channel has been moved to one side of the valley by man to allow the construction of homes (Type ME). After the channel passes the homes, it flows down a street to its junction with Sunnycove Wash. Sunnycove Wash originates in the foothills of the Vulture Mountains three miles southwest of its junction with Sunset Wash. The channel in these upper reaches is a well defined natural channel (Type NE). Below the confluence of Sunset and Sunnycove washes the channel has been modified by man (Type ME) as homes were built on the flood plain. The modified channel from the confluence to where the wash enters the Fisher and Maguire Addition subdivisions is well defined, but has quite limited capacity.

In the subdivisions the channel is the paved Sylvan Street, until it reaches the AT&SF Railroad. Between the railroad and the Hassayampa River a channel has been constructed and diked to reduce flood damages to the agricultural land in the Hassayampa River flood plain.

The quality of surface waters in the watershed has not been classified by the Arizona Health Department. It is estimated that the runoff carried by these ephemeral washes contains from 350 to 700 ppm dissolved solids, composed primarily of calcium and magnesium carbonate-bicarbonate, with average suspended sediment concentrations around 20,000 ppm.[4]

No wetlands are located in the watershed.

Plant and Animal Resources (Flora and Fauna)

The shrubs in the hills unit portion of the watershed include palo verde, range ratany, broom snakeweed, fairy-duster, Mormon tea and

palo christi. Cacti include primarily saguaro, prickly pear and cholla. Principal grasses are desert needlegrama, bush muhly, cottontop, big galleta, perennial three-awns, and sixweeks grama. The dominant plant species are palo verde, cholla, and big galleta. The ground cover is estimated at 13 percent if annuals are included.

The plains unit shrubs are creosote bush, mesquite, shrubby buckwheat, bursages, and white brittlebush. Cacti are the prickly pear and cholla. Grasses include fluff grass, needlegrama, bush muhly, big galleta, and six-weeks grama. The dominant plant species are creosote bush and big galleta in the flatter areas, with mesquite along the washes. Generally, the range condition is fair with ground cover estimated to be 16 percent.

Casandro and Sunset-Sunnycove washes provide good permanent habitat for resident populations of small mammals and birds. Gambel quail, mourning and white-winged dove, and non-game birds, along with jack and cottontail rabbits, ground squirrels and other small mammals provide a small but easily accessible wildlife resource for hunting and observation.

Sols Wash is somewhat less accessible, but because of its larger area (approximately 20 times as large as the other three washes combined), it contains a more significant wildlife resource. The habitat is in poorer condition than Casandro and Sunset-Sunnycove washes, due to intensive grazing. The species of wildlife are the same as those found on the other washes in the watershed, except that deer are found in the upper reaches of this wash.

Several species of reptiles and amphibians, including western spadefoot toad, leopard frog, desert tortoise, zebra tailed lizard, collared lizard, red racer, coachwhip snake, and western diamondback rattlesnake, are found in the watershed.[5] There is no fisheries habitat in the watershed, and no rare or endangered species of wildlife have been identified in the watershed.[6]

Economic Resources

The landownership within the Wickenburg Watershed is as follows: private land, 25,665 acres; state land, 70,335 acres; and federal lands, 4,000 acres. Local public land, included in the private land figures, includes a city park in Wickenburg and the Wickenburg Municipal Airport.

There are five farms and fifteen ranches in the watershed. The farms are family owned and operated with an average size of 20 acres. All farmers have employment off the farm to supplement their incomes. Most of this farm land is located on the Hassayampa River flood plain. The land currently is used as pasture land to produce supplemental feed

for cattle and horses. The ranches are primarily involved in beef production. Three of the ranches are also considered dude ranches and make a major contribution to the economy of the area. The average size of the ranches is 7,100 acres, although five ranches or portions of ranches cover 74,000 acres. The average number of cattle grazing on the rangeland is 1,100 head. Only one of the working ranches and two of the dude ranches employ one and one-half man years or more of outside labor.

