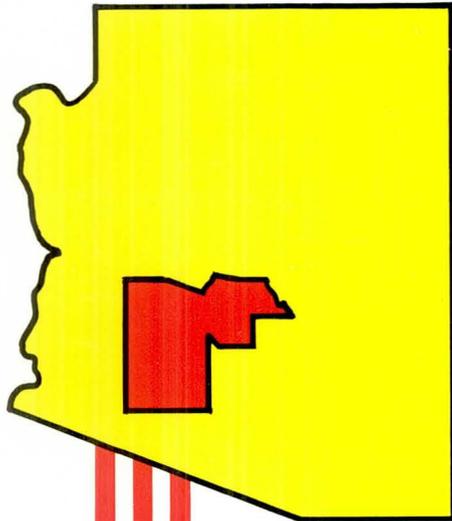


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MARICOPA COUNTY,  
ARIZONA

# COMPREHENSIVE WATER AND SEWER PLAN

PREPARED FOR

MARICOPA COUNTY HEALTH DEPARTMENT

UNDER A GRANT FROM

FARMERS HOME ADMINISTRATION

ELLIS, MURPHY AND HOLGATE  
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JOHN C. ANDERSON

January 15, 1971

Dr. S. F. Farnsworth, Director  
Maricopa County Health Department  
1825 East Roosevelt Street  
Phoenix, Arizona 85006

Attention: Joseph J. Weinstein, MCE

Re: Maricopa County Comprehensive  
Water and Sewer Plan

Dear Dr. Farnsworth:

In accordance with the terms of our contract, we are pleased to submit herewith the *MARICOPA COUNTY COMPREHENSIVE WATER AND SEWER PLAN*.

It is our desire that the report serve as a basic document for an active program to improve the social and economic status of rural Maricopa County in the years ahead.

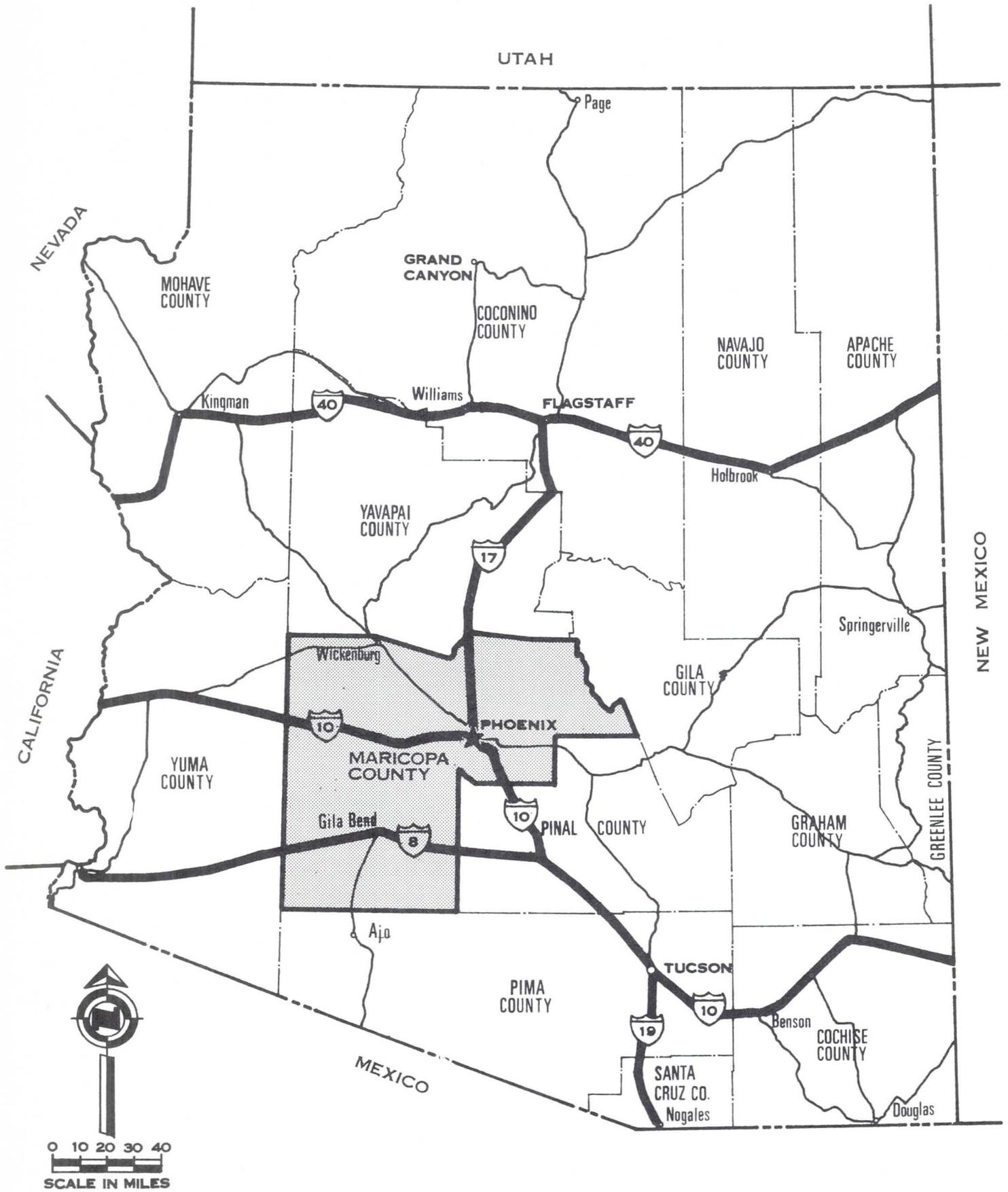
We wish to express our sincere appreciation to the Maricopa County Health Department, Farmers Home Administration, and a multitude of agencies and people who have given assistance or furnished information vital to the preparation of the Comprehensive Plan.

Sincerely,

ELLIS, MURPHY & HOLGATE  
JAMES F. ELLIS, JR., P.E.

JFE/am





VICINITY MAP

## CONTENTS OF THE REPORT

The report has been divided into five general sections as follows:

### SECTION I - AUTHORIZATION, PURPOSE AND SCOPE

A statement identifying those agencies under whose auspices the report has been prepared; the purpose and objectives of the Comprehensive Plan; and narrative defining the "Planning Area", definition of the geographic and chronologic limits of the study and report, and identifying its limitations.

### SECTION II - SUMMARY REPORT

A brief summary of the important background information, existing conditions and recommended plans for the communities in the Planning Area.

### SECTION III - BASIC BACKGROUND INFORMATION

Basic background information for Arizona, Maricopa County, and the various communities in the Planning Area is presented as reference data essential to the preparation of Section IV.

### SECTION IV - WATER & SEWER PLAN

A statement of general conditions relating to the communities in the Planning Area is followed by a detailed description for each community relating its existing conditions, present problems, projected needs, and a proposed plan for solving the defined needs.

## SECTION V - APPENDICES

General items of reference that are applicable to several or all of the communities covered in the Comprehensive Plan.

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A list of bibliographical references are listed at the back of the report.

## INDEXES

Each Section is preceded by a detailed Index Sheet showing the contents and page number for that Section. Plate and Table Indexes follow this sheet.

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\* In compiling information for the report, many source documents were researched which reflected various spellings for the community of Wittmann. In the final stages of preparation, an attempt was made to standardize the spelling as indicated. However, the colored maps had already been printed at considerable cost and for this reason were not reprinted to make the spelling conform with the rest of the report.

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## AUTHORIZATION

This report was prepared in accordance with the terms of an agreement between the engineering firm of ELLIS, MURPHY & HOLGATE (formerly Williams & Ellis) and the Maricopa County Board of Supervisors. The report was prepared under the guidance of the Maricopa County Health Department and financed through a federal grant from the Farmers Home Administration, United States Department of Agriculture.

## PURPOSE

The purpose of this Comprehensive Plan is to furnish public and quasi-public bodies of rural communities, the Maricopa County Board of Supervisors, the Maricopa County Health Department, Farmers Home Administration, and other agencies and residents of Maricopa County with a reference document that will encourage coordinated planning for water and sewer systems on a county-wide basis. Specific goals of the Comprehensive Plan are:

1. *To create an awareness within the communities of their present and future water and waste-disposal problems.*
2. *To facilitate the preparation of water and waste-disposal plans by local public bodies and similar agencies.*
3. *Through coordinated planning promote the efficient and orderly development of rural communities.*
4. *To provide adequate information to minimize unnecessary overlapping, duplication, underdesign or overdesign of community water and sewer facilities that may be developed in the area covered by this Plan.*

## SCOPE

### Study Area Definition

Under the terms of the FHA grant, the area covered by the study is restricted to "rural areas" which will include open country, and incorporated or unincorporated towns, villages, or other places, which do not include:

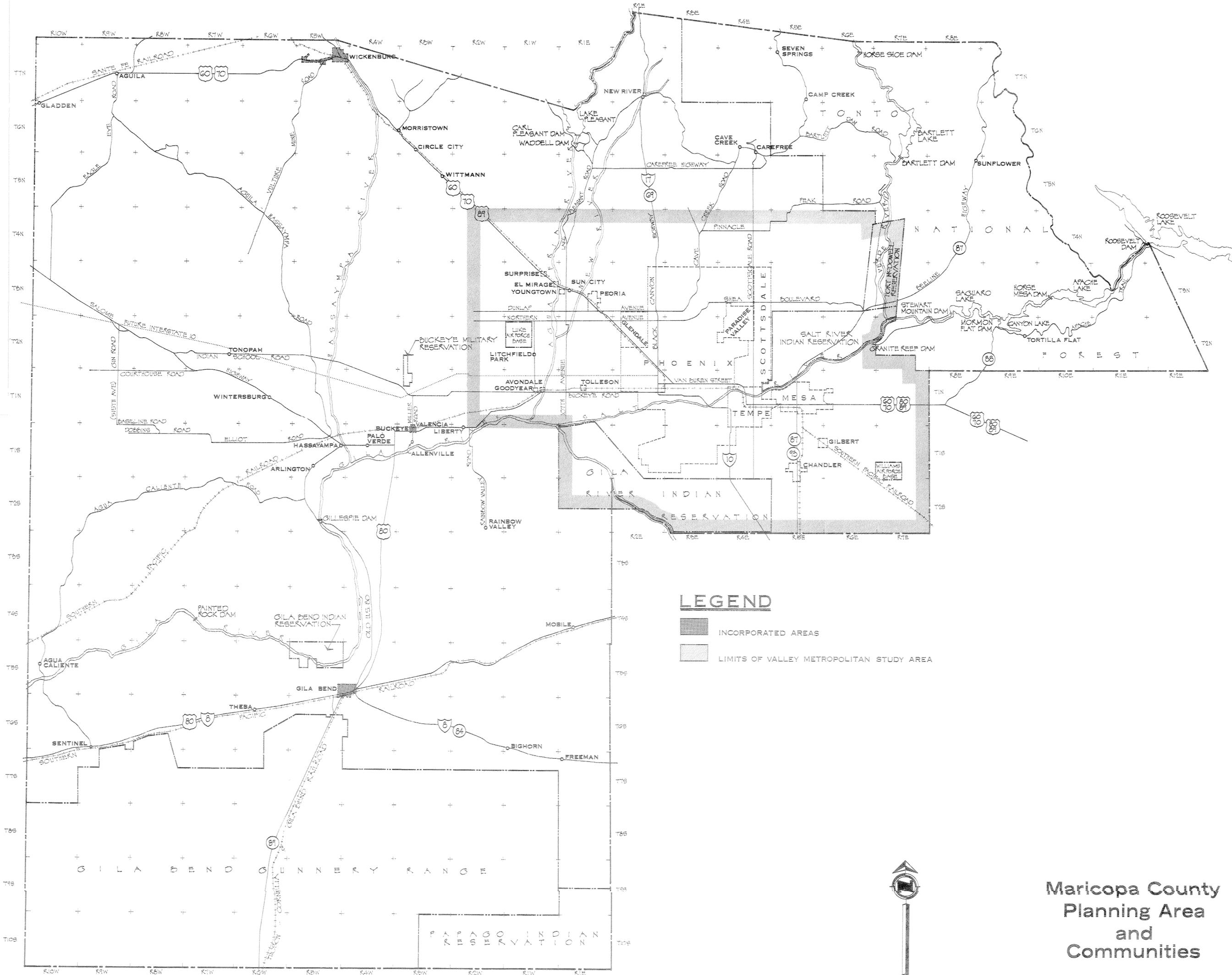
1. *Any city or town or place which has a population in excess of 5,500 permanent residences.*
2. *A densely settled area surrounding, adjacent to, or growing out of a town, village or place of more than 5,500 people.*
3. *An established community or subdivision development near to, or likely to become closely associated with, a town, village, or place of more than 5,500 people.*

The term "Planning Area" as used in this report refers to all of Maricopa County except the area referred to as the Valley Metropolitan Study Area.

The limits of the Valley Metropolitan Study Area are indicated on Plate 2 as well as several other Plates.

### Scope Definition & Limitations

The report will include the results of research and development of Basic Background Information of the Planning Area for reference in defining existing conditions and projecting future needs as a basis for proposed community plans. Each community in the Planning Area will be reviewed for existing conditions and capacities, and then studied, analyzed and



**LEGEND**

- INCORPORATED AREAS
- LIMITS OF VALLEY METROPOLITAN STUDY AREA



GRAPHIC SCALE IN MILES  
0 2 4 6 8 10 12

**Maricopa County  
Planning Area  
and  
Communities**

ELLIS, MURPHY AND HOLTGATE  
Consulting Civil Engineers  
Phoenix, Arizona

reviewed to determine "immediate" needs and future needs. For this report we have selected two design years to cover these two chronological needs. The term "immediate need" may be an exaggerated definition in some instances; however, even if the need was "immediate" the time span from community awareness, through tentative plans, application for and approval of funds, final plans and completed construction is difficult to predict with any accuracy. Therefore, we have selected the year 1975 for recommended plans to resolve existing or immediate needs. To stay within the realm of realistic projections of land use and population we have selected the year 1990 as the basis for projecting future needs. With these projections, a recommended plan will be prepared for each community that has a reasonable need and a feasible solution.

The limits shown for the Valley Metropolitan Study Area represent the area around Phoenix which was the subject of two reports prepared in 1968 by John Carollo Engineers entitled "*WATERWORKS REPORT FOR THE VALLEY METROPOLITAN AREA*" and "*WASTEWATER REPORT FOR THE METROPOLITAN VALLEY AREA*". While this area is outside the scope of this report, we have taken the liberty to mention some local areas inside the Metropolitan Area that have experienced unexpected growth and development patterns since the 1968 study reports were prepared. The growth and development of the Phoenix Metropolitan Area necessarily is interrelated to the rest of Maricopa County. This report has attempted to relate the planned development of the Phoenix Metropolitan Area as expressed in these two

reports to the rest of Maricopa County, thus accomplishing the most efficient planning possible for the rural communities.

The Planning Area, in many instances, is affected by overlapping political agencies, public and private boundaries, water rights, and other legal restrictions that may have overriding influences requiring alternate solutions to those shown in this report which are based primarily on engineering analysis.

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## SUMMARY REPORT

### BASIC BACKGROUND INFORMATION

Maricopa County, located in the south-central portion of Arizona, is the state's most populous county and encompasses 5.9 million acres of predominantly arid desert land. However, the geology is quite varied with elevations ranging from 450 in the western desert areas to nearly 7,700 in the mountainous area in the northeastern part of the county.

The greatest proportion of land in Maricopa County is owned by the Federal Government (63.3%); private interests own 26.5% and state and state subdivisions account for 10.2% of the county's land area.

Almost all of the urbanized areas in Maricopa County are located inside the Valley Metropolitan District. Therefore, all of the Planning Area is considered generally rural in character. Urban development is occurring, however, in some Planning Area communities and continued expansion of these areas during the study period is anticipated.

In Maricopa County, agriculture is second only to manufacturing as a source of income. Most of the areas used for agriculture are located in the central portion of the county, generally surrounding Phoenix. Although there has recently been a reduction in agricultural land in the county as a whole, some new land has been developed for agricultural use in the western part of the county, resulting in a slight net increase

in agricultural land. Within the limits of available irrigation water, agricultural activity will probably continue to shift westward in the county.

Five Indian Reservations are partially or totally contained within Maricopa County. Except for some leasing potential, reservation land in the Planning Area is considered as not available for development. Reservation land use in the Planning Area is not expected to change significantly during the study period.

In Maricopa County 58.2% (5,366 square miles) of the total land area consists of unreserved areas that are not used because they are unsuitable for urban or agricultural development; most of these areas are in the Planning Area. In the next 10 years this area is expected to be only slightly reduced by urban and agricultural expansion.

The major public open spaces in the Planning Area--land owned by government bodies and reserved for public or military purposes--include the Maricopa County Regional Park System, the Gila Bend Bombing and Gunnery Ranges, the Buckeye Military Reservation, and several small community airports. The county park system probably will not be appreciably expanded in land area committed to the system but development of the existing system will be emphasized instead.

Although the future size and function of military installations depend on the emphasis of national military policy, it is assumed that the installations in the Planning Area will maintain their current status. Development and expansion of the small airports in the Planning Area

is expected to occur during the study period.

Tonto National Forest, with a total area of 4,531 square miles of beautiful scenery and cool climate, provides a major recreational area in Maricopa County. Forest Service plans call for private development of facilities to accommodate the increasing numbers of tourists. These improvements will be made by the Forest Service and are not included in the Comprehensive Plan.

The population of the State of Arizona in 1970, as indicated by the preliminary 1970 census estimates, is 1,752,707. Maricopa County is the most dense and most populous of Arizona's 14 counties. The county's population of 962,918 is concentrated in the Valley Metropolitan Study Area, with only 20,000 of its residents living in the Planning Area.

The population of the county as a whole is expected to grow rapidly during the study period, at a projected rate of 66% to 1980 and 117% to 1990. In the Planning Area, growth is projected to be uneven, with dormant or declining growth expected in strictly agriculturally oriented communities, and gradual to rapid growth anticipated for communities that are experiencing or expect to experience urban or suburban influences.