The private land in the upper reaches of the watershed ranges from $350 to $800 per acre in value. Land values in and near Wickenburg range from $1,000 to $1,500 per acre for land in the flood plain and $2,000 to $2,500 per acre for the upland areas. The urban property values vary considerably by location. The homes along Casandro Wash range in value from $8,000 to $16,000, while the homes along Sunset Drive range in value from $15,000 to $25,000. Homes below the confluence of Sunset and Sunnycove washes vary in value from $8,000 to $80,000, with the average value of this reach being $20,000.

Transportation facilities within the watershed are good. Access to markets is excellent because of the proximity to the Phoenix metropolitan area. Limited railroad facilities in Wickenburg include service to and from California, Phoenix and northern Arizona. Private and chartered air flights can be accommodated from the Wickenburg Municipal Airport.

Supplemental income is necessary for those persons farming within the watershed because of the small acreages. Such sources of income include employment in retail establishments and tourist facilities.

That part of the watershed within Maricopa County is within the Hohokam Resource Conservation and Development project area. That part of the watershed within Yavapai County is within the Cocopai Resource Conservation and Development project area.

Recreational Resources

The existing recreational resources in the watershed include a city park, swimming pool, and nine-hole golf course in Wickenburg, and several dude ranches which provide opportunities for horseback riding, nature trail hikes, and other recreational facilities. The watershed does not contain any water-based recreation developments. The nearest water-based recreation area is Lake Pleasant, located approximately 50 miles east of Wickenburg. The Alamo Dam recreation area is located approximately 70 miles west of Wickenburg.

Archeological and Historical Resources

Although history plays an important part in the tourist industry, there are no historical sites in the watershed that are listed in the National Register of Historic Places. Field investigations by the Arizona Game and Fish Department and the Bureau of Sport Fisheries and Wildlife did not indicate any areas of value for scientific investigations in the watershed.

Soil, Water, and Plant Management Status

Very little change in land use has occurred in the watershed during the last 10 years. The urban population has increased about 10 percent with the additional land needed to provide living space for these people being less than 50 acres. Much of this new development has taken place in the foothills of Sunset Wash, Sunnycove Wash, and Casandro Wash drainages. People are buying 2 to 5 acre lots and building $20,000 to $50,000 homes on them to be used as retirement or winter homes. Most of these homes are located on knolls or small hills and are not in a flood plain. Access roads are primarily graded dirt roads and are susceptible to erosion and flood damage.

Eighteen of the 20 farm and ranch operators within the watershed are cooperators with either the Triangle or Wickenburg Natural Resource Conservation District and are managing 88 percent of the land in the watershed. Six of the cooperators have basic conservation plans which cover approximately 38 percent of the total watershed.

The land treatment installed during the last 10 years has consisted of various measures and management practices with the total investment amounting to $194,000. These investments included $94,000 for adequate livestock water on the rangeland. All measures in the basic conservation plans for this purpose have been installed. About 75 percent of other planned measures for rangeland improvement, such as proper grazing, range seeding, deferred grazing and fencing have been installed at an estimated cost of $37,000. About 74 percent of the planned measures for pastureland have been installed at an estimated cost of $63,000.

In an attempt to properly distribute their livestock over the range, most of the ranchers have stressed stock water more than erosion control in their expenditures for land treatment in the past 10 years.

WATER AND RELATED LAND RESOURCE PROBLEMS

Land and Water Management

A major portion of the watershed is in either poor or fair range condition. Because of the severe desert climatic conditions, the area is dominated by desert plants and supports few perennial grasses and forbs. Heavy use of the range by livestock has further reduced the amount of vegetation.

Changes in vegetation types and amounts have been characterized by a reduction of perennial grasses and desirable shrubs and an increase in annual grasses and unpalatable shrubs, such as creosote bush. These vegetative changes have increased the already large amount of bare soil subject to accelerated erosion processes. Many areas of the watershed have severe sheet and gully erosion problems. The problems on about 500 acres are classified as critical in nature.

Improved management of the land and the establishment of vegetation through mechanical treatment is necessary in many areas to improve cover conditions. Economic return per acre on these desert lands is low. Most of the ranchers cannot afford to spend large sums of money to treat the land.

The irrigated pasture land along the Hassayampa River is subject to flooding by both the Hassayampa River and the washes in the watershed. Most of these lands have not been treated intensively enough to assure the maximum production possible with efficient use of water, due to the flood hazard.