Development of educational facilities is anticipated to parallel population growth except in those communities where the population consists largely of retired persons, in which case school population will decline more rapidly than the community population.

The economy of Maricopa County has experienced dramatic growth since World War II. Manufacturing, agriculture, commercial development and tourism are now the principal areas of economic activity in the county. In the Planning Area, where agriculture is the major source of income, agricultural land use will possibly increase for the next few years, but finally will begin to decrease as land suitable for agricultural development in western Maricopa County is expended and urban development increasingly extends into the Planning Area. In recent years retail sales in Maricopa County have accelerated more rapidly than has the population; increased prosperity and increased tourist spending account for this condition. This trend is expected to continue, with metropolitan Phoenix contributing the major proportion of the county's income.

Two railroads serve the county, providing both passenger and freight service. Interstate and intrastate bus lines provide service to nearly all county communities, buses in some cases being the only form of public transportation available. The state highway system is, for the most part, adequate to handle present rubber-tire vehicle traffic; because of trends toward increasing automobile usage, the location of the major traffic arteries will continue to play an important role in future expansion. The only airport in the county that provides scheduled freight and passenger service is Phoenix Sky Harbor International. Improvements to the smaller municipal airports located in the Planning Area will play a vital role in the

growth and development of these communities.

Of the natural resources that have contributed to the growth and prosperity of Maricopa County, by far the most important is water. The economy of the county depends to a great extent on the quantity and quality of water available. The county is now supplied by surface water systems on the Salt, Verde, Agua Fria and Gila Rivers, and by pumping from groundwater basins. All water supplies in the Planning Area are pumped from groundwater basins. The annual overdraft on total county water supplies is estimated at 2.2 million to 3.0 million acre feet. The presently unfunded Central Arizona Project may deliver 2,000,000 acre feet of water 10 years after construction, but even under optimum conditions it will not fully replace depleted ground water reserves.

Increased effort and expenditures to develop other ways of augmenting the county's water supplies is essential.

## WATER AND SEWER PLAN

### General

Within the Planning Area the Tonto National Forest and the Gila Bend Gunnery Range have been excluded from further consideration in the Water and Sewer Plan due to their topography, current use, and lack of availability for future development. The remaining area covered in this report is a small but rapidly growing area north of the Valley Metropolitan Study Area, and a vast expanse of sparsely settled territory in the western portion of Maricopa County.

Virtually all of the area covered in this report has been, and remains, economically oriented to agriculture and ranching. Under this rural influence most major communities have grown slowly over the years while smaller communities are generally declining in population and economic stability. Because of mechanization, urban expansion, and crop changes, the rural communities have not shared in the overall prosperity of the county and the state. Several small rural communities will probably continue to decline and eventually disappear. Those that grow and prosper will have to supplement or replace their financial dependence on agriculture alone.

Some of the communities in the Planning Area, particularly the established or incorporated towns, will experience an urban type expansion from within by attracting commercial and industrial developments to their communities. Other communities will experience suburban growth and expansion as a result of the pressure of urban expansion in the Phoenix Metropolitan Area.

There are many certificated water companies in the Planning Area. Most of these companies are small and many are not in operation. Consolidation of some small companies into one operating agency would provide more dependable service and reduce operating costs in areas where such consolidation is feasible.

In the following narrative of the major communities in the Planning Area, the extent and condition of existing facilities are described, recommendations to correct existing or eminent deficiencies to the year 1975 are explained, and long range planning to the year 1990 is discussed.

Some smaller communities are also discussed to describe existing conditions and future potential.

#### Buckeye - Valencia - Allenville

A new interstate freeway, located north of Buckeye and near the municipal airport, will be completed and open to traffic in the near future. With convenient access to the major transportation corridor and anticipated development of industrial facilities in the airport area, Buckeye is expected to experience substantial growth in the 20-year study period. This growth may be relatively slow for the next few years until the freeway is completed. However, growth should be quite rapid after this period.

Growth is expected to move outward along main traffic arteries, but principally northward toward the airport and the freeway surrounding

the community of Valencia. It is possible, and probably preferable, that Valencia be annexed into Buckeye during this period. There appears to be less incentive for significant growth south toward Allenville.

The present water supply for Buckeye is derived from wells that produce water which is unsatisfactory for domestic use due to excessive hardness. Raw water is treated in a modern plant by electro dialysis. Treated water is stored in two elevated tanks and connected to a pressure tank for normal distribution. The existing distribution system is satisfactory. The capacity of the existing water system is more than adequate for present and immediate future demands.

The Valencia Water Company supplies water to the community of Valencia and an area within the Buckeye town limits. Allenville water is supplied by a local well in the community. In both of these communities the water furnished is so high in mineral content as to be unacceptable for human consumption. Bottled water is purchased by residents for drinking and cooking purposes.

The existing Buckeye sewer system is satisfactorily serving all of the developed areas in the town. Valencia and Allenville do not have sewer lines or treatment facilities at the present time.

Short Range Recommendations to 1975:

1. The Town of Buckeye should acquire ownership of the Valencia Water Company if possible and feasible.

2. As soon as ownership is acquired, the area served by the Valencia Water Company should be connected to the Buckeye system.
3. Consideration should be given to the advantages of annexing the community of Valencia.
4. Allenville water system should be connected to the Buckeye system.
5. The existing Buckeye sewer system is adequate for this period. A program of preventive maintenance is suggested for the sewage lagoons to control periodic objectionable odors.

Long Range Planning to 1990:

1. The Buckeye water supply and treatment plant facilities will probably require an increase in capacity of about 25%, along with extended water mains and distribution lines.
2. As soon as possible, a new sewage system should be installed to include the community of Valencia and connected to the Buckeye system.
3. A later study will be required to determine the most effective way of meeting increased sewage loads in Buckeye. At the present time it appears that increased capacity oxidation ponds at a more remote location or a package treatment plant are the more likely solutions.
4. At the present time it does not appear likely that sewage system for Allenville will be warranted within the study period.

Cave Creek - Carefree

It is expected that the communities of Cave Creek and Carefree will grow into each other and growth in this entire area is expected to be rapid. Therefore, long range planning should be initiated now toward the development of a single utility district to administer water and

sewer to both communities and the surrounding area. Immediate and interim needs will probably be resolved independently by each community; however, such plans should be reviewed and oriented for compatible inclusion in the future consolidated utility district plan.

The water supplies and the limited distribution systems in Cave Creek are privately owned at present, and consists of 5 wells connected to three separate distribution systems with storage and pressure tanks on each system. Active capacity of these water supplies is not known.

In Carefree there are currently three water supply wells furnishing water satisfactory both in quantity and quality. There are three elevated tanks connected to three pressure zones. The largest of these tanks suffers from excessive pressure loss due to the long run and inadequate size of pipe connecting the tank to the distribution system.

Cave Creek does not have an existing sewer system, and individual waste-disposal units are used extensively.

Carefree has a similar sewage condition, except that some commercial and residential areas have consolidated their waste-disposal into common septic tanks or other small commercial treatment units.

#### Short Range Recommendations to 1975:

1. Acquisition of the private water companies in Cave Creek or consolidation of the three systems into one administrative agency.

2. Remodel the Cave Creek water supply system by inter-connecting the systems, adding necessary local mains to serve adjacent developed areas, provide adequate fire hydrants, and change to a gravity system by construction of a storage tank on the high ground below Black Mountain.
3. Initiate action on the planning of a comprehensive sewer system for Cave Creek with temporary or interim sewage lagoons located near the Cave Creek drainage channel.
4. In Carefree the overloaded septic tank serving the shopping center should be replaced immediately with a temporary treatment system until a complete sewage collection and treatment system can be provided.

Long Range Planning to 1990:

1. Continued study and planning to form a Consolidated Utility District within this time period. Such studies should include investigations and possibly negotiations with the several private water companies located in the area surrounding Cave Creek and Carefree. A general plan for the proposed Consolidated Utility District is covered in Section IV of this report. This preliminary plan should be reviewed, refined, updated, and a firm plan developed as a basis for establishing the consolidated district.
2. Provide additional water storage capacity in Carefree, and connect all storage tanks into a looped system to insure full fire flow at all times.

Gila Bend

Growth in Gila Bend has been dormant in recent years and has not achieved the population increases provided several years ago. In fact, 1970 census data indicates a slight decline in population compared to the 1960 census.

In spite of this history, today's prognosticators are predicting that Gila Bend will nearly double its present population by 1990. Gila Bend is located in the path of an interstate freeway which greatly enhances its accessibility to the state's major marketing centers. With strong

community effort, the growth now being predicted might be achieved.

Their success in achieving these goals may be largely contingent upon the town's expeditious resolution of some rather serious and difficult problems with their present water system.

The existing water system is owned and operated by a certificated water company which either owns or leases all of the system and supplemental equipment. The quantity of water supply and storage is adequate at present. The distribution is considered generally unsatisfactory, with undersized mains. Service is nonexistent in some areas and very poor in others due, apparently, to pressure losses from pipe seepage, corrosion, and inadequate pipe size.

The untreated water now being furnished is poor quality with excessive amounts of fluorides and dissolved solids. Virtually all residents supplement their metered water with bottled drinking water, which in this area represents a cost of \$10 to \$15 per month.

The Town of Gila Bend is willing to assume ownership of the water system but has thus far been unsuccessful in arriving at agreement on terms of transfer of ownership.

The existing municipal sewage system is adequate for current and foreseeable future loads, except for the addition of collection mains to service new development areas. The system is functioning satisfactorily and service is provided to all developed areas. There are 25 Indian

residences adjacent to, but outside of, the town limits that are presently using unsatisfactory leaching beds for sewage disposal.

It is anticipated that solutions to the existing deficiencies will largely take care of the needs for Gila Bend to the end of the study period. Furthermore, it is felt that the corrective measures necessary now will require expenses in excess of available funds within the period to 1975. Completion of the recommendations will therefore require priorities based on available funds as well as social needs and engineering judgment.

All recommendations made herein assume that the Town of Gila Bend has acquired ownership of the water system. The recommendations shown in the order of importance as we evaluated them, are:

1. Expand and/or improve the existing distribution system to supply an adequate quantity of water to residents receiving none or very little now.
2. Install an electro dialysis unit for demineralization of the raw water. Design capacity to be determined at the time of installation.
3. Begin replacement of the distribution system piping, beginning with the oldest and smallest mains. Use 6-inch minimum size mains in areas where fire hydrants are required.
4. Add additional distribution as necessary to newly developed areas. This phase will be done concurrently with the overall replacement program as the need arises.
5. During the long term period of pipe replacement, a defloridation unit should be installed when funds are available. Design capacity to be determined at the time of installation.
6. The existing and future Indian residences on the reservation adjacent to the town limits should be connected to the Gila Bend sewer system if at all possible.

## Wickenburg

Wickenburg has demonstrated a steady growth pattern over the last decade. In spite of economic losses associated with being "by-passed" by the interstate system in the near future, it is projected that Wickenburg will maintain a pattern of steady growth and a stable economic base.

A large measure of this optimism is related to the historic civic and community activity that has created a thriving transient and temporary residence tourist trade. Planned airport expansion and industrial development at the airport are indicative of this civic involvement by the residents. School attendance at all levels is continuing to increase, which indicates an incentive for young people to stay in the town.

The existing water supply is pumped from three wells into the distribution system, on which two storage tanks are floated. The quality of water is acceptable without treatment, although the fluoride content is somewhat high. The distribution system is satisfactory and all developed areas in the town limits are being served, with the exception of the municipal airport. The two industrial facilities at the airport are using water from a local well. This well water is unacceptably high in fluoride and is used untreated for industrial purposes only.

Substantially all settled areas of the city are adequately served by sewers. There are three areas that are not now sewered: Wickenburg West subdivision, the mobile home court on the west side of town, and

the housing area east of the Hassayampa River. The sewage plant was designed for a connected population of 6,000, which is well above the 1990 projected population of 4,000. However, the plant was not producing consistently satisfactory results, apparently due to inadequate performance in the oxygen activation process, and to reduced holding pond capacity as the result of a partial failure caused by a minor flood prior to the devastating Labor Day flood of this year. Flood damage in Wickenburg was extensive and widespread. The outfall sewer line to the treatment plant was washed out, oxidation pond berms were washed out, and the entire plant inundated. The subsiding flood waters deposited a heavy layer of silt in the oxidation ponds, underground piping was filled with silt, and all machinery and electric motors were damaged and plugged with silt.

Under a "crash" program the damaged facilities were replaced, repaired, reconstructed, cleaned, and reconditioned. The plant was restored, is now in operation and the oxidation ponds were restored to their original design capacity.

#### Short Range Recommendations to 1975:

1. Construct a water main to serve the airport with water. This main will also serve present and future residences in the area between the town and the airport.
2. Initiate an investigation to determine the feasibility of the Town of Wickenburg acquiring ownership of the Country Club Acres Water Company.
3. Evaluate the performance of the treatment plant to determine if the work accomplished under the flood repair program has corrected the unsatisfactory production previously experienced.

4. Extend the sewage collection system to serve those developed areas that are not being served.

Long Range Planning to 1990:

1. Add water mains as required to new development areas. By 1990 it is expected that an additional storage tank with an approximate capacity of 700,000 gallons will be required.
2. Complete extension of sewer system to unsewered areas not completed by 1975, and install additional mains to new development areas.
3. Planning should include a new trunk interceptor sewer to the airport.

Potential New Development Areas

The sudden development of an unsuspected area has been an almost historic phenomenon in the growth of Arizona and in the Phoenix area. It is now natural to expect that this kind of sudden development will occur many times in the future. Whether it be residential, commercial, or industrial it is most likely to occur initially in the more central locations of the Valley Metropolitan Study Area and extend later into the Planning Area. The planning difficulty lies in predicting where and when such developments will take place.

The Avondale-Litchfield Park area, located on the western limits of the Valley Metropolitan Study Area, is an outstanding example of this phenomenon of rapid development in an area considered dormant a few years ago. The previous projections for this community are already so substantially changed that it is suggested that a new study be made of this

area to update the data and evaluate its projected potential in light of the intense activity of the last few years. The Queen Creek area east of Chandler is another example of unpredictable change. Within a two year period this area changed from a dormant agricultural economy to a thriving suburban area with numerous mobile home sites and residential subdivisions with more still being planned.

Another unique enterprise was started several years ago when a developer started a completely new town at a previously uninhabited site in Arizona along the Colorado River, called Lake Havasu City. This city is now a thriving and prosperous community. This same developer is now in the process of doing the same thing again at a site in the northeast part of the Valley Metropolitan Study Area for a town to be called Fountain Hills. The developer predicts a population of 78,000 by the year 2000.

These are examples of what has happened in the past and is happening now. Where similar developments will occur in the future is difficult to predict and, if history in Arizona holds true to form, perhaps impossible, for future development will be the locations where nothing happens. In the face of these odds, we still believe that certain areas, because of their resources and geographic locations, have more potential for this kind of development than other areas.

Most of the area adjacent to the Black Canyon Freeway (Interstate 17) north from the Valley Metropolitan Study Area to the community of New River is suitable for development. Convenient access to an excellent

transportation corridor and to Deer Valley Airport, along with interesting topography, make this area ideal for all forms of land development.

There are two rather serious drawbacks to development along this corridor; an inadequate water supply to support a significant water system, and a rocky surface not suitable for septic tank use.

Alternative solutions to both of these problems to support extensive development are difficult and expensive. For this reason, growth in this area will probably be slow during the next several years until the expanding urban pressure from Metropolitan Phoenix is strong enough to justify the expenditures involved in constructing adequate water and sewer facilities. Once these problems are overcome, growth in the area is anticipated to be rapid.

The Harquahala Valley area has received considerable attention over the years as an ideal location for various types of land development. The apparent drawbacks are: the considerable distance from Phoenix with only secondary road connections, and the questionable quality of available raw water. Interstate 10 (known locally as the Brenda Cutoff) is located along the northerly side of the valley. This freeway should be open to traffic in the next few years. It is an area that will then have potential for a possible complete community type of development of sufficient scale to permit economical treatment of poor quality water if necessary.

### Small Communities

There are many small communities in the Planning Area. Virtually all of them are economically dependent on adjacent agriculture. Residences are generally widely separated. Several of the small communities have some type of rural water system but due to the widely separated residences, they are unable to operate efficiently, and the facilities are invariably substandard.

None of the small communities have a sewage collection system or treatment facility. Sewage disposal is handled on an individual basis by whatever means the individual deems appropriate.

Suffering from loss of commercial revenue due to the continuing decrease in the agriculture labor force, the future of the small communities appears bleak. There is almost no incentive for young people to stay in the community, with the result that the remaining population has become predominantly retired persons and families on welfare. It is expected that these communities will continue to decline in population, with no reason to believe that improvement to their water systems will be warranted from an economic standpoint.

SECTION III

BASIC BACKGROUND INFORMATION

LOCATION AND CLIMATE . . . . .	3-1
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## LOCATION AND CLIMATE

Arizona is located in the southwestern part of the United States; bordered by Mexico on the south, California and Nevada on the west, Utah on the north, and New Mexico on the east. Maricopa County is situated in the south-central portion of Arizona and is predominantly arid, desert area typical of central and southern Arizona.

The name "Arizona" is a Papago Indian word meaning "few springs" which is appropriately descriptive of this arid state. Average annual rainfall in Maricopa County ranges from 4-8 inches in the lower desert areas to about 25 inches in the mountainous areas in the northeast. Mean annual temperatures vary from about 64° - 72° in the low desert to 45° - 50° in the mountains.

## GEOLOGICAL CHARACTER

Maricopa County has a total area of approximately 5.9 million acres. The geology is quite varied with elevations ranging from about 450 feet in the low western desert areas to nearly 7,700 at Four Peaks Mountain in the northeastern part of the county.