Direct Floodwater and Sediment Damages

Floodwater damage occurs frequently in the watershed. During periods of intense rainfall, primarily during summer thunderstorms, sediment-laden floodwaters rush down the washes. Overland flooding occurs when the flows exceed the limited capacities of the washes or when sediment fills the channels.

Agricultural flood damage occurs at many locations on the rangeland and on most of the irrigated farm land in the watershed. It is estimated that 15 acres of the 100 acres of pasture land in the watershed are susceptible to flooding from the washes in the watershed. Ninety acres, including the 15 acres mentioned above, are subject to flooding by the Hassayampa River.[7]

Overland flooding occurs along the Sunset-Sunnycove Wash and the Casandro Wash about once every four years and along Sols Wash about once every 10 years.

Sunset-Sunnycove Wash

The 100-year flood plain along Sunset-Sunnycove Wash includes 69 acres of land. A breakdown of this land shows 37 acres are developed urban land, 10 acres are irrigated pastureland, 8 acres are channels, and 14 acres are undeveloped urban land, of which 4 acres are projected for future housing. All this land is within the city limits of Wickenburg.

Seven floods have occurred along this wash during the last 20 years. Houses have been flooded, yards inundated, and streets damaged. The last flood which put water inside houses occurred in September 1965. This flood event was estimated to be a once-in-four-years event. Storms which have occurred since 1965 have caused only minor damage. The storm of August 5, 1955, estimated to be a once-in-five years storm, put water to a depth of one foot inside two houses. Since that time, several houses have been built in the flood plain. These houses will be flooded by a recurrence of this event.

Streets become impassable during heavy rainstorms because of the flowing water. Street erosion and sediment deposition further restrict traffic after each flood passes. Annual street damage is expected. Damage also occurs to utility lines and sewer lines, creating hazardous health conditions.

The once-in-100-years flood (one percent chance event) will cause floodwater damages of approximately $195,000 along this wash. Floodwater will inundate approximately 75 of the 110 homes in the flood plain. The other 35 homes in the flood plain will not have water inside them, but water will be over the yards and around the foundations.

Casandro Wash

The 100-year flood plain along Casandro Wash includes 27 acres of land. This includes 15 acres of developed urban land, 9 acres of undeveloped urban land with 5 of these acres projected for future development, and 3 acres of channels. All this land is within the city limits of Wickenburg.

During heavy rainstorms, the residents of this area have the same problems as the residents along Sunset-Sunnycove Wash in that the streets act as channels and are impassable during the runoff period.

The streets in the Casandro reach are for the most part unpaved, so street erosion damage is a very common problem. Every flow does some damage to the streets.

Since 1949, nine flood flows have occurred along Casandro Wash. Water and sewer lines have been broken, streets have been damaged, and yards have been flooded.

The once-in-100-years flood will cause an estimated $26,000 floodwater damage on this flood plain. Floodwater will get inside 22 of the 33 homes. Depths will vary from 1 to 29 inches. The foundations and contents of these houses, as well as the yards around the homes, will be damaged.

The other 11 homes in the flood plain will have water around them, but not inside the houses. The average annual floodwater damages are estimated to be $2,600.

Sols Wash

The 100-year flood plain along Sols Wash covers 86 acres of land. This includes 39 acres of developed urban land, 28 acres of open land, 14 acres of channels, and 5 acres of irrigated pastureland, all within the city limits of Wickenburg.

The flood of August 17, 1971, estimated to be a once-in-25-years event, overtopped the north bank of the wash just downstream from the Highway 89 bridge and flooded approximately 15 acres. The land flooded included the city park, houses, and yards. Four houses and several yards were damaged by sediment deposition. The total damage caused by the flood was estimated to be $6,200.

The 100-year flood will cause an estimated $67,000 of floodwater damages on the Sols Wash flood plain. Floodwater will get inside approximately 32 of the 45 houses on the flood plain to depths varying from 3 to 13 inches. Water will surround the rest of the 45 houses and approximately 40 trailer houses located in the flood plain. The average annual floodwater damages are estimated to be $3,000.