Maricopa County is geologically characterized by many individually block faulted mountain ranges alternating with broad plains, valleys or basins. The margins of these mountains as they exist today are usually composed of a rock or gravel pediment which merges into an alluvial valley floor. Commonly, during their formation, these rockpediments dropped off abruptly into a deep valley trough. These troughs have since been filled with alluvium eroded from the mountains. The process of erosion and filling has continued to the extent that many of the mountains are virtually buried in their own debris. Because of the rapid deposition of the alluvial material that create these flat deeply filled valleys and the close proximity of their source sediments, the in-situ soils are somewhat granular and of low density. This condition normally affords good liquid percolation rates.

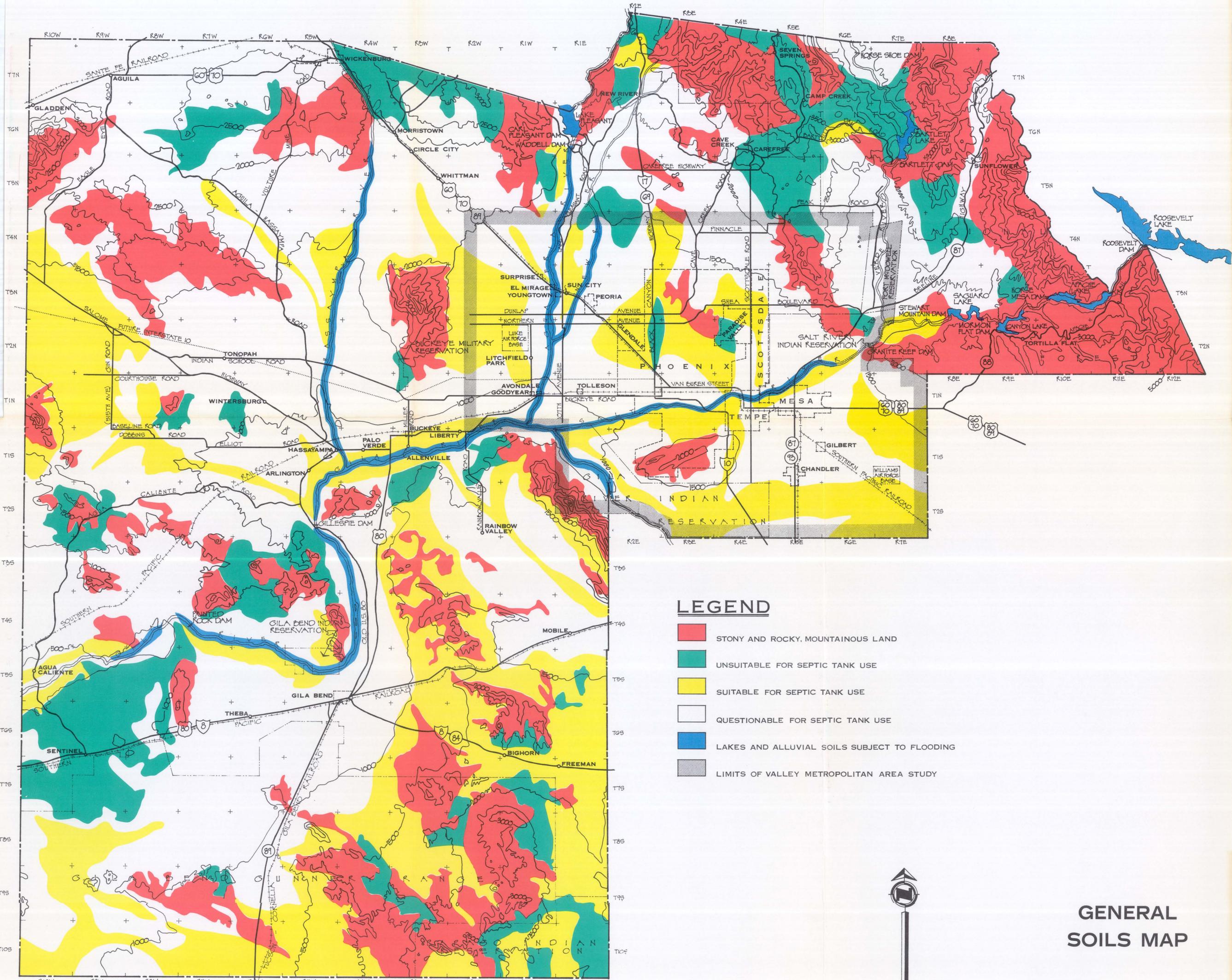
Table I shows total acreage of various soil classifications in Maricopa County. Plate 3 is a General Soils Map that has been modified to group soils classifications relative to their suitability for septic tank use as a waste-disposal possibility. Plate 3 also indicates mountainous areas, lakes and low areas subject to flooding.

Maricopa County is considered to be in a light to medium seismic risk zone with no recorded history of major earthquake activity.

TABLE I  
SOIL CLASSIFICATIONS  
Maricopa County

<u>Classification Description</u>	<u>Acreage</u>
Deep sandy loam soils	472,080
Deep loamy soil	660,400
Gravelly sandy loam and loamy sand soils	201,500
Soils with limy and clayey subsoils	377,300
Soils with saline and limy gravelly clay loam subsoils	200,800
Soils with limy clay loam subsoils	671,100
Limy gravelly soils	341,300
Limy loamy soils	882,800
Limy gravelly soils	169,300
Soils with limy and alkali clay loam subsoils	34,100
Stony soils on basalt	157,300
Shallow soils over endesite	35,800
Shallow soils over basalt	122,000
Shallow soils over granite	176,900
Shallow soils over schist	57,800
Shallow and moderately deep soils over sand or gravel	71,300
Shallow and moderately deep soils over lake deposits	4,100
Shallow and moderately deep soils over sandstone and shale	21,000
Shallow and moderately deep soils over mixed volcanics	10,900
Alluvial soils subject to flooding	64,500
Stony and rocky mountainous land	<u>1,172,400</u>
Total	5,904,680

Source: General Soil Map Maricopa County, Arizona  
Prepared by United States Department of Agriculture



**LEGEND**

- STONY AND ROCKY, MOUNTAINOUS LAND
- UNSUITABLE FOR SEPTIC TANK USE
- SUITABLE FOR SEPTIC TANK USE
- QUESTIONABLE FOR SEPTIC TANK USE
- LAKES AND ALLUVIAL SOILS SUBJECT TO FLOODING
- LIMITS OF VALLEY METROPOLITAN AREA STUDY



**GENERAL SOILS MAP**

ELLIS, MURPHY AND HOLGATE  
Consulting Civil Engineers  
Phoenix, Arizona

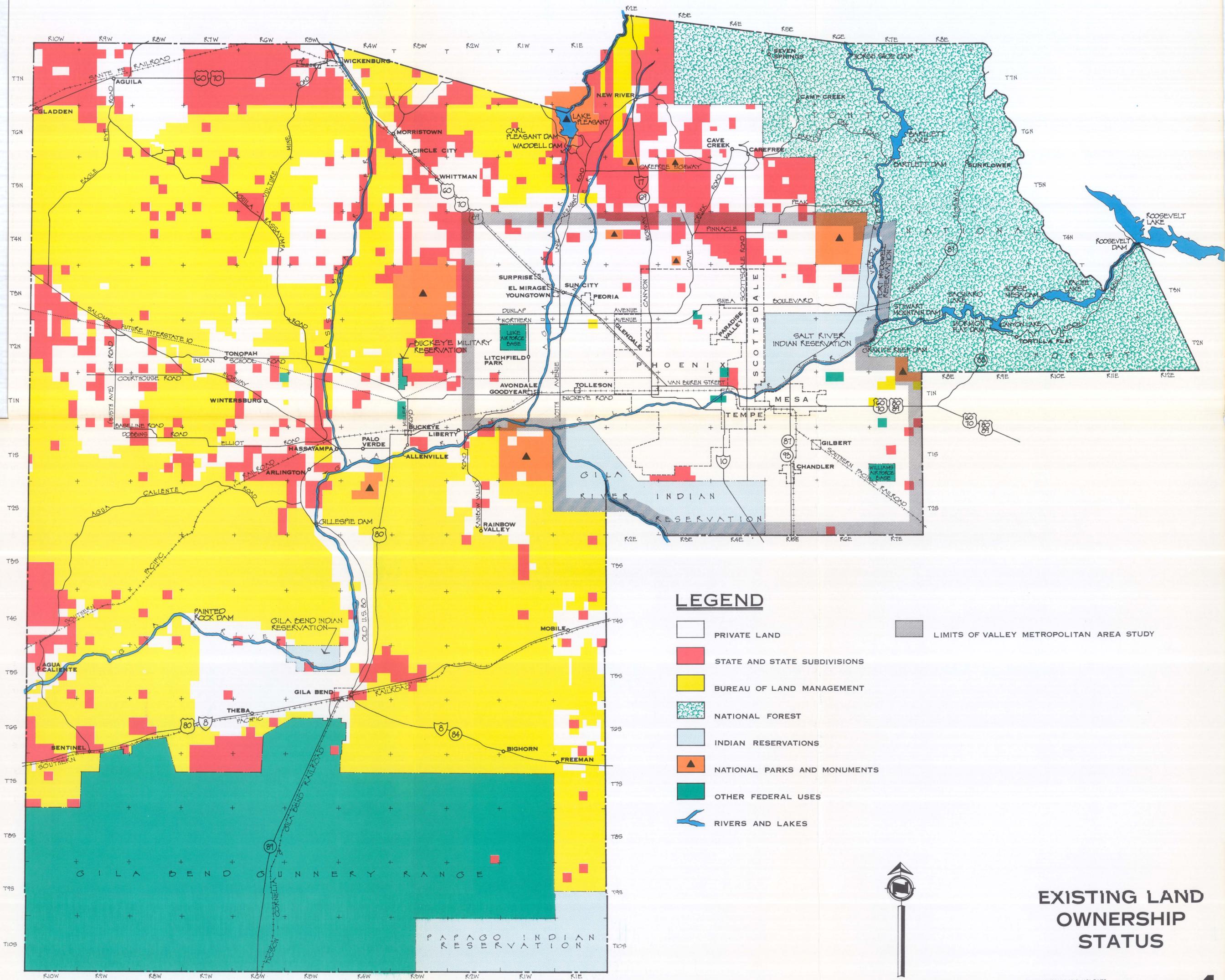
EXISTING LAND OWNERSHIP STATUS

Ownership in Maricopa County is generally divided into 3 major categories; i.e., private ownership; State, County and City ownership; and Federal ownership. Private interests own approximately 26.5 per cent of the county. State and state subdivisions account for any other 10.2% while federally owned or controlled land amounts to about 63.3% of the total land area in Maricopa County. Table II indicates the breakdown of land ownership in Maricopa County.

TABLE II  
LAND OWNERSHIP STATUS  
Maricopa County, 1967

<u>Ownership</u>	<u>Acres</u>	<u>% of County</u>
Bureau of Land Management	1,997,609	33.8
Military Reservations	782,720	13.3
National Forests	692,480	11.7
Indian Reservations	265,600	4.5
State, County, or City	599,609	10.2
Private	<u>1,566,662</u>	<u>26.5</u>
TOTAL - MARICOPA COUNTY	5,904,680	100.0

Plate 4 indicates relative size and locations of land ownership in Maricopa County from data recorded for the year 1967 and is considered reasonably accurate for conditions as they exist today.



**LEGEND**

- PRIVATE LAND
- STATE AND STATE SUBDIVISIONS
- BUREAU OF LAND MANAGEMENT
- NATIONAL FOREST
- INDIAN RESERVATIONS
- NATIONAL PARKS AND MONUMENTS
- OTHER FEDERAL USES
- RIVERS AND LAKES
- LIMITS OF VALLEY METROPOLITAN AREA STUDY



GRAPHIC SCALE IN MILE  
0 2 4 6 8 10 12

**EXISTING LAND OWNERSHIP STATUS**

ELLIS, MURPHY AND HOLGATE  
Consulting Civil Engineers  
Phoenix, Arizona

## EXISTING LAND USE

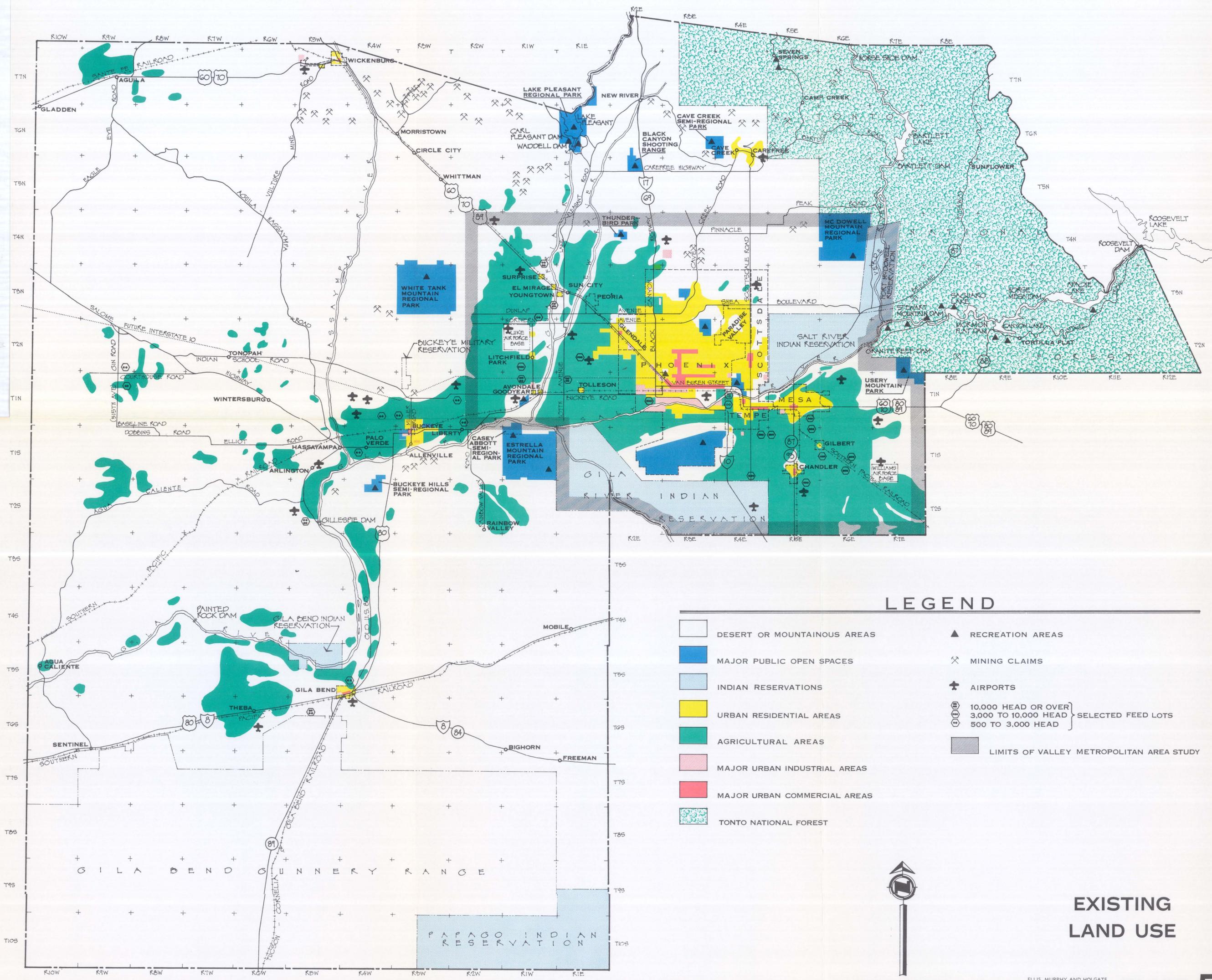
Table III is a tabular list of the areas of general land use categories for Maricopa County in 1964.

Plate 5 illustrates the location and extent of various general land use categories for Maricopa County in 1964.

TABLE III  
EXISTING LAND USE - 1964  
Maricopa County

<u>Use Category</u>	<u>Area in Square Miles</u>	<u>Per cent of County Area</u>
Urbanized Areas	160	1.7
Agriculture	860	9.3
Indian Reservations	415	4.5
Desert or Mountainous Areas (unused or undeveloped)	5,366	58.2
National Forest	1,082	11.7
County Regional Park System	93	1.0
Phoenix Park System	27	0.3
Military Installations and Airports	<u>1,223</u>	<u>13.3</u>
Totals	9,226	100.0

Source: Future General Land Use for Maricopa County, Arizona, prepared by Maricopa County Planning Department, 1967



**LEGEND**

- DESERT OR MOUNTAINOUS AREAS
- MAJOR PUBLIC OPEN SPACES
- INDIAN RESERVATIONS
- URBAN RESIDENTIAL AREAS
- AGRICULTURAL AREAS
- MAJOR URBAN INDUSTRIAL AREAS
- MAJOR URBAN COMMERCIAL AREAS
- TONTO NATIONAL FOREST
- RECREATION AREAS
- MINING CLAIMS
- AIRPORTS
- 10,000 10,000 HEAD OR OVER
- 3,000 3,000 TO 10,000 HEAD
- 500 500 TO 3,000 HEAD
- LIMITS OF VALLEY METROPOLITAN AREA STUDY



**EXISTING LAND USE**

ELLIS, MURPHY AND HOLGATE  
Consulting Civil Engineers  
Phoenix, Arizona

### Urbanized Areas

All of the urbanized areas in the county have a combined total of less than 2% of the total land area of the county, but contains more than 90% of the County's population.

Practically all of the urbanized area in the county is within the limits of Valley Metropolitan Area Study. Small urbanized areas are indicated on Plate 5 at Wickenburg, Gila Bend, and Cave Creek. Smaller urbanized areas are not shown on Plate 5 because of the scale of the map. It is graphically apparent from Plate 5 why all of the Planning Area is considered rural in character.

### Agriculture

Areas used for agriculture are largely located in the central portion of Maricopa County, generally surrounding the Phoenix Urban Area. There are smaller agricultural areas in the western portion of the county which promise to become more important as they increase in size.

Agriculture has been made possible in Maricopa County because of irrigation. The use of surface water collections and ground water sources vary throughout the county; however, virtually all agricultural areas in the Planning Area are irrigated from ground water sources.

In recent years there has been a reduction in agricultural lands in the county as a whole, due primarily to urban expansion. However, this loss of agricultural lands has occurred almost exclusively within the boundaries of the Valley Metropolitan Study Area. Simultaneous with this loss of

agriculture land in the Phoenix Urban Area some new lands have recently been developed for agriculture in the western part of Maricopa County with the result that in the Planning Area of this report there has been a slight increase in agricultural land in recent years.

TABLE IV  
FARM STATISTICS

	<u>Maricopa County</u>		<u>Arizona</u>	
	<u>1959</u>	<u>1964</u>	<u>1959</u>	<u>1964</u>
Number of Farms	2,502	2,154	7,233	6,477
Average Size (Acres)	1,033	1,169	5,558	6.262
Number of Irrigated Farms	2,231	1,887	5,391	4,725
Land in Irrigated Farms (Acres)	1,932,790	1,771,887	20,261,106	22,102,778
Average Size of Irrigated Farms (Acres)	-	939	-	4,678

Source: 1964 United States Census of Agriculture,  
U. S. Dept. of Commerce, Bureau of the Census

It is interesting to note that the statistics shown in Table IV show that the total land in irrigated farms for Arizona has increased during the period 1959 to 1964 while Maricopa County shows a decrease during the same period. This demonstrates the observation that there is an increased demand for agricultural land in the rural areas which, on a statewide basis, has

offset the loss in agricultural land to urban expansion and changing water conditions. While this same rural expansion of agricultural land is also being experienced in Maricopa County, it has not been sufficient to keep pace with the vast amount of land taken out of agricultural production in the Phoenix Urban Area.

Table IV also indicates that while the average size of farms in Maricopa County is significantly smaller than for the State, they are still large in comparison to most other geographic locations in the United States. Farmers Home Administration people believe that most farms in Maricopa County are around 160 acres in size which is not necessarily in disagreement with the average size shown in Table IV.

Our research did not disclose any agency that records statistics in such a manner as to determine how many owner-operated family farms exist in Maricopa County in accordance with the FHA definition of a "family farm" which states:

*"A family farm is defined as one: (1) that will produce agricultural commodities for sale in sufficient quantities so that it is recognized as a farm rather than a rural residence, (2) that will provide substantial income by itself and which together with any other dependable income will enable the family to pay necessary family and other operating expenses, including maintenance of essential chattel and real property and pay debts, and (3) for which the operator and his immediate family provide the management and major portion of labor including any non-farm enterprise, except during seasonal peakload periods."*

All agencies contacted agreed that the number of farms operating within the FHA definition of a "family farm" was very small and that the trend in Arizona and in Maricopa County is away from this type operation. Our

studies verified this position, and we did not locate a significant number of owner-operated family farms within a reasonable proximity of each other to merit serious consideration for the joint development of either water or waste-disposal systems. Family farms are eligible for financial assistance for the development of feasible water and waste-disposal systems either singly or in groups. This item is more fully covered in Appendix "A". This study and report did not consider the possible independent needs of each farm unit, but would have proposed a plan for the mutual solution of water and waste-disposal problems of several units working together if such a problem was discovered. However, farm units are so widely spaced, except near small urbanized communities, that a joint system for resolving purely farm problems was not feasible.

Agriculture plays an important part in the economy of Maricopa County. It is second only to manufacturing as a major source of income, and as recently as 1953, it was the County's leading source of income.

#### Indian Reservations

Five Indian Reservations are totally or partially contained within Maricopa County. These are: all of the Salt River and Fort McDowell Reservations northeast of Phoenix and the Gila Bend Reservation north of the town of Gila Bend, and portions of the Gila River Reservation south of Phoenix and the Papago Reservation southeast of Gila Bend. Reservation land in the county totals 415 square miles or 4.5 per cent of the total land area in Maricopa County. Only the Gila Bend Reservation and a portion of the Papago Reservation are in the Planning Area.

Indian Reservations were established through separate treaties between the U. S. Government and the various Indian tribes. In accordance with these treaties the Federal Government holds Reservation property in trust for the Indians and recognizes an obligation to work with the people residing on the reservations and their tribal councils to help conserve and protect their interests.

The reservation land in the Planning Area that has been developed is almost entirely committed to agricultural use.

#### Desert or Mountainous Areas

Desert or mountainous areas, in the context of this report, are those unreserved areas which have not been developed or used either because they have not been needed for urban development or because they are unsuitable for urban or agricultural use due to topographic conditions, geology and soil conditions, or inadequate water resources. This vast area accounts for 5,366 square miles or 58.2 per cent of the total land area of Maricopa County. It is apparent from studying the Existing Land Use Map (Plate 5) that the percentage of land in the Planning Area occupied by this wasteland is significantly higher than for the whole county since most of the desert and mountainous areas are outside the Valley Metropolitan Study Area.

#### Major Public Open Spaces

Major public open spaces includes land owned by governmental bodies and reserved for public or military purposes. These areas include the

Phoenix Park System, Maricopa County Regional Park System, lands reserved for military installations and use, and airports. The portion of Tonto National Forest in northeast Maricopa County is a major public open space, however, it is identified separately on Plate 5 and will be discussed separately hereinafter. The Phoenix Park System is entirely within the Valley Metropolitan Study Area and outside the scope of this report.

The Maricopa County Regional Park System includes four Regional Parks and five Semi-Regional Parks. These are: McDowell Mountain Regional Park, Estrella Mountain Regional Park, White Tank Mountain Regional Park, Lake Pleasant Regional Park, Cave Creek Semi-Regional Park, Utery Mountain Semi-Regional Park, Thunderbird Semi-Regional Park, Casey Abbott Semi-Regional Park, and Buckeye Hills Semi-Regional Park. All of the parks in the Maricopa County System have a "Plan of Development". Of the nine parks in the system, three (Thunderbird, McDowell Mountain and Utery Mountain) are not in the Planning Area.

The County Regional Park System provides public facilities for hiking, horseback riding, picknicking, nature studies and sightseeing. Casey Abbott Park, adjacent to Estrella Mountain Park, offers the additional recreation facility of an 18-hole golf course. Lake Pleasant Park, which extends into Yavapai County, is the only County owned park oriented towards water. Lake Pleasant Dam stores water of the Agua Fria River and

the lake is extensively used for boating and water skiing.

Military reservations in Maricopa County comprise 1,223 square miles. Of this total, the Gila Bend Bombing and Gunnery Ranges cover some 1,206 square miles in Maricopa County and extends into Pima and Yuma counties. The Buckeye Military Reservation is also in the Planning Area, located five miles north of Buckeye. The other military installations are within the Valley Metropolitan Study Area and would include Luke Air Force Base, ten miles west of Glendale; Williams Air Force Base, nine miles east of Chandler; and National Guard property in or adjacent to the Phoenix area.

Virtually all important civilians airports in Maricopa County are within the limits of the Valley Metropolitan Area Study including, of course, Phoenix Sky Harbor International Airport serving the Phoenix area. Sky Harbor handles general aviation, military and air-carrier operations; and is one of the busiest airports in the country in terms of operations.

Several communities in the Planning Area do have some kind of airport facility as shown on Plate 5. These airports are for general aviation use only, and will be more fully discussed later in this report. There are many minor or insignificant airport facilities dotting the county; some are abandoned and shown on air navigation charts for emergency use only, while others are privately owned and used for crop-dusting or other private operations.

### Tonto National Forest

The Tonto National Forest has a total area of 4,531 square miles which includes 1,082 square miles of rugged territory in the northeast portion of Maricopa County. This high mountainous area with its natural and man-made lakes, beautiful scenery, and cool summer climate is a haven for tourists, sportsmen, and weekend vacations for residents in the hot desert valley of central Maricopa County.

The man-made lakes created by dams along the Salt and Verde Rivers were primarily developed to furnish water for homes, industry and irrigation in Maricopa County. Saguaro, Canyon, and Apache Lakes are located in a chain on the Salt River below Roosevelt Dam, and Bartlett Lake on the Verde River. Recreational facilities have been provided at most of these lakes in cooperation with the Maricopa County Board of Supervisors.

## FUTURE LAND USE

This segment of the report discusses general future land use patterns relative to urbanization, agricultural land use development, etc. To provide a detailed future land use plan for Maricopa County would be an unreliable reference in resolving localized community problems and growth potential. With over 60% of the county's total land area either owned or controlled by the Federal Government, the future land use in Maricopa County as a whole is closely affiliated with national policy decisions being made in Washington, D.C. United States foreign policy and military posture, the emerging national awareness of environmental needs and conservation, and increasing attention directed to Indian affairs and conditions, all have a substantial influence on the future growth and development of Arizona in general and Maricopa County in particular. The impact of these monumental decisions, which are beyond the jurisdiction of any local agency, are impossible to predict for extended periods of time.

Furthermore, long range projections of urban growth and land use have historically proven to be unreliable in the Phoenix area. For instance, in the 1950's the expansion of the urban area northward was so pronounced that some predictions contended that the ultimate population center would be east of Glendale in the vicinity of 19th Avenue and Bethany Home Road. The growth of the Phoenix area has been an uneven process repeatedly exhibiting convincing, but short-lived "trends".

In spite of the erratic growth pattern in the Phoenix urban area there are generalized trends within the county that are reasonably predictable. Table V is a tabulated projection of general land use to the year 1980.

TABLE V  
FUTURE LAND USE - 1980  
Maricopa County

<u>Use Category</u>	<u>Area in Square Miles</u>	<u>Per Cent of County Area</u>
Urbanized Area	451	4.9
Agriculture	707	7.7
Indian Reservations	415	4.5
Desert or Mountainous Areas (unused or undeveloped)	5,228	56.6
National Forest	1,082	11.7
County Regional Park System	93	1.0
Phoenix Park System	27	0.3
Military Installations and Airports	<u>1,223</u>	<u>13.3</u>
Totals	9,226	100.0

Source: Future General Land Use for Maricopa County, Arizona, prepared by Maricopa County Planning Department, 1967.

#### Urbanized Areas

A comparison of Tables III & V indicates an increase in urbanized areas in Maricopa County from 160 square miles in 1964 to 451 square miles in 1980. Most of the growth is projected for the Phoenix Urban Area, which

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Source: Future General Land Use for Maricopa County, Arizona, prepared by Maricopa County Planning Department, 1967.

Urbanized Areas

A comparison of Tables III & V indicates an increase in urbanized areas in Maricopa County from 160 square miles in 1964 to 451 square miles in 1980. Most of the growth is projected for the Phoenix Urban Area, which

is estimated to increase from 151 square miles in 1964 to 398 square miles in 1980. This represents an increase of 164%.

The urbanized area outside of the Phoenix Urban Area shows an increase from 9 square miles in 1964 to 53 square miles in 1980, which is an increase of 489%.

It was expected that the urban communities in the Planning Area, such as Buckeye, Gila Bend, and Wickenburg would continue their expansion essentially in an outward direction along major thoroughfares with subsequent development of areas between thoroughfares. At the present time these predictions appear to be reasonably accurate with exception of Gila Bend which has not shown any significant expansion since 1964. As will be pointed out hereinafter, Gila Bend has actually decreased slightly in population in recent years.

In addition to these more established areas, the Cave Creek-Carefree area, the rural community of New River, and the Harquahala Valley area were expected to become significant urban areas by 1980. To date, the Cave Creek-Carefree area is showing active urban development while New River and Harquahala Valley have not yet demonstrated any strong activity toward urban expansion.

There are two areas, inside the Valley Metropolitan Study Area, that were not expected to develop significantly with the time-frame projections of previous studies and based on background information available at that

time. Both of these areas have experienced development in recent years that exceeds all expectations and projections, and both areas continue to demonstrate a strong growth pattern.

One location is in the southeast corner of the Valley Metropolitan Study Area, commonly referred to as the Queen Creek Area. During most of 1969 and through 1970 this area has experienced an unprecedented activity in mobile home and residential development. While the area is outside the scope of this study it is worthwhile to this report because it demonstrates how quickly an area can change. The 1968 projections for this area, which were sound at the time, were substantially incorrect by the end of 1969.

The other location is the area generally west of Litchfield-Avondale. Not previously reckoned for more than nominal agricultural growth, this west Litchfield-Avondale area has demonstrated a substantial developmental pattern, generated chiefly by the W.S.C.C., an active group of citizens with a dedicated interest in the development of the area. This represents an example of the kind of civic awareness that has previously been mentioned as one of the objectives of this kind of Comprehensive Planning Study. There is good reason to believe that growth here will continue and perhaps increase in coming years. Although the Avondale-Litchfield area is outside the Planning Area of this report, we recommend that an independent Water & Sewer

Study and Plan be executed for this area to correlate existing conditions, update projections for the future, and develop a more comprehensive Water & Sewer Plan for the entire Avondale-Litchfield "metropolitan" area.

Urban land uses are dependent upon a water supply of sufficient quantity and quality to meet future needs; therefore the location, availability, quantity and quality of water influence or determine the location, type and extent of urban land uses that can be supported. In sparsely settled rural areas, sewage may be disposed of satisfactorily by the use of septic tanks; however, in urbanized areas, sewer systems are a recognized necessity for the disposal of sewage.

#### Agriculture

Within the central portion of Maricopa County there has been a constant absorption of agricultural land by urban development. Although the future trend in the total amount of land used for agriculture in Maricopa County is almost certain to decline, it is expected that more acreage will be developed for agriculture in the western portion of the county.

The expected development of agricultural land in western Maricopa County will probably concentrate around the community of Aguila, in Harquahala Valley, in the Tonopah area, in Arlington Valley, in Rainbow Valley southeast of Buckeye, in Citrus Valley northwest of Gila Bend, the community of Theba, and on the Palomas Plain north Agua Caliente. The extent of agricultural development in these areas will directly relate to the quantity and quality of water available for irrigation.

The transfer of agricultural activities to western Maricopa County may for a time slow the decline in the total county acreage, but water costs are likely to limit the extent to which increased agricultural acreage can be developed.

Within the Planning Area only it is likely that development of new agricultural land will equal or possibly exceed the acreage of existing agricultural land absorbed by urban expansion for the next few years. Beyond this period the increase in agricultural acreage will depend on the development of new or cheaper water sources such as the Central Arizona Project.

Another future projection for agricultural activity in the Planning Area is indicated in Table VI (see next page), which indicates a continuing trend of fewer farms in the sizes of 200 acres or less and an increase in the number of farms larger than this. It is apparent that to maintain an economically successful operation in farming, it is becoming more and more necessary to mechanize and increase the size of the farm.

#### Indian Reservations

There has been considerable interest in opening land on the Indian reservations for private development through long term lease agreements. The U. S. Department of Interior and the Bureau of Indian Affairs have sponsored, and are continuing to conduct, various studies to determine the potential for industrial and other development on Indian reservations in Maricopa County.

TABLE VI  
FARM STATISTICS 1959 & 1964

	Maricopa County		Arizona	
	1959	1964	1959	1964
No. of Farms	2502	2154	7233	6477
Average Farm Size (Acres)	1032.7	1168.8	5558.3	6262.1
Number of farms according to crop- land harvested				
1 to 9 Ac.	464	489	1017	1034
10 to 19 Ac.	187	158	498	415
20 to 29 Ac.	108	61	301	212
30 to 49 Ac.	201	104	495	310
50 to 99 Ac.	244	169	652	491
100 to 199 Ac.	247	166	652	494
200 to 499 Ac.	273	277	746	685
500 to 999 Ac.	113	148	315	344
1,000 or More Ac.	70	97	172	206

Remainder of farms reported land used for pasture or non-productive use.

Source: 1964 United States Census of Agriculture

TABLE VI  
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	Maricopa County		Arizona	
	1959	1964	1959	1964
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100 to 199 Ac.	247	166	652	494
200 to 499 Ac.	273	277	746	685
500 to 999 Ac.	113	148	315	344
1,000 or More Ac.	70	97	172	206

Remainder of farms reported land used for pasture or non-productive use.

Source: 1964 United States Census of Agriculture

To date and within the predictable future, it appears that only those reservations in the Valley Metropolitan Study Area have any potential for such development. The Gila Bend Reservation and that portion of the Papago Reservation in Maricopa County are not expected to change significantly by 1990. Scattered residences will continue to locate on the reservations, but probably at a decreasing rate since past population trends indicate a decline in the number of Indians residing on reservations.

The extent to which development actually occurs on the reservations will depend in large part upon decisions made by the Indians and their Tribal Councils.

#### Desert or Mountainous Areas

The amount of area considered desert or mountain in Maricopa County is expected to decrease slightly by 1980. This decrease is expected due to urban expansion, particularly in the central portion of the county, and to the development of new agricultural land in the western portions of the county.

The desert or mountainous areas in 1980 will still include considerable land physically suited for urban or agricultural development, and some future development can be expected in these areas. The location, type and extent of this development would be influenced by topographical conditions, geology and soil conditions, and water resources.

### Major Public Open Spaces

There is an increasing national concern for reserving open space to give service to urban areas through public parks and recreation facilities, to preserve scenic and historical sites, and to protect, develop and preserve our natural resources. Ecological considerations will continue to have increasing importance in the planning of technological improvements.

The County's Regional Park System has been analyzed for future needs as presently constituted with the four regional and five semi-regional parks. There is not an apparent need to significantly expand this park system in the foreseeable future through land acquisition for additional park sites. Instead, the County's Regional Park Plan stresses the need to develop the parks it already has.

The future size and function of military installations is difficult to predict. The best assumption would appear to be that the United States will maintain a substantial defense posture for some time to come as an important part of its foreign policy. The size, function and location of military installations will be changed only if the nation's overall military posture changes in scope or emphasis. For purposes of the report and the Comprehensive Plan, it is assumed that military installations in the Planning Area will maintain their current size and function.

Airport development is of major importance in Maricopa County, which is an area with unexcelled flying weather. As previously mentioned, there

are many airports in Maricopa County and in the Planning Area. Of these, there are three airports in the Planning Area that are listed in the latest "*NATIONAL AIRPORT PLAN*". This plan sets forth the general requirements of the national system for airport development.