Sediment damages during floods are high. The types of damage caused are the same as along the other washes. The magnitude of damages is considerably higher because Sols Wash delivers approximately 100 times as much sediment to the Hassayampa River as that delivered by Sunset-Sunnycove Wash or Casandro Wash.

Indirect Floodwater and Sediment Damages

Indirect floodwater and sediment damages include, among other things, the cost of emergency flood prevention measures, loss of production time, and expense of temporary relocation because of the need to clean up living quarters after flooding.

Emergency flood prevention measures include the patrol of potential flood areas, the providing of assistance to residents of the area being flooded, and the rescuing of stranded motorists and vehicles. The loss of production time results from the inconvenience caused residents in traveling to and from homes to businesses. The temporary relocation costs include the costs of residents moving into motels, apartments, or other temporary accommodations until their homes are cleaned up and repaired.

Average annual indirect damages for the three evaluation reaches in the watershed are estimated to be: Sunset-Sunnycove, $4,540; Sols Wash, $510; and Casandro Wash, $420.

Plant and Animal Resource Problems

A major problem in the watershed is the poor range condition, especially in the upper reaches of Sols Wash. Many of the perennial range grasses have been replaced by annuals. The ground cover has been reduced and erosion is occurring. The decreased carrying capacity of the range has caused economic hardships on ranchers in the area. The poor range condition also causes increased competition for the limited flood supplies between domestic animals and resident wildlife populations.

Water Quality Problems

It is estimated that presently about 60,000 tons of sediment are delivered annually to the Hassayampa River by the watershed washes. In terms of water quality, it is estimated that presently the watershed washes add on the average about 3,100 parts per million of sediment to the Hassayampa River water.

Floodwater also floods septic tanks, breaks sewer lines, and pollutes water wells, causing sanitary and health problems.

Economic-Social Problems

The Wickenburg Watershed includes within its boundaries the communities of Wickenburg and Congress. The economic base of Wickenburg is tourism with some light industry starting in the area. Local residents derive their incomes from employment in retail and service

establishments oriented toward the tourist trade. Other residents have come to Wickenburg to retire. Residents affected face great financial strain when floodwaters damage their homes and property. Some businesses are interrupted when time is needed to clean up home damage. General interruption of daily activities is caused by flooding. Constant tension also exists for residents living in a potential flood area. Some residents hesitate to make improvements on property because of the possibility of flood damage.

ENVIRONMENTAL IMPACTS

Conservation Land Treatment

The sediment delivered by Sols Wash to the Hassayampa River will be reduced by about 3,850 tons annually due to the land treatment program. It is estimated that presently about 60,000 tons of sediment is delivered annually to the Hassayampa River by the watershed washes. The completion of the land treatment program will reduce the average annual sediment delivered to 56,150 tons.

The installation of the waterspreader systems will result in clearing some native vegetation during construction; but, by providing more water to the area upstream from the spreaders and around the end of the spreaders, the overall effect should be to increase the vegetation on the land. It is estimated that for every acre of land cleared to construct the sytems, increased vegetation should occur on at least three acres. This vegetation will be available for use by both wildlife and livestock.

Structural Measures

The proposed structural program will substantially reduce floodwater and sediment damages to the Sunset-Sunnycove Wash evaluation reach.

It is estimated that under present conditions the peak flow at the Sunset-Sunnycove junction during the 100-year flood is 1,590 cfs. The construction of the proposed works of improvement will reduce that peak flow to 690 cfs.

The construction of the two floodwater retarding structures will reduce the area flooded by the 100-year flood from 69 acres to 10 acres. Presently, 110 homes are located in the 69-acre flood plain. Of these, 75 would have floodwater inside the house. Following construction of the proposed structural program, only one house will still be subject to floodwater and sediment damage by water getting inside it during the

100-year flood. This one home has a partially-completed floodproofing wall built around it, and completion of this wall would protect the home from the after-project 100-year flood. The protection provided by the floodwater retarding structures will prevent eight acres of irrigated pasture land from being flooded by Sunset-Sunnycove Wash flows. A total of 10 acres of irrigated pasture land is presently subject to flooding from these two washes. The eight acres will still be subject to flooding from the Hassayampa River.