The three airports in the Planning Area are Buckeye Municipal, Gila Bend Municipal, and Wickenburg Municipal. All three of these airports are classified as Basic Utility-Stage II type airports. This type of airport accommodates about 95% of propeller aircraft under 12,500 pounds, and is primarily intended to serve locations which have a medium size population with diversity of usage and potential for increased aviation activities. The 1969/1970 Amendment by FAA to the latest National Airport Plan publication lists recommended improvements to all three airports.

The need for such airport development is affirmed by the continuous growth and demand for air transportation and by recent emphasis by FAA regarding development of the smaller Basic Utility type airports. This emphasis appears to be the result of national recognition of the contribution that improved airport facilities can make to the economic progress of smaller communities.

Of the three existing airports in the Planning Area, Wickenburg probably has the most immediate potential for stimulating and supporting the expected growth and economic progress of the community.

Gila Bend Municipal also has potential for playing an important role in the overall progress of this community. However, other conditions are more urgent in the immediate future. Long range planning should certainly consider the influence and benefits to be realized from improving the functional capacity of the airport.

Because of the proximity of Buckeye to the westside of the Phoenix Urban Area the potential for useful development of Buckeye Municipal Airport may be delayed for a period of time. The Litchfield Naval Air Facility, which was closed as a military installation, has been acquired by the City of Phoenix to serve as a satellite airport supplementing Phoenix Sky Harbor International Airport. The improvement of the airport by the City of Phoenix combined with the convenient access connection to the Buckeye area when Interstate Route 10 is completed may negate the value of developing the Buckeye Airport for several years. However, the same factors that will tend to limit the need for improving Buckeye Municipal Airport should also be recognized as strong factors in contributing to the potential growth and development of Buckeye community.

The City of Phoenix is also in the process of acquiring Deer Valley Airport north of Phoenix for similar development to supplement Sky Harbor International. The planned improvements to this facility should substantially strengthen the growth projections anticipated for the Cave Creek-Carefree area.

### Tonto National Forest

The Tonto National Forest offers a great measure of recreational benefits to Maricopa County. The Forest Service intends to seek private development of necessary facilities to accommodate the ever increasing numbers of visitors. A typical development site might consist of a restaurant, lodge, trailer park, campground and picnic area.

In addition to its recreational areas, vast areas of the Tonto National Forest have been declared "Wilderness Areas". Wilderness Areas will not be developed for visitors, but left to remain in their natural state. However, in some parts of the Wilderness Areas the Forest Service does plan a program of "controlled burning" of brush and shrub trees to increase the yield of grass for wildlife forage. This plan would also increase rainfall runoff, mostly into the retention lakes along the Salt and Verde Rivers.

## POPULATION

Before 1940, population growth in Arizona was slow and stable, primarily because major employment opportunities were in either mining or agriculture. During the 1940's, however, Arizona's population began a dramatic increase: major industry began moving into the state, many of the military and civilian personnel who had been introduced to Arizona during the war stayed here or returned after the war, and commercial enterprises and tourism began accelerated development.

Preliminary estimates from the 1970 census indicate an Arizona population of 1,752,707. (a 1964 population study projected that Arizona's population would reach 2,118,000 by 1970). The census figures indicate a decline in the growth rate. Statewide average population density is now 15.50 persons per square mile as compared with 11.50 per square mile in 1960 and 6.60 per square mile in 1950.

Population and industrial development are centered in only two of the state's 14 counties. In 1970 Maricopa County's 962,918 residents represent 55% of the state's total population and Pima County's population of 344,635 comprises 20% of the total.

Maricopa County, with 55% of the people living on only 8% of the land, has the highest population density in the state.

The median age of the population of Maricopa County, as estimated by the 1970 Republic and Gazette Consumer Survey, is 24.7 years. Age groups, reported as a percentage of total county population, are shown in Table VII.

TABLE VII

POPULATION AGE GROUPS  
Maricopa County - 1970

<u>Age Group</u>	<u>Percent of Total</u>
Under 5	14.0
6 - 13	18.6
14 - 24	17.9
25 - 34	13.5
35 - 44	10.4
45 - 54	9.8
55 - 64	7.5
Over 65	8.3

In 1960 the Republic and Gazette survey reported the median age in the county as 26.7. The two-year drop in the median age over the past 10 years shows a trend toward a younger population despite an increase in absolute numbers of persons aged 65 and over.

Recent population expansion in Maricopa County has resulted from a natural increase of the resident population and migration from other states. A summary of population statistics for the period 1960-1968 is shown in Table VIII.

TABLE VIII

COMPONENTS OF POPULATION GROWTH - MARICOPA COUNTY

<u>YEAR</u>	<u>BIRTHS</u>	<u>DEATHS</u>	<u>NET MIGRATION</u>	<u>NET GAIN IN POPULATION</u>	<u>POPULATION AT YEAR END</u>
1960	17,800	5,000	39,200	52,000	701,000
1961	18,400	5,200	27,800	41,000	742,000
1962	18,500	5,500	20,000	33,000	775,000
1963	18,200	6,000	18,800	31,000	806,000
1964	18,000	6,200	10,200	22,000	828,000
1965	16,700	6,200	4,500	15,000	843,000
1966	16,400	6,600	8,200	18,000	861,000
1967	16,500	6,700	15,200	25,000	886,000
1968	16,800	7,200	18,400	28,000	914,000

Source: Arizona Statistical Review

A review of Table VIII indicates a wide variation in the annual influx of migratory residence. The variance in these figures could be attributable to many things but probably the most significant would be the state of the nations economy. Contrary to the wide

variation in the migratory increase in resident population, the natural increase of the resident population has been relatively stable, with the net increase slowly declining since 1965.

The 1970 Republic and Gazette Survey shows that 89% of Maricopa County's population is white. Mexican-Americans comprise 7% of the county's residents and Negroes account for 3%. The remaining 1% is reported as "other", which is assumed to include Indian.

These figures reflect racial balance only in the Valley Metropolitan Area; no information is available for the rest of the county.

A large number of persons spend winter vacations in Arizona: Their visits, lasting as long as a full season, are not reflected in population figures but their presence adds to the number, variety and size of the total services required.

In the Planning Area this effect is most pronounced in the Wickenburg area which enjoys a substantial winter tourist trade.

Although development in the Planning Areas accessible to Phoenix is increasingly urban, Maricopa County includes considerable farmland. It is difficult, however, to arrive at accurate projections of population on farms and in farm-oriented communities because recent rural population figures are scarce.

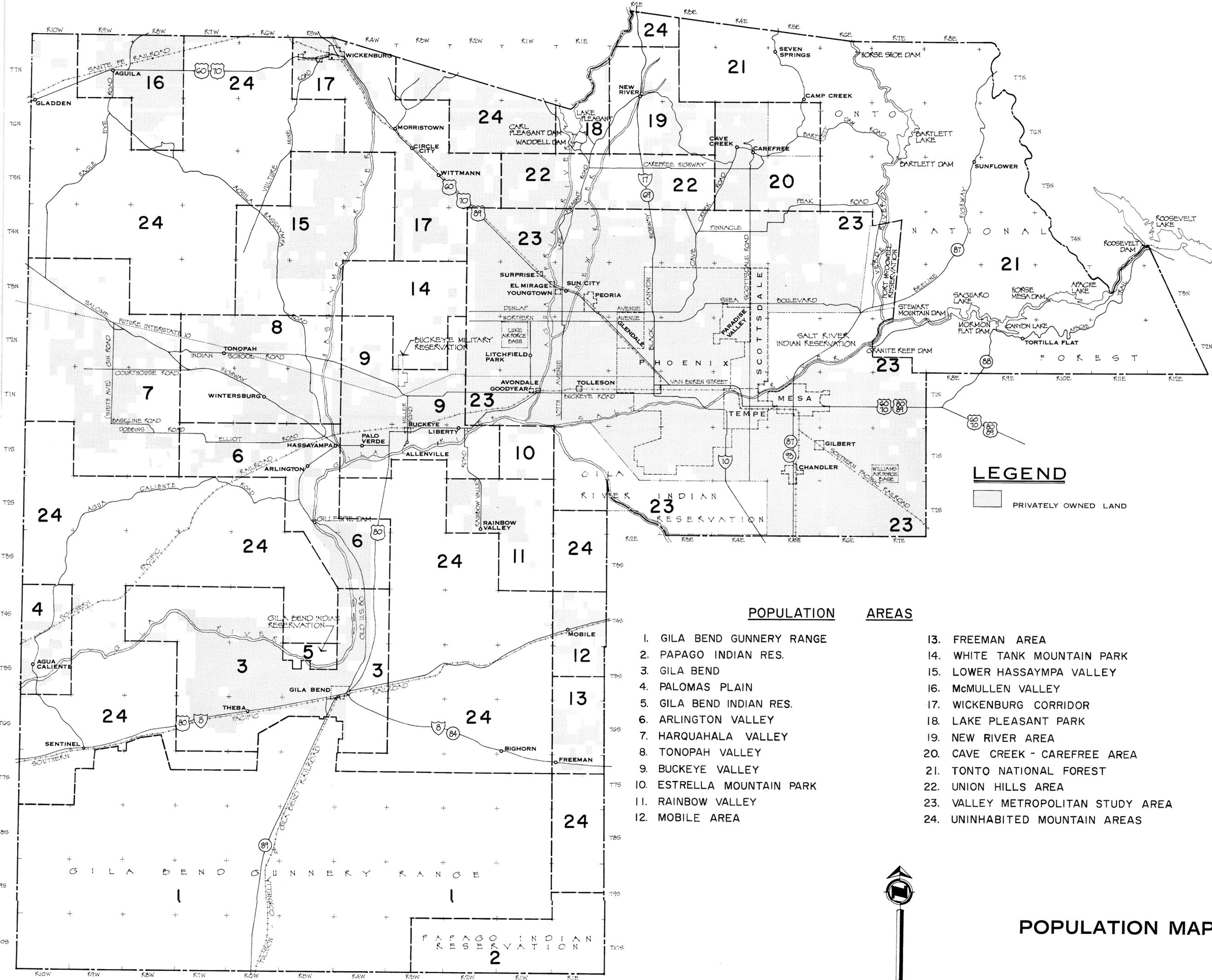
The three incorporated towns within the Planning Area - Gila Bend, Wickenburg, and Buckeye - fall into the 1,500 to 3,000 population bracket. An estimated 1,850 persons live in the Cave Creek-Carefree area in 1970, and numerous other communities in the Planning Area have populations considerably under 1,000. Population density for the Planning Area (based on information in Table IX) is 3.7 persons per square mile in 1970; for 1980, 10.3 persons per square mile, and for 1990, 14.9 per square mile.

Our basic source of population data was U. S. Census reports to 1960 and preliminary census estimates for 1970. Other sources include the Arizona Statistical Review of 1969, the Maricopa County Planning and Zoning Report on Future Land Use, the 1964 U. S. Census of Agriculture, Western Management Consultant's report on "The Economy of Maricopa County 1965 to 1968" and, to a lesser extent, sources shown in the Bibliography.

Arriving at accurate population estimates for the Planning Area is difficult because for unincorporated settlements and extensive rural areas population estimates are not available. In addition, some estimates of town populations are confusing because the areas included are inconsistent, varying somewhere between the limited settled area and the entire township. Where practicable, 1970 census estimates have been used to extend tabulations from other sources. In no case have comparisons to project growth been made between different sources.

In order to estimate population growth in the Planning Area on the basis of all known pertinent facts, the territory has been broken down into regions according to such varying factors as federal land control, topography and existing communities. These areas are shown on Plate 6, Population Map.

Figures used for the projected average growth were developed from past recorded growth in Maricopa County as a whole, extended to 1990 by comparison with projections made by the County Planning Board and others. All estimates were revised to agree with the 1970 preliminary census figures. Plate 7 shows these projections as well as the population growth curve on which they are based. It indicates an average growth rate of 66% in the next 10 years and 117% in the next 20 years.



**LEGEND**

PRIVATELY OWNED LAND

**POPULATION AREAS**

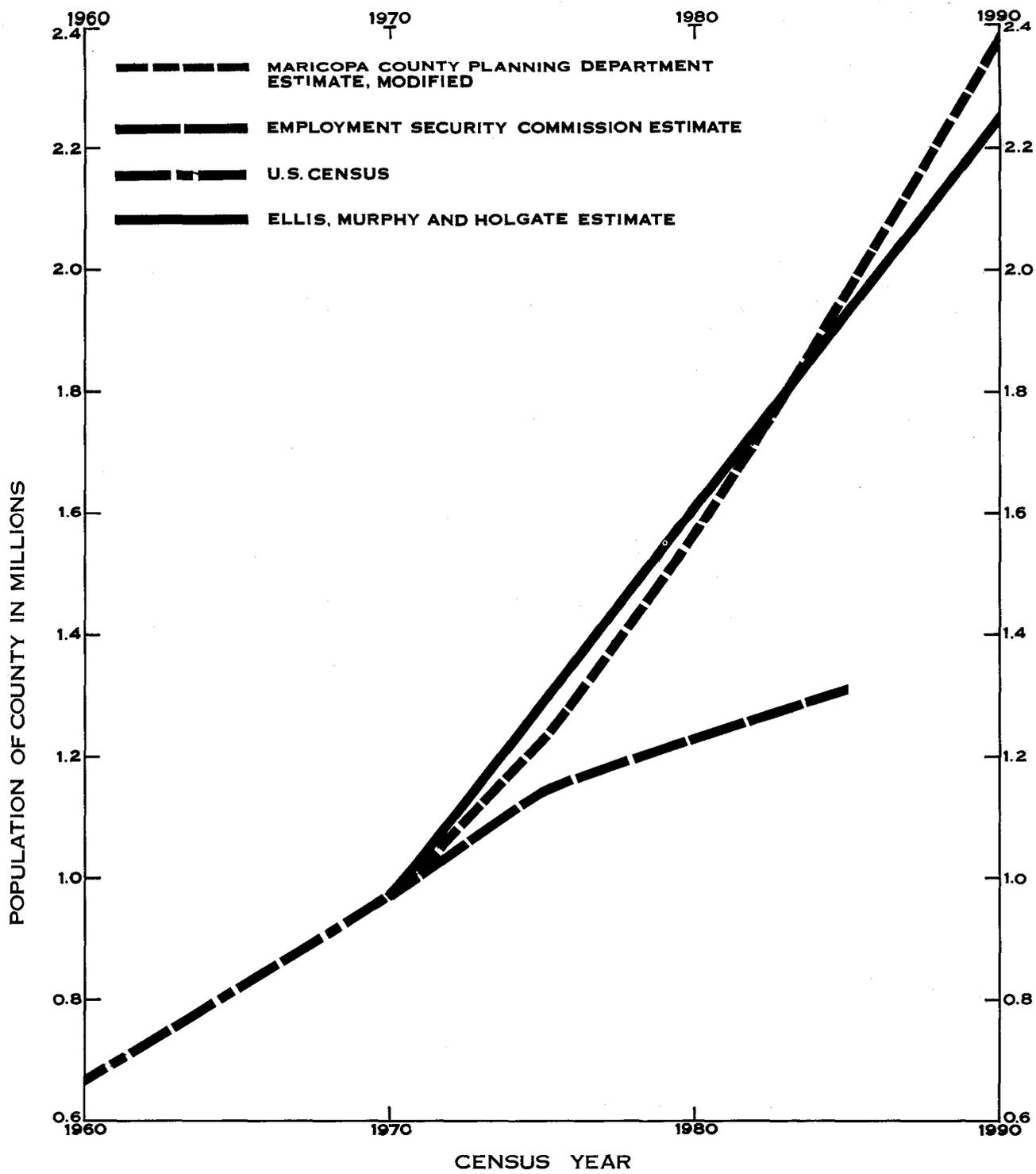
- |                            |                                    |
|----------------------------|------------------------------------|
| 1. GILA BEND GUNNERY RANGE | 13. FREEMAN AREA                   |
| 2. PAPAGO INDIAN RES.      | 14. WHITE TANK MOUNTAIN PARK       |
| 3. GILA BEND               | 15. LOWER HASSAYMPA VALLEY         |
| 4. PALOMAS PLAIN           | 16. McMULLEN VALLEY                |
| 5. GILA BEND INDIAN RES.   | 17. WICKENBURG CORRIDOR            |
| 6. ARLINGTON VALLEY        | 18. LAKE PLEASANT PARK             |
| 7. HARQUAHALA VALLEY       | 19. NEW RIVER AREA                 |
| 8. TONOPAH VALLEY          | 20. CAVE CREEK - CAREFREE AREA     |
| 9. BUCKEYE VALLEY          | 21. TONTO NATIONAL FOREST          |
| 10. ESTRELLA MOUNTAIN PARK | 22. UNION HILLS AREA               |
| 11. RAINBOW VALLEY         | 23. VALLEY METROPOLITAN STUDY AREA |
| 12. MOBILE AREA            | 24. UNINHABITED MOUNTAIN AREAS     |



GRAPHIC SCALE IN MILES  
0 2 4 6 8 10 12

**POPULATION MAP**

ELLIS, MURPHY AND HOLTGATE  
Consulting Civil Engineers  
Phoenix, Arizona



MARICOPA COUNTY  
POPULATION PROJECTIONS

After applying factors to account for varying local conditions to the average growth curve for Maricopa County, we arrived at population estimates for each of the areas shown on Plate 6. They are shown on the following table:

TABLE IX

POPULATION PROJECTIONS

<u>AREA</u>	<u>1970</u>	<u>1980</u>	<u>1990</u>
1. Gila Bend Gunnery Range	----	----	----
2. Papago Indian Reservation	----	----	----
3. Gila Bend Basin	----	----	----
	4	5	5
Town of Gila Bend	1726	2695	3200
Gila Bend Fringe Areas	1624	1805	2150
Balance of Basin	200	1000	1550
4. Palomas Plain	50	50	50
5. Gila Bend Indian Reservation	350	350	350
6. Arlington Valley	2000	2000	2000
7. Haraquahala Valley	130	130	130
8. Tonopah Valley	300	300	300
9. Buckeye Valley			
		2	
Town of Buckeye	2900	9000	11,500
Buckeye Fringe Areas	1600	----	----
Balance of Valley	1350	3500	4400
10. Estrella Mountain	----	----	----
11. Rainbow Valley	100	100	100
12. Mobile	80	80	80

TABLE IX - Continued

POPULATION PROJECTIONS

<u>AREA</u>	<u>1970</u>	<u>1980</u>	<u>1990</u>
13. Freeman	----	----	----
14. White Tank Mountain	----	----	----
15. Lower Hassayampa Valley	----	----	----
16. Aguila	400	490 <sup>5</sup>	570 <sup>5</sup>
17. Wickenburg Corridor			
Circle City	300	345 <sup>5</sup>	390 <sup>5</sup>
Morristown	100	150 <sup>5</sup>	210 <sup>5</sup>
Wittmann	625	730 <sup>5</sup>	830 <sup>5</sup>
Town of Wickenburg	2,640	3,250	4,000
Wickenburg Fringe Area	500	620	760
Balance of Corridor	175	225	300
18. Lake Pleasant	----	----	----
19. New River	550	1,500	2,500
20. Carefree-Cave Creek Area			
Urban Area	1,850	7,465 <sup>5</sup>	12,000
Balance of Area	----	10,400	17,000
21. Tonto National Forest	200	200	200
22. Union Hills - New River Area	<u>250</u>	<u>8,615</u>	<u>14,430</u>
ELLIS, MURPHY & HOLGATE Study Area	20,000	55,000	79,000
23. Valley Metropolitan Study Area (Note 4)	<u>942,918</u>	<u>1,557,000</u>	<u>2,168,000</u>
Maricopa County Total	962,918	1,612,000	2,247,000

## Sources:

1. ELLIS, MURPHY & HOLGATE Field Estimate
2. Maricopa County Planning Department, "A Report upon the Land Area Required for Future Urban Uses", 1968
3. John Carollo Engineers, "Waterworks Report for the Valley Metropolitan Area", 1968
4. U. S. Census, Preliminary Report, June 1970

Sources: (Continued)

5. Arizona State Highway Department
6. Van Cleve Associates, "Wickenburg General Plan", 1965.

Notes

1. Where applicable, population curves have been translated to match 1970 population information.
2. (----) indicates no known population.
3. 100 100 100 indicates no information to justify population increases, area where population decrease is likely are also shown as constant population.
4. Population estimates for this area have been studied with full consideration of increased development in outlying areas, such as the Queen Creek-West Chandler, West Litchfield-Avondale, Fountain Hills, etc. areas.

Accurate population projections are difficult to make, however, for Arizona and Maricopa County in particular because of the unpredictability of the migration rate. It can vary significantly because of unforeseen events or local policy regarding migration. For example, out of concern for maintaining ecological balance in Arizona, the 1970 Town Hall forum recommended that the state reverse its policy of encouraging migration. Should such a recommendation be accepted as government policy, the state's population growth pattern would change significantly.

In addition, Interstate 10 is presently under construction. When completed, probably by 1975, it will divert high volumes of through traffic from U. S. 60 and 70, and tourist and commuter travel patterns will undergo some change. As a result, growth patterns in the western part of the Planning Area will be affected.

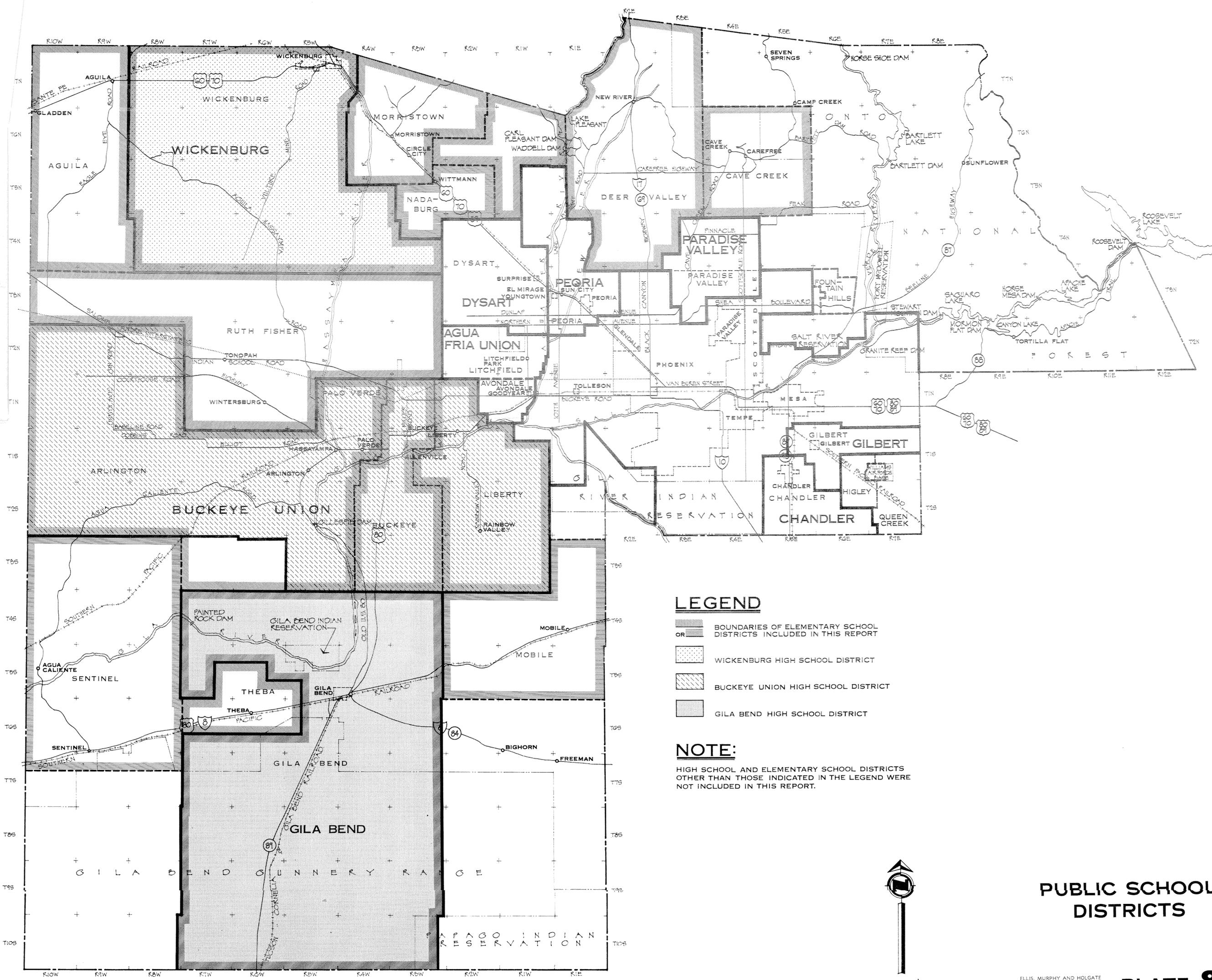
## EDUCATION

In Maricopa County there are 52 elementary school districts encompassing a total of 229 schools, and 15 high school districts encompassing 33 schools. Depending on population density, a district may include from 1 to 25 schools. In addition to normal school facilities, "accommodation schools", with no district boundaries, are provided for students requiring special education for abnormal physical or mental problems.

As shown on Plate 8, school district boundaries do not coincide with the boundaries of the Valley metropolitan district. Therefore, in our analysis of future water needs generated by school usage, we have taken into account those districts which are located primarily but not necessarily entirely in the Planning Area. Districts that lie primarily outside the Planning Area were not considered in the analysis.

The high school districts included are Buckeye Union, Gila Bend, and Wickenburg. Elementary districts are: Aguila, Arlington, Buckeye, Cave Creek, Deer Valley, Gila Bend, Liberty, Mobile, Morristown, Nadaburg, Palo Verde, Ruth Fisher, Sentinel, Theba, Wickenburg, and the Horse Mesa Accommodation School.

Most of the elementary school districts in the Planning Area are located within one of the three high school districts. But a few, such as Ruth Fisher or Cave Creek, for example, do not fall within a high school district. Students from these areas are bussed to a nearby high school.



**LEGEND**

-  BOUNDARIES OF ELEMENTARY SCHOOL DISTRICTS INCLUDED IN THIS REPORT
-  WICKENBURG HIGH SCHOOL DISTRICT
-  BUCKEYE UNION HIGH SCHOOL DISTRICT
-  GILA BEND HIGH SCHOOL DISTRICT

**NOTE:**

HIGH SCHOOL AND ELEMENTARY SCHOOL DISTRICTS OTHER THAN THOSE INDICATED IN THE LEGEND WERE NOT INCLUDED IN THIS REPORT.



**PUBLIC SCHOOL DISTRICTS**

ELLIS, MURPHY AND HOGGATE  
Consulting Civil Engineers  
Phoenix, Arizona

In the southwestern part of the county the school districts serve areas that are primarily agricultural. From a survey of school officials in the Gila Bend area, the consensus appears to indicate a stable population within the next five to six years. The Mobile Elementary District has a recently completed school building and expects to serve 60 students by 1972. (Present enrollment is 22)

In the area served by the Buckeye Union High School District, population generally appears stable. Some communities, such as Buckeye, are considered active and are anticipating population growth and a building influx, largely as a result of Interstate 10, during the next several years. In some of the elementary districts such as Liberty and Arlington, school population is stable or decreasing. Decreases are attributed either to a general population decline or to a drop in the number of families with elementary school children (as is the case in retirement communities).

In the northwest section of the county, the Wickenburg area anticipates steady growth for the most part over the next several years. Wickenburg is considered an active community, and by 1975 Wickenburg High School District anticipates an increase of 100 over the present enrollment of 325. Likewise, Wickenburg Elementary expects its enrollment to reach 580 from the present 480 and is planning a room addition for 1971. The remaining elementary districts in the area have bleak futures: Aguila's population is declining (attributed by the superintendent to being by-passed by Interstate 10); the Morristown district's population is primarily retired and is now experiencing water supply problems; and

Nadaburg is a poor community without resources, whose population is largely dependent on welfare support.

To the east, Deer Valley Elementary School District population is growing at a conservatively estimated 12% per year. At present 358 high school students are bussed out of the district to Moon Valley or Apollo High Schools, but by late 1972 Deer Valley may be ready for a high school.

The Cave Creek Elementary District is also growing rapidly. The present enrollment of 246 students is expected to reach 924 by the school year 1978-79. High school students are now bussed out of the district to Paradise Valley.

It is perhaps likely that Deer Valley and Cave Creek Elementary Districts will form the boundary for a new high school district prior to 1975.

## ECONOMY

Before 1940, the economy in Arizona was based primarily on agriculture and mining. During World War II, Arizona became a major contributor in the war effort through its supplies of agricultural and mineral products.

After 1940, the advantages of Arizona for industrial development, commercial development and tourism became apparent to the nation as a whole. As a result these factors have combined with agriculture, mining and cattle growing to form a vast and complex economy.

Latest income figures (1969 Preliminary) for metropolitan Phoenix indicate the strength of this growth:

<u>Item</u>	<u>Annual Amount in thousands</u>
Personal Income	\$3,250,000
Farming Income	328,000
Manufacturing Income	1,600,000
Tourism Income	265,000

Sources: Republic & Gazette Research Department  
Valley National Bank  
U. S. Department of Commerce

Tables X and XI present various self-explanatory statistics of Maricopa County employment. Plate 9 shows non-farm employment trends in Phoenix.

TABLE X  
EMPLOYMENT TRENDS IN MARICOPA COUNTY  
MAY 1970

Manufacturing	73,100
Mining	200
Construction	20,700
Transportation and Utilities	17,400
Warehousing and Retail Trade	81,800
Financial, Insurance and Real Estate	21,800
Service and Miscellaneous	52,900
Government	57,100
Agriculture, Seasonal	9,000
Agriculture, Regular	6,300

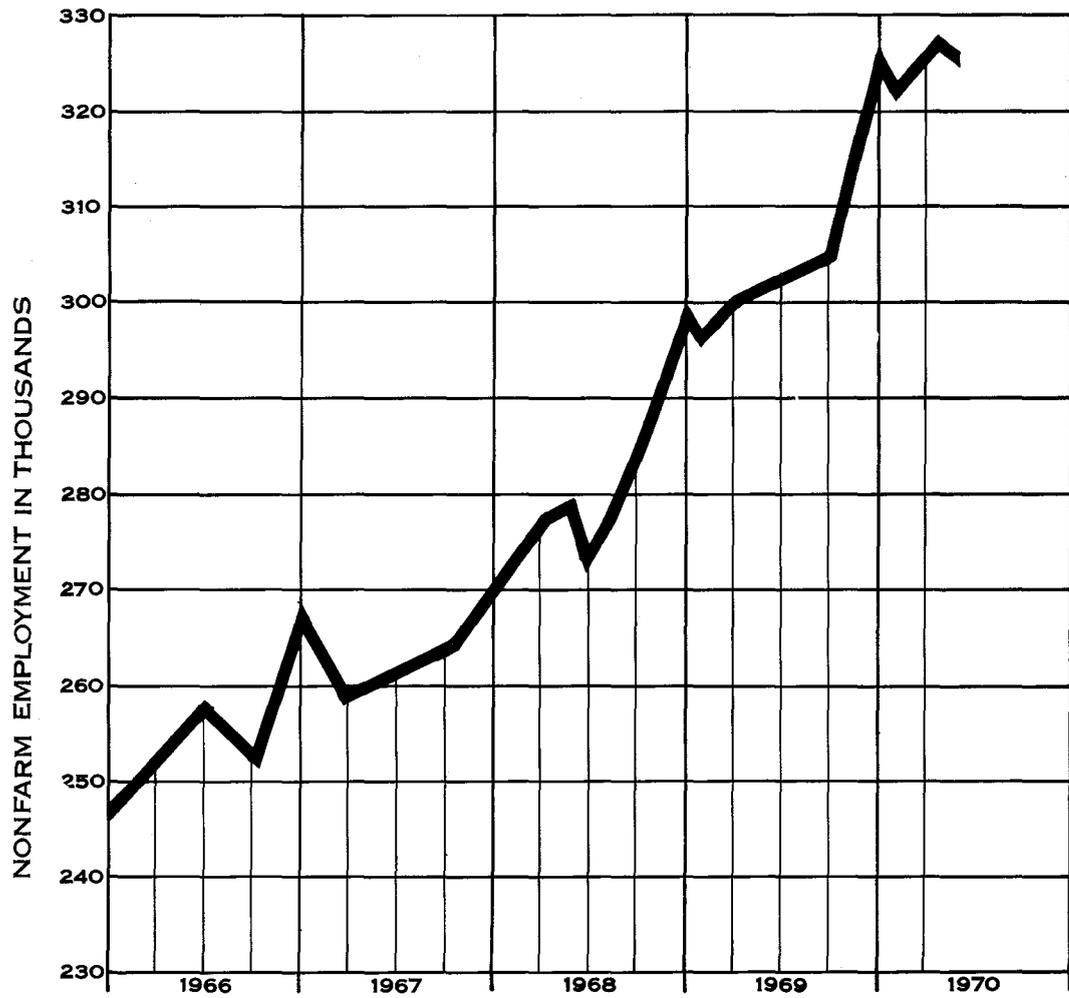
Sources: Employment Security Commission, M.C. Division

Employment Security Commission, Farm Labor and Rural  
Manpower Division

TABLE XI  
LABOR FORCE DATA-MARICOPA COUNTY (Annual Average)

<u>Year</u>	<u>Agricultural</u>	<u>Non-Agricultural</u>	<u>Total</u>	<u>Per Cent of Labor Force Unemployed</u>
1956	23,800	149,300	173,100	3.4
1957	23,700	164,700	188,400	3.5
1958	24,900	174,700	199,600	5.4
1959	22,100	195,000	217,100	4.2
1960	22,100	211,600	233,700	4.8
1961	20,700	221,600	242,300	5.8
1962	19,600	232,900	252,500	5.0
1963	19,700	244,800	264,500	4.6
1964	19,300	251,800	277,100	4.4
1965	18,500	268,200	286,700	4.7
1966	16,600	292,200	308,800	3.4
1967	16,700	299,000	315,700	3.9
1968	16,200	320,400	336,600	2.9
1969	15,800	347,900	363,700	2.6

Source: Employment Security Commission of Arizona



NONFARM EMPLOYMENT

## Agriculture

Maricopa County's agricultural production is a major component of the overall state agricultural economy. Table XII shows the county's share of selected crops harvested and livestock for 1969. Although agricultural trends in the county are mixed, there has been a gradual decrease in gross acreage planted. This acreage decrease is due in part to urban development in traditional farming areas around Metropolitan Phoenix. As Metropolitan Phoenix land becomes too valuable for farm use, agriculture is and will continue to be pushed away from the gravity zones of the major irrigation canal systems and into rural areas.

Even with growing pressure to relocate farms and cultivate new acreage in rural areas, rural Maricopa County may continue to show acreage declines in the future, largely because of the lack of surface water. The Central Arizona Project is intended to provide much of this needed surface water. Until the CAP is implemented, however, rural farms will continue to rely on underground water mining and this underground water supply is of questionable quantity and quality due to many years of agricultural mining, which constitutes recycling irrigation water and ultimately results in a build-up of salts in the water supply.

At this point, however, it is evident that there is a limit to the agricultural potential until more water, suitable for irrigation use both in cost and in quality, is available. Whether or not the Central Arizona Project will appreciably improve this condition has not yet been clearly demonstrated.

TABLE XII  
 1969 AGRICULTURAL HARVEST  
 (Selected Crops and Livestock)

<u>ITEM</u>	<u>ACRES</u>	
	<u>ARIZONA</u>	<u>MARICOPA COUNTY</u>
All Cotton	309,000	113,300
Barley	144,000	64,000
Wheat	73,000	22,000
Sorghum for grain	199,000	54,000
Alfalfa Hay	188,000	87,000
Lettuce, Early Spring	20,000	9,070
Lettuce, Late Fall	13,600	8,190
Potatoes	12,800	12,690
Watermelons, Early Summer	5,100	2,100
All Oranges	23,400	9,180
All Grapefruit	6,680	4,760
Lemons	13,300	1,595
Tangerines	6,360	2,490
Cattle on Feed average	450,000	240,000

Source: Arizona Agricultural Statistics 1970

### Livestock

Despite the steady encroachment of urbanization on the livestock feed lots in Maricopa County, there are still large feeding operations in the West, South and East sections of the Salt River Valley that account for over 50 per cent of the agricultural economy of the county. These lots constitute the most important segment of the county's livestock industry. About 75 per cent of the steers raised in the state are fed in Maricopa County's feed lots, and 90 per cent of the finished cattle are shipped live from the county to processing plants in California or Texas.