The 10 acres that still will be flooded after construction of the proposed works of improvement, except for the house mentioned, are presently being used as streets, yards, irrigated pasture, or channels. The depth of flooding on these areas will be reduced 1.3 feet for the 100-year flood by the structures.

The longest that any water will be stored behind the structure from one runoff event will be about 12 days. The use of buried pipe for outlets will require disturbance of the area needed for installation of the pipe, mainly streets and existing channels, during the construction period. After completion of construction the outlets will not be noticeable throughout their entire length, except for the inlet and outlet structures. Interruption of local traffic will result during the installation of the pipes. About four acres of vegetation, mostly mesquite, will be removed along the present channel by the installation of the buried pipe outlets.

The construction of the two floodwater retarding structures will require the clearing of approximately 15 acres of land currently occupied by mesquite, catclaw, palo verde, creosote bush and annual grasses and forbs. The land cleared will be kept to the minimum needed to construct the works of improvement and provide the needed borrow.

The land treatment measures will reduce the erosion in the upper watershed by increasing the density of cover and by slowing down the flow of the water through the use of waterspreader systems.

The investigations made by Arizona Game and Fish Department and the Bureau of Sport Fisheries and Wildlife indicate that the construction of the structural program will not significantly affect the wildlife resources of the watershed. No rare and endangered species were identified in the areas that will be disturbed by the project.

Nonstructural Measures

It is recommended that some nonstructural measures be used in conjunction with the structural and land treatment measures proposed in the project.

Flood plain management and zoning will prevent floodwater and sediment damages from increasing. Development in the flood-prone area will be discouraged and priority will be given those uses that are most compatible with the flood conditions. Such uses would include a park, open space, and green belts. Flood plain zoning will not reduce damages to existing developments. These measures, coupled with flood insurance, would reduce the financial impact of a major flood on the residents in this study area.

Economic and Social

The construction of the project will relieve the current atmosphere of tension that exists during a rainstorm for the people living on the flood plain. They will be able to commute and keep their utilities in operation. While some damages will still occur, they will be limited in extent.

It is not expected that anyone will need to be relocated due to installation of the project.

During construction some dust can be expected from the sites, and the disturbed areas will be subject to more erosion than if they were left in their natural state. After construction the disturbed areas will be revegetated including the earth structures. Until the vegetation gets established on the earth structures, an unvegetated fill will be visible at the Sunset site from many homes in the area.

The land needed for the floodwater and sediment pools and the detention dams will require the commitment of 16 acres at the Sunset site and 25 acres at the Sunnycove site. Of course, this land will not be available for other types of development. The land in the temporary pool areas will receive additional soil moisture.

The temporary storage areas behind the Sunset-Sunnycove structures will remain undeveloped. As Wickenburg continues to urbanize, these undeveloped areas will have increasing importance in supporting small game and songbird populations within the city.

It is estimated that $70,000 will be spent in the town of Wickenburg during installation of the structures by the construction company and its employees.

Appendix B gives a summary of annual project costs, benefits, and benefit-cost ration.

FAVORABLE ENVIRONMENTAL EFFECTS

The land treatment measures will increase vegetative cover and improve overall range conditions. These measures are planned to benefit both livestock and wildlife. The land treatment measures will also reduce erosion on the upper reaches of the watershed, which in turn will help control water pollution from sediment.

The two flood control structures located on Sunnycove and Sunset washes will protect 110 residences from floodwater and sediment damage.

The temporary water storage that will occur behind the structures after each heavy rainfall will cause increased soil moisture in the submerged areas behind the structures.

The 41 acres behind the structures that are subject to flooding will remain undeveloped. Since this land is located near or within the Wickenburg city limits, it will create islands of vegetative cover and open space within the city that should be able to support limited wildlife populations.

During the construction phase of the watershed project, it is estimated that the contractor and his crew will spend $70,000 in the town of Wickenburg.

ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

Vegetation and wildlife will be removed from about 15 acres of land due to construction of the two flood retarding structures and installation of the pipeline from the structures to the Hassayampa River.

Approximately 41 acres of land, of which 10 acres are in the existing flood plain, will be removed from possible future development due to the construction of the two flood retarding structures and the flood pool behind each one.