Dairy and poultry farms in Maricopa County are geared primarily to the local market. This market orientation dictates that dairy and poultry operations remain fairly close to the urban area in central Maricopa County, although large-scale operations could be conducted profitably in more remote areas.

### Mining

Mining operations are not considered part of the economic base of the county because sand and gravel operations, a relatively small segment of the mining industry, have been responsible for most of the county's employment classified as mining. Maricopa County accounted for only 1.16 per cent of the \$617,549,000 state mineral production for 1968.

### Tourism

Tourism and recreation facilities have developed rapidly in Maricopa County as a whole. The Arizona Highway Department estimates that almost half of the cars using Arizona's main highways are from out of State.

Various reasons listed for visits to Maricopa County, in order of occurrence, are "vacation", "visit friends or relatives", and "health reasons". The bulk of the Maricopa County tourist trade is centered in the Phoenix area. Within the Planning Area only a few communities offer tourist accommodations for an extended stay; major tourist attractions are sight-seeing and dude ranches.

Recreational facilities are available to the public throughout the county, particularly in the larger communities. Several large lakes in the county provide opportunities for fishing, boating, and swimming. The feasibility of additional recreational facilities throughout the state has been studied. Future recreational facilities are planned for areas in the Tonto National Forest, Paradise Valley, and Lake Pleasant. The Central Arizona Project may provide opportunities for additional facilities in Maricopa County.

For communities with facilities to accommodate tourism and for communities with plans for encouraging tourist trade, the presence of this non-resident population contributes significantly to the demand on water and waste-disposal systems. This is particularly true when planning for "peak load" periods because winter tourism is also the period of highest domestic use.

#### Manufacturing

The manufacturing industry as well as most retail trade, transportation, wholesale trade and construction industries in Maricopa County tend to locate in the Phoenix Metropolitan area. For industry there are several

important advantages to locating in Maricopa County. Those industries catering to national markets tend to emphasize weather and living conditions as advantages to their employees and their operations. Those dependent upon local sales emphasize market factors above other advantages.

It is likely that major future industrial development will locate in areas immediately surrounding the Phoenix metropolitan area, while smaller industries may be scattered throughout the remainder of the county.

Manufacturing is now the major source of income in Maricopa County. The principal manufacturing industries in the county are, in order of value of product:

TABLE XIII  
MARICOPA COUNTY MANUFACTURING  
Largest Manufacturing Groups in County

<u>Type of Manufacture</u>	<u>Employees March 1968</u>	<u>Taxable payroll First Quarter 1968</u>
Machinery except electrical	14,000	\$33,100,000.00
Electrical and electronics	20,500*	\$35,400,000.00
Transportation equipment	2,000*	\$ 3,500,000.00
Food and kindred industry	4,800	\$ 7,400,000.00

\*Before transfer of two large plants from Electrical to Transportation

Source: Summarized from U. S. Bureau of Census "County Business Patterns", 1968 (Ariz. C.B.P. - 68-4)

These industries are essentially based upon local products or favorable climatic conditions with minor emphasis on quantity or quality of water supplies. It is anticipated that the underlying conditions which have served to develop this type of industry will not substantially change, except that less agricultural production in the county may prevent growth of food processing industries. In any case, development of manufacturing that is dependent on large quantities of process water is not practicable unless water can be recycled or new sources developed.

Recent legislation establishing minimum standards for pollutants in plant effluents may have considerable effect on the amounts of water that will be necessary to comply with the legal standards. It is too early to predict the future effects of such environmental control on the growth of manufacturing in Maricopa County.

#### Retail Trade

Retail sales figures quoted in the "Arizona Statistical Review" indicate that such sales in the county increased much more rapidly than population in the 1961-1968 period. The figures given indicate a population increase of 24 per cent and a retail sales increase of 62 per cent which might be reduced to 30-35 per cent by applying a factor for inflation. This condition is partially explained by increased prosperity, but mostly due to increased tourist spending.

It is expected that Maricopa County will continue to increase its proportionate share of Arizona's retail sales volume. Here again the

majority of the County's total volume will come from the Phoenix metropolitan area, with outlying areas contributing more and more as urbanization continues to develop.

Wage Scales

Comparing median wage rates is generally an unsatisfactory method of comparing economies between cities. It is more realistic to make comparisons on the basis of the relationship between living costs and selected wage rates as shown on Table XIV. Table XIV is for the year 1969 and does not reflect increases resulting from labor settlements made in 1970, particularly in the construction industry, where strikes or labor contract terminations control the wage rates.

TABLE XIV  
COMPARATIVE MEDIAN WAGE RATES - 1969

	Hourly Rates			
	<u>Phoenix</u>	<u>Los Angeles</u>	<u>St. Paul</u>	<u>Houston</u>
Living Cost Budget*	9,747	10,285	10,369	9,212
Rank in Report*	20	12	10	24
Secretary	2.75	3.34	2.70	3.05
Draftsman	4.24	4.58	4.45	4.80
Machinist, Maint.	4.30	4.26	4.24	4.22
Laborer	2.56	3.37	3.11	2.08
Truck Driver	3.42	3.84	3.72	2.87

Source: U. S. Department of Labor - Bureau of Labor Statistics

\*Urban Family of Four - Intermediate Standard

In general terms, with some selected exceptions, Phoenix wage scales are slightly low relative to the cost of living compared to most other metropolitan areas.

## TRANSPORTATION

### Railroads

Maricopa County has adequate railroad facilities to provide passenger and freight connections to points throughout the United States as well as connections with the railroad systems owned by mining companies in other counties. The Southern Pacific Railroad maintains two routes within the county, and the Atchison, Topeka and Santa Fe maintains one.

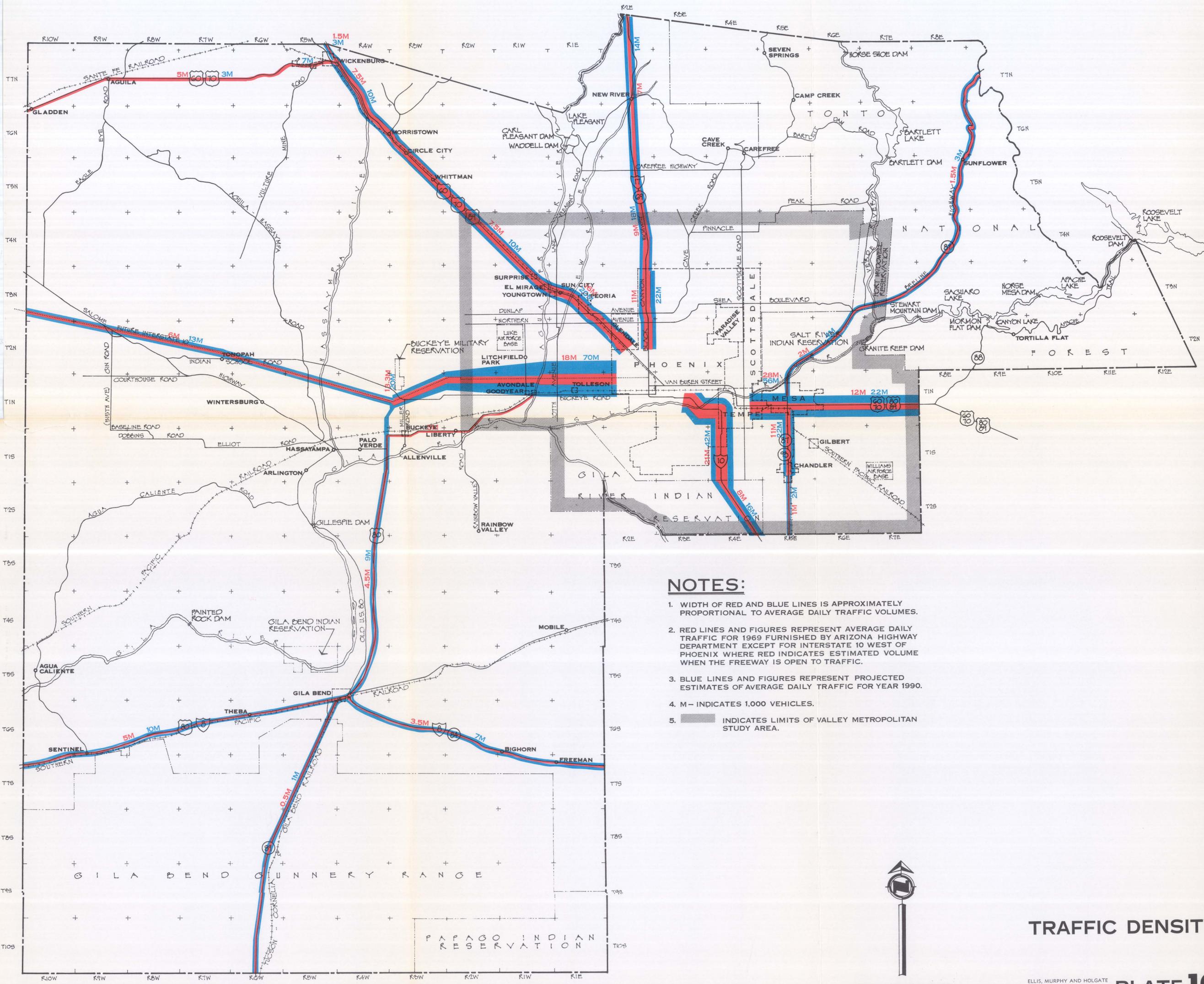
It is not too unrealistic to expect that railroad passenger service will continue to decline in the next 20 years, perhaps to the point of being virtually non-existent. However, railroads will continue to play a major role in the economical transportation of goods and materials.

### Bus Service

Interstate bus lines operate within Maricopa County, serving large and small communities throughout Arizona. In addition, several intrastate bus lines serve almost every town in Arizona; some of these lines are licensed to provide nationwide charter trips. At the present time, and in most locations for the foreseeable future, bus service represents the only public transportation for many county communities.

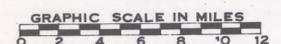
### Automobiles

The state highway system adequately serves Maricopa County except for occasional congestion in places where Interstate routes are incomplete and in the metropolitan district during rush hours. Plate 10 shows estimated traffic volumes on principal highways.



**NOTES:**

1. WIDTH OF RED AND BLUE LINES IS APPROXIMATELY PROPORTIONAL TO AVERAGE DAILY TRAFFIC VOLUMES.
2. RED LINES AND FIGURES REPRESENT AVERAGE DAILY TRAFFIC FOR 1969 FURNISHED BY ARIZONA HIGHWAY DEPARTMENT EXCEPT FOR INTERSTATE 10 WEST OF PHOENIX WHERE RED INDICATES ESTIMATED VOLUME WHEN THE FREEWAY IS OPEN TO TRAFFIC.
3. BLUE LINES AND FIGURES REPRESENT PROJECTED ESTIMATES OF AVERAGE DAILY TRAFFIC FOR YEAR 1990.
4. M- INDICATES 1,000 VEHICLES.
5. [Shaded Area Symbol] INDICATES LIMITS OF VALLEY METROPOLITAN STUDY AREA.



**TRAFFIC DENSITY**

Despite increasing national awareness of the contribution of the automobile to air and noise pollution and increasing rhetoric regarding restrictive legislation to eliminate or substantially reduce the use of the internal combustion engine, there is not now a definable trend in this direction to form a basis for future projections. The location of major automobile or "rubber-tired" vehicle arteries will continue to play a major role in the direction and type of urban expansion and to a more limited extent agricultural growth and agriculturally oriented industries.

#### Aircraft

Phoenix Sky Harbor International is the only airport in the county which provides scheduled freight and passenger service. This service is provided by the following airlines: Aeronaves de Mexico, Air West, American, Apache, Continental, Delta, Frontier, Trans World, Valley and Western. Growth of passenger service is indicated in Table XV (see next page).

There are numerous private and community-owned airports with limited facilities in the outlying areas of Maricopa County. These are used by privately owned planes for business and recreational flying and for crop dusting.

The improvement and development of these small airports will play a vital role in the growth and prosperity of the small rural communities. With adequate upgrading, these airports could be a strong influence in

TABLE XV  
 PHOENIX SKY HARBOR INTERNATIONAL  
 PASSENGER OPERATIONS

<u>YEAR</u>	<u>ARRIVALS</u>	<u>DEPARTURES</u>	<u>TOTAL</u>
1960	427,300	432,400	859,700
1961	458,400	465,500	923,900
1962	536,100	554,900	1,091,000
1963	612,300	629,900	1,242,200
1964	659,000	716,900	1,375,900
1965	792,300	798,600	1,590,900
1966	971,000	972,300	1,943,300
1967	1,113,500	1,121,700	2,235,200
1968	1,269,900	1,272,900	2,542,800

Source: Arizona Statistical Review

attracting light industry as a means of replacing loss of economic stability by the reduction in manpower requirements for some agriculturally oriented communities. The possibility of utilizing air taxi service for connecting passenger flights to Sky Harbor International, and for limited air freight service, should be a significant factor to the small communities that could reasonably support such an operation. These possibilities and other potential benefits could be studied and developed by local governmental bodies, with strong civic support dedicated to the preservation and growth of their communities. As previously stated, FAA has increased its efforts toward supporting improvements to Basic Utility type airports, and have appropriated more funds than ever before for this use.

## UTILITIES

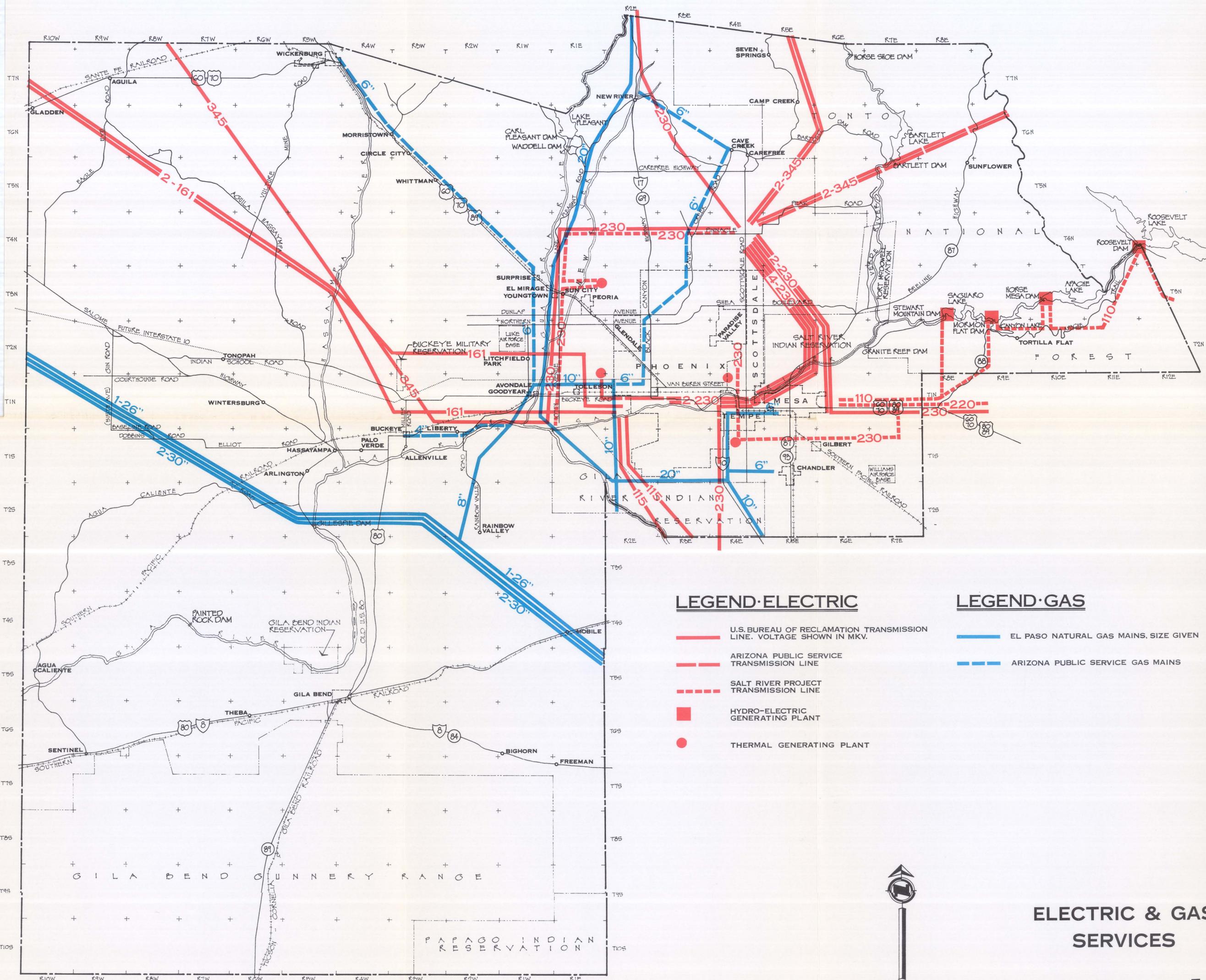
### Electrical Power

Three separate agencies supply almost all electrical energy to the county via the system of transmission lines indicated on Plate 11. Principal primary sources are Hoover Dam for the Bureau of Reclamation, the adjacent hydro-electric plants for the Salt River Project and the Four Corners Regional Commission and other thermal generation plants for the Arizona Public Service Company. In addition to these base load sources, several generating plants are located throughout the county. The thermal generating plants utilize various types of fuels to produce power; those located within the metropolitan area are designed to use natural gas or, in case of emergency, they may use oil. The power produced by these and other generating plants is distributed directly by the larger power companies or by locally certificated companies or cooperatives.