There will be some unavoidable noise and dust pollution during the construction phase of the project. This will be more noticeable due to the proximity of housing to the construction sites.

Several houses and business establishments in the area of the Sunset structure will have a view of the structure and sediment pool.

ALTERNATIVES

Sites located higher in the watershed were checked. Because of the nature of the high intensity, convective storms which are small in areal extent, it was desirable to locate the structures as near the residential areas as possible to assure protection. It would be necessary to combine channel improvement downstream with the upstream reservoirs to provide the 100-year storm level of protection in the residential area. Because better wildlife habitat exists upstream from the proposed sites, the total environmental disruption would be greater with the upstream sites and channel improvement below.

The alternative of depressing Sylvan Road so that it would serve as a floodway was considered. While such a floodway could be constructed, it would result in major changes in the streets, utilities, yards, and driveways and would degrade the esthetics of this well-kept residential area. Serious interruptions to traffic would continue to occur.

An alternative was considered which would use flood insurance to reduce the economic impact of flooding on owners of existing developments; and flood plain management, including elevated floors, in the homes in any new developments. Although this alternative would provide protection for new developments, it would not prevent damages from occurring to present developments including streets, sewers and other utilities. Traffic would still be disrupted. Flood insurance would reduce the local financial burden caused by the floods.

Using only land treatment measures for flood protection was evaluated as an alternative. These studies showed that in this climatic area adequate amounts of vegetative and structural land treatment measures (waterspreaders, etc.) could not be installed and maintained to prevent flooding.

If no project is installed, there will be continued damage to streets, yards, and homes. Economic growth in the area below the proposed structures will continue to be inhibited and there would be further health and sediment problems. Without the project, it is estimated that $14,450 in average net benefits will be foregone.

SHORT-TERM VS. LONG-TERM USE OF RESOURCES

Most of the land below the structures is in residential use. The area above the structures is rural and range land that is being urbanized at a fairly slow rate. This trend is expected to continue.

The structures in this project will supply an immediate solution to flooding problems on two washes. The land treatment measures along with good zoning will supply a long-term solution which will be in effect before the designed life of the structures is over.

During construction the borrow areas will be located within the flood pool so that the holding capacity will be increased and disruption of the surrounding environment will be kept to a minimum. After construction is completed, it should take from two to five years for the vegetative plantings to become established and the construction sites to become stabilized.

The project is compatible with the projected long-term uses of the land in the watershed, except for the areas occupied by the structures and flood pools. These areas would probably be urbanized if the land use was not restricted.

The structures will still be effective, after their designed life of 100 years, in protecting land and resource investments. After the structures are no longer effective, there should be no nonstatutory limitations to the use of the structure sites that are not present at this time.

Within the Gila Subregion of the Lower Colorado Water Resource Region there are two completed P.L. 566 watersheds. Seven are in the construction phase and 22 applications have been accepted as of January 1972.

Of all these P.L. 566 projects, only one, the Buckeye Watershed, which is in the construction phase, will have an effect on the Hassayampa River drainage. The proposed Buckeye structures will discharge into the Hassayampa River about 40 miles below the proposed outlet for the Wickenburg structures. These two P.L. 566 watersheds should have no cumulative effect on either the Hassayampa or Gila rivers. No P.L. 566 projects in the Gila Subregion have been identified that have permanent water storage; consequently, their cumulative effect on the Gila River should be minimal.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Resources committed by this project include the land occupied by the structures and flood pools (this land is only partially committed as it is available for limited use such as grazing or wildlife), the materials and energy used in construction, and the materials permanently committed to the structures and pipeline.

The project will commit about 41 acres of land, of which 10 acres are in the existing flood plain, to the construction of the structural works and for the flood pool. This will not interfere with the use of this land for range, wildlife, or open space, but will prevent its being put to more intensive use.

Construction activities will commit such resources as money, manpower, equipment depreciation and fuel.

Nothing will prevent essentially all of the material and land resources involved in this project from being retrieved. The structures could be removed and the land restored to close to present conditions if so desired.

CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

The application for assistance for this project was submitted to and approved by the Governor of Arizona. The plan was developed in consultation with federal, state and local agencies, and groups expressing interest. Numerous coordination meetings were held and contracts made during plan development. During preparation of the draft work plan, open public meetings were held in the town of Wickenburg, one on April 17, 1972, and another on October 16, 1972. At these meetings all interested parties were invited to present their views. At least one additional public meeting will be held prior to approval of the completed plan. The work plan is being prepared in consideration of such comments and recommendations as were provided by federal, state and local agencies and interested groups and individuals.

The following federal and state agencies will be asked to review and comment on the work plan:

Department of the Army
Department of Commerce
Department of Health, Education, and Welfare
Department of the Interior
Department of Transportation
Environmental Protection Agency
Advisory Council on Historic Preservation
Federal Power Commission
Governor of Arizona (or designated state agency)
Arizona Archeological Center
Arizona Highway Department
University of Arizona
Arizona Water Commission
State Land Department

Department of Economic Planning and Development
Arizona Department of Health
Arizona State Parks
Arizona Game and Fish Department

The following organizations and groups will be asked for comments:

Arizona Conservation Council
Advisory Commission on Arizona Environment
Audubon Society
Arizona Wildlife Federation
Earthline Bulletin
Sierra Club
Maricopa County Parks Department

LIST OF APPENDIXES

Appendix A - References Cited

Appendix B - Comparison of Benefits and Cost for Structural Measures (Table 6 from Work Plan)

Appendix C - Project Map

APPENDIX A

REFERENCES CITED

1. Lower Colorado Region--comprehensive framework study, prepared by Lower Colorado Region State-Federal Interagency Group for the Pacific Southwest Interagency Committee. June 1971. Appendixes I through XVIII.

2. Arizona Climate. 1964. Prepared by the staff of the Institute of Atmospheric Physics, University of Arizona, with the cooperation of the United States Weather Bureau. The University of Arizona Press, Tucson. 503 pages.

3. Map of Known Metallic Mineral Occurrences in Arizona and Map of Known Nonferrous Base and Precious Metal Mineral Occurrences in Arizona. 1969. Arizona Bureau of Mines, University of Arizona, Tucson.

4. Rainwater, F. H. 1962. Stream Composition of the Conterminous United States. Hydrologic Investigations Atlas HA-61. Published by the U. S. Geological Survey, Washington, D. C.

5. Stebbins, R. C. 1966. A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Company, Boston. Library of Congress No. 66-16381. 279 pages.

6. Rare and Endangered Fish and Wildlife of the United States. 1970 edition. Bureau of Sport Fisheries and Wildlife, U. S. Department of the Interior.

7. Flood Plain Information--Hassayampa River, Vicinity of Wickenburg, Arizona. 1972. Prepared for Flood Control District of Maricopa County by Corps of Engineers, U. S. Army, Los Angeles District, California.

APPENDIX B

COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Wickenburg Watershed, Arizona

(Dollars)

Evaluation Unit	Average Annual Benefits: Damage Reduction 1/	Average Annual Benefits: Total	Average Annual Costs 3/	Benefit Cost Ratio
Floodwater Retarding Structures and Outlet Pipelines	35,570	35,570	19,630	1.8:1.0
Project Administration	xxx	xxx	1,490	xxx
GRAND TOTAL	35,570 2/	35,570	21,120	1.7:1.0

1/ Price Base - 1972

2/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of $180 annually on Sunset-Sunnycove Wash.

3/ From Table 4 of Draft Work Plan

July 1973

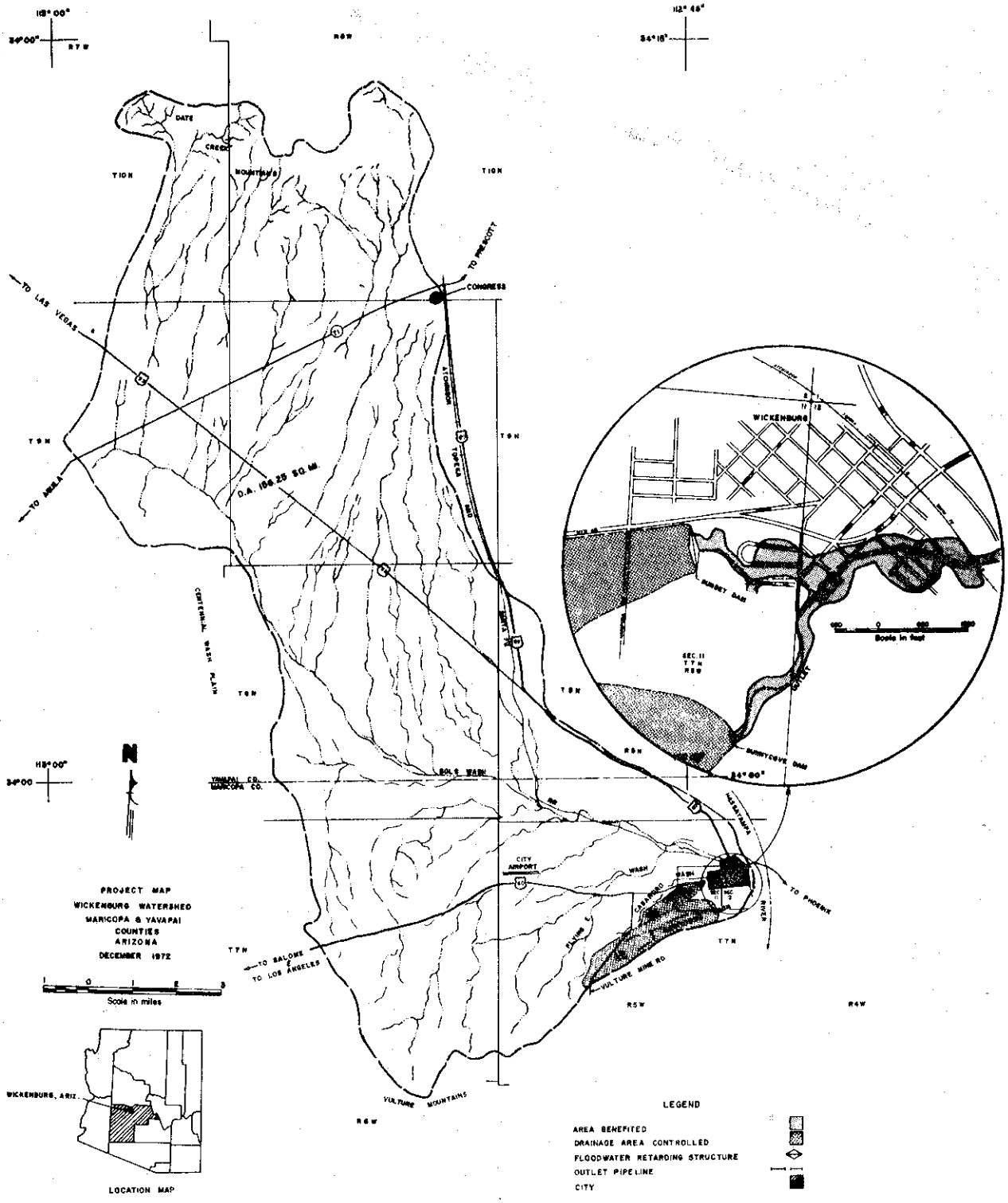
PROJECT MAP
WICKENBURG WATERSHED
MARICOPA & YAVAPAI
COUNTIES
ARIZONA
DECEMBER 1972
Scale in miles
LOCATION MAP
WICKENBURG, ARIZ.
LEGEND
AREA BENEFITED
DRAINAGE AREA CONTROLLED
FLOODWATER RETARDING STRUCTURE
OUTLET PIPELINE
CITY
TO LAS VEGAS
TO PRESCOTT
TO PHOENIX
TO SALOME
TO LOS ANGELES
CONGRESS
D.A. 198.25 SQ. MI.
WICKENBURG
SUNSET DAM
SUNNYCOVE DAM
Scale in feet
CENTENNIAL WASH PLAIN
BOLS WASH
YAVAPAI CO.
MARICOPA CO.
CITY AIRPORT
VULTURE MINE RD
VULTURE MOUNTAINS
ATCHISON
TOPEKA
SANTA FE
HASSAYAMPA
RIVER
OUTLET
T10N
T9N
T7N
R6W
R5W
R4W

Figure 5