### Natural Gas

All natural gas is transmitted to Maricopa County by El Paso Natural Gas Company to distribution stations, where local distribution to consumers is transmitted by Arizona Public Service Co. El Paso Natural Gas Company, except for a few large mining operations in Arizona, does not sell gas directly to consumers.

The great majority of natural gas comes from wells located in the Permian Basin of Southeastern New Mexico and Western Texas. A small

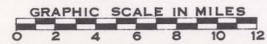


**LEGEND-ELECTRIC**

- U.S. BUREAU OF RECLAMATION TRANSMISSION LINE. VOLTAGE SHOWN IN MKV.
- ARIZONA PUBLIC SERVICE TRANSMISSION LINE
- SALT RIVER PROJECT TRANSMISSION LINE
- HYDRO-ELECTRIC GENERATING PLANT
- THERMAL GENERATING PLANT

**LEGEND-GAS**

- EL PASO NATURAL GAS MAINS, SIZE GIVEN
- ARIZONA PUBLIC SERVICE GAS MAINS



**ELECTRIC & GAS SERVICES**

amount is transmitted from the San Juan Basin in the Four Corners Area. Most of the gas is transmitted 600 to 700 miles to the Arizona Public Service "City Gates".

The proven reserves for El Paso Natural Gas amount to approximately 34 trillion cubic feet. The Reserve Life Index is the amount of proven reserves divided by the annual production. As of January, 1970 El Paso Natural Gas has a Reserve Life Index of 18 years compared to an industry wide index of 14 years.

The drilling rate of new wells has been declining in recent years. The price of natural gas at the well head (the price El Paso Gas pays to firms that drill the wells) is controlled by the Federal Power Commission if the gas is to be transmitted in interstate pipe lines. The present well head price is not high enough to provide sufficient incentive to the well drillers to continue drilling for natural gas and they are increasingly directing their efforts and investments in ventures that have a more profitable return. The natural gas industry believes there is sufficient unproven reserves to last well into the next century; however, it appears that the Federal Power Commission will have to raise their price controls to attract drillers back to drilling these unproven reserves.

It is expected that an adequate increase in the well head price would leave natural gas as a strong economically competitive energy source. Beyond this need increase, the increase in consumer cost for natural gas would not be more than the normal inflationary influences. Plate 11 shows the size of principal transmission pipelines. All pipe lines are underground.

### Communications

Communications facilities in the Planning Area include telegraph and telephone service. Telegraph facilities are available only in the more densely populated areas, and telephone service, provided by Mountain Bell Company, is almost uniformly available in the county.

As other services which use telephone lines for transmission become more sophisticated and diversified for business purposes, such as data processing, etc. it is expected that telephone service lines will continue to be expanded. Perhaps satellite, maintenance, or relay offices will be established in outlying communities.

At present it can only be speculated how much and in what manner television services will be improved and expanded. Increased use as educational visual aid for schools, monitoring systems for traffic, special cable connections for business, transmission for audio and visual communication are but a few of the known possibilities.

### Irrigation & Drainage Districts

There are various water-related development programs within Maricopa County. These programs include flood control facilities that are being constructed in conjunction with the Soil Conservation Service and the U. S. Army Corp of Engineers.

The following flood control projects are planned or are in progress by the Soil Conservation Service: (1) Harquahala Valley, (2) Eagletail Mountain, (3) Buckeye, (4) Buckhorn-Mesa, (5) Apache Junction-Gilbert,

(6) Wickenburg, and (7) Williams-Chandler. These projects, as well as the completed White Tanks Project will control floodwaters through construction of diversions, floodways, and flood control dams throughout the drainage areas.

The flood control program of the Corps of Engineers also includes completed as well as proposed projects. Those completed are Painted Rock Reservoir and McMicken Dam and outlet channel. Authorized flood control projects not started yet include Indian Bend Wash, and the Gila and Salt Rivers Levee and channel improvements. In addition to providing flood protection, Painted Rock Reservoir tends to reduce the sediment load that enters the Colorado River from the Gila River.

Construction and installation of services as well as administering contracts for these projects are conducted by the federal government, the Flood Control District of Maricopa County and/or other local interests.

There are three drainage districts and five irrigation districts that operate within the county. The purpose of the three drainage districts is to provide drainage protection, to confer title of drainage water collected to the district, and to make such water non-appropriable. The five irrigation districts acquire water rights and make appropriations, provide for water storage and conveyance facilities, provide for the construction, operation and leasing of plants for the generation and distribution of electrical energy, and provide the district with water, electricity and other public conveniences. The drainage and irrigation districts obtain financing through the issuance of bonds or by levying special assessments subject to the decisions of electors.

The following tabulation shows the Drainage & Irrigation districts within Maricopa County, along with an indication of their status.

TABLE XVI  
DRAINAGE & IRRIGATION DISTRICTS

<u>NAME OF AGENCY</u>	<u>STATUS</u>
<u>WATER USERS ASSOCIATIONS</u>	
Salt River Valley Water Users Association	Active
<u>DRAINAGE DISTRICTS</u>	
Drainage District No. 1	Active
Drainage District No. 2	Active
Drainage District No. 3	Active
<u>FLOOD CONTROL DISTRICTS</u>	
Maricopa Flood Control District	Active
Magma Flood Control District	Inactive
<u>IRRIGATION DISTRICTS</u>	
Aguila Irrigation District	Inactive
Chandler Heights Citrus Irrigation District	Active
Harquahala Valley Irrigation District	Active
Leon Irrigation District	Inactive
McMicken Irrigation District	Inactive
Nadaburg Irrigation District	Unknown
Queen Creek Irrigation District	Inactive
Roosevelt Irrigation District	Active

TABLE XVI (Continued)

<u>NAME OF AGENCY</u>	<u>STATUS</u>
St. Johns Irrigation District	Active
San Tan Irrigation District	Inactive
Southside Irrigation District	Inactive
<u>IRRIGATION AND DRAINAGE DISTRICTS</u>	
New Magma Irrigation and Drainage District	
New State Irrigation and Drainage District	Active
<u>WATER CONSERVATION DISTRICTS</u>	
Buckeye Water Conservation and Drainage District	Active
Camelback Water Conservation District	Inactive
Gila Water Conservation District	Inactive
Maricopa County Municipal Water Conservation District No. 1	Active
Maricopa County Southern Water Conservation District	
Phoenix Water Conservation District	
Roosevelt Water Conservation District	Active
South Chandler Water Conservation District	

## WATER RESOURCES

Maricopa County has several valuable resources that contribute to its growth and prosperity; however, for purposes of this report and for the county itself, water is by far the most important resource. The past, present and future economy of Maricopa County is so dependent on the quantity and quality of water available, that the conservation of this valuable resource should be of paramount concern to every citizen of the county. The area is now supplied by surface water systems on the Salt, Verde, Agua Fria and Gila Rivers, and by pumping from the ground-water basins.

### Surface Water

The existing surface water systems serving Maricopa County are now used to their fullest capacity. Stream flow is fully developed and completely utilized. In general, the quality of this surface flow for irrigation use is superior to that of groundwater, and it poses no serious limitations in this respect. A problem does exist, however, in that only a small portion of the total water demand in the area is derived from surface flows. For example, in 1967 only one million acre feet of the 4.8 million acre feet of water demand for the central area of the state was met by surface systems; the remaining 3.8 million acre feet was pumped from groundwater basins.

Almost all of the surface water which accumulates in the Gila River below Ashhurst-Hayden Dam, located in Pinal County, is diverted for

irrigation in Maricopa County at the Buckeye Irrigation Company diversion dam, the Arlington Canal Company diversion works, and at Gillespie Dam. Except for storm flows and leakage at the dam, there is no surface flow between Gillespie Dam and Painted Rock Dam 60 miles downstream. (Painted Rock Dam is a flood control dam used to protect Yuma from flash floods)

The Salt River system includes the Salt and Verde Rivers. Essentially all of the flow from this system is diverted for irrigation, municipal and industrial use at Granite Reef Diversion Dam east of Phoenix. Therefore, the Salt River system contributes very little surface water to the Gila River system. Table XVII (on the following page) indicates the yearly flow for each October through September period of the Salt and Verde Rivers, just upstream from the Granite Reef Diversion Dam. Table XVIII shows Gila River diversions for water years at various locations.

The Agua Fria River drains an area of 1,459 square miles upstream from Waddell Dam, and practically all of the 59,440 acre feet per year average flow is diverted for irrigation use before it reaches the Gila River.

#### Ground Water

Ground water use in the western basins of Maricopa County averages 650,000 to 700,000 acre feet per year, most of it for agricultural purposes. In some of these basins groundwater storage reserves are considerable. Generally speaking, however, rates of annual decline in Maricopa County groundwater levels are high and are accelerating, as shown on Table XIX. Variation of groundwater levels in the county is shown on Plate 12.



TABLE XVII  
SALT RIVER SYSTEM STREAM FLOW DATA  
Water Year (Acre Feet)

	Month	1961	1962	1963	1964	1965
<hr/>						
Salt River						
below Stewart Mountain	O	14,260	16,060	4,090	8,120	21,450
Dam	N	200	2,810	6,680	411	5,410
	D	4,000	492	0	6,400	97
	J	315	2,220	0	1,630	72
	F	17,530	8,410	5,060	14,470	1,650
	M	82,370	9,370	90,060	74,180	6,400
	A	51,570	57,770	62,490	55,250	266
	M	75,670	69,020	83,550	61,400	16,330
	J	88,150	78,520	108,400	77,260	33,830
	J	101,500	80,890	121,100	82,590	46,020
	A	72,220	118,500	69,700	36,300	32,900
	S	58,250	81,120	61,760	30,740	38,820
	WATER YEAR	566,000	525,200	612,900	445,800	203,200
<hr/>						
Verde River	O	4,440	8,880	23,520	30,100	12,870
below Bartlett Dam	N	14,160	1,910	6,130	18,610	7,900
	D	12,630	13,540	13,470	34,840	14,500
	J	6,590	10,460	11,230	12,690	4,580
	F	4,280	19,600	14,930	9,760	4,560
	M	11,960	111,900	4,890	7,120	77,440
	A	3,160	52,550	24,490	5,560	139,700
	M	4,880	12,950	3,280	9,340	80,370
	J	35,020	35,170	14,010	31,670	68,060
	J	14,920	42,510	19,080	31,330	77,180
	A	7,960	11,840	5,630	35,310	92,740
	S	13,200	9,400	31,470	46,030	44,840
	WATER YEAR	133,200	330,700	152,100	272,500	624,700
<hr/>						
Total to Granite Reef						
Diversion Dam		699,200	855,900	765,000	718,300	827,900
<hr/>						

TABLE XVIII  
GILA RIVER DIVERSION DATA

	Month	1961	1962	1963	1964	1965
Gila River Diversions Gillespie Dam	O	578	408	1,063	1,110	972
	N	679	498	467	829	713
	D	740	1,223	565	708	1,005
	J	902	1,271	782	640	1,327
	F	770	1,120	1,327	637	1,595
	M	859	938	858	834	1,501
	A	699	842	742	713	1,824
	M	515	679	500	603	981
	J	333	436	276	270	604
	J	1,118	299	216	613	585
	A	1,085	290	2,666	5,378	629
	S	592	514	596	3,380	1,224
	WATER YEAR		8,870	8,520	9,660	15,710
Gila River below Gillespie Dam	O	0	0	135	0	0
	N	0	0	0	0	0
	D	0	0	0	0	0
	J	0	0	0	0	0
	F	0	0	0	0	256
	M	0	0	0	0	0
	A	0	0	0	0	68
	M	0	0	0	0	0
	J	0	0	0	0	0
	J	163	0	0	0	0
	A	0	0	1,070	1,670	0
	S	0	0	79	1,330	480
	WATER YEAR		163	0	1,300	3,000
Gila River below Painted Rock Dam	O	0	0	0	1	361
	N	0	0	0	0	46
	D	0	0	0	0	58
	J	0	0	0	0	103
	F	0	0	0	0	122
	M	0	0	0	15	112
	A	0	0	0	9	77
	M	0	0	0	1	3
	J	0	0	0	0	0
	J	0	0	0	0	0
	A	57	0	76	384	0
	S	188	0	0	448	0
	WATER YEAR		245	0	76	858

TABLE XIX

GROUND WATER BASINS OUTSIDE THE PHOENIX METROPOLITAN AREA  
 Water Tables, Spring 1963, Rates of Annual Decline and Forecasts 1970, 1980 and 1990  
 (Assuming Continuous Past Decline Rates)

Area	Depth to Water Spring 1963 Feet	Rate of Annual Water Table Decline Feet	Depth to Water Forecast 1970 Feet	Depth to Water Forecast 1980 Feet	*Depth to Water Forecast 1990 Feet
Waterman Wash Basin (Rainbow Valley)	215-356	2.0-10.0	277-385	365-454	453-523
Gila Bend Basin	24-329	0.0-9.7	24-364	24-414	24-464
Dendora Valley	30-60	0.7-1.8	35- 65	40- 78	45- 91
Palomas Plains (North South)	76-244	0-1.0	77-253	78-263	79-273
	30- 76	0-1.0	30- 77	30- 78	30- 79
McMullen Valley (Aguila)	406-484	2.6-9.0	424-547	450-637	476-727
Harquahala Basin	31-390	0.9-22.0	200-525	350-730	500-935
Tonopah Valley	64-245	0.3-7.7	70-273	75-313	80-353
Arlington Valley	63-200	0.6-3.0	88-215	120-235	152-255
Lower Hassayampa Valley	30-480	0-1.3	30-490	30-500	30-510

3-63

Source: Present & Future Water Use and Its Effect on Planning in Maricopa County, Arizona

\*ELLIS, MURPHY & HOLGATE Forecast

There is some natural recharge to these groundwater aquifers but it is inadequate to meet present pumping needs. During the summer, the rain that falls on the desert is usually lost to evaporation. It is estimated that only one per cent of the annual precipitation in the desert areas enters the groundwater reserve. However, locally heavy rainfall produced by high intensity thunderstorms will often cause flooding which can appreciably affect recharge over a wide area. Much of the urban growth has occurred and will continue to occur at the expense of agricultural acreage; because the water required for residential use is roughly half of that required for crop production, such growth will relieve the pressure on groundwater reserves. However, as discussed later in this report, much of the water now being used for irrigation has a fluoride content in excess of the amount allowed for domestic use by the State Board of Health.

The irrigated acreage fluctuates from year to year, in accordance with the available water supply and government acreage allotments. New additional lands are continually being developed for irrigation wherever groundwater sources can be found. Some of the older acreage is forced out of production either because the local groundwater supply is exhausted or because it has to be abandoned as pumping costs increase beyond economic limits due to falling water tables.

From the forecasted depths to groundwater, as shown in Table XIX (on the previous page), it can be seen that there may be sufficient groundwater reserves to last beyond the year 1990, but the rate of increased pumping

Costs would be a factor in determining the economic limitations of this water source.

The quality of groundwater depends on the concentration of minerals and chemicals in the water. Amounts of total dissolved solids (TDS) and individual chemicals are expressed in this report in milligrams per liter (mg/l), which is approximately equal to parts per million (ppm).

Water Quality Standards published in 1962 by the Arizona State Department of Health and adopted by reference into the regulations of the Arizona State Board of Health, establish minimum standards for chemical content of domestic water supplied by certified systems. These standards are as follows:

<u>Chemical</u>	<u>Limit</u> <u>Milligrams per Liter</u>
Total Dissolved Solids	Recommended limit 500
Hardness	Recommended range 100 to 200
Chloride	250
Fluoride	0.61 - 0.80* (optimum)**
Nitrate	45
Sulfate	250

\*This range (0.61-0.80 mg/l) is shown in Arizona State Department of Health publication "WATER QUALITY REPORT", 1962.

\*\* Two times optimum is the upper limit of acceptability.

Very little data is available on water quality for Gila and Agua Fria River flows within Maricopa County. However, one source reports the Gila River TDS load at Gillespie Dam to average 5,000 to 6,000 mg/l, while the fluoride concentration ranges from 2 to 4 mg/l. The extensive reservoir systems on

the Salt and Verde Rivers tend to equalize the extremely high and low salt waters. The TDS of the Salt River below Stewart Mountain Dam varied from 361 to 1300 mg/l during the period of 1950 to 1964, while the TDS of the Verde River below Bartlett Dam varied from 158 to 550 mg/l during the same period. The quality of water delivered to users depends on the relative amount of water contributed by each of the rivers.

Table XX (on the following page) indicates the chemical content of random samples of groundwater in various basins in the Planning Area.

#### Future Development

The overdraft on total Maricopa County water supplies is variously estimated to be between 2.2 million and 3.0 million acre-feet annually. Existing proposals promise to bring in additional water to offset the over draft.

In 1967 the President approved congressional legislation authorizing federal planning and construction of the Central Arizona Project. However, funds for the project have not yet been appropriated by Congress. In addition, although the project may deliver in excess of 2,000,000 acre-feet per year into Central Arizona within ten years after construction starts, the volume will decline by attrition of resource factors, and by the next century it may not amount to more than 500,000 acre-feet annually. Even at deliveries of 2,000,000 acre-feet, the Central Arizona Project would not fully replace depleted groundwater reserves.

TABLE XX

## GROUND WATER BASINS OUTSIDE THE PHOENIX METROPOLITAN AREA

## Quality of Ground Water 1963

Area	Total Dissolved Solids		Values Shown in Parts Per Million				Temperatures	
	Range ppm	Average ppm	Total Hardness		Fluorides		Range °F	Average °F
			Range ppm	Average ppm	Range ppm	Average ppm		
Waterman Wash Basin	528 - 2,100	1100	40 - 416	130	0.3 - 7.3	4.5	81 - 96	89
Gila Bend Basin	335 - 14,500	1900	96 - 4,860	490	0.2 - 8.0	2.9	66 - 119	82
Dendora Valley	2,111 - 7,235	3200	191 - 2,537	1,450	1.0 - 6.8	3.9	79 - 95	85
Palomas Plains	526 - 700	660	37 - 60	56	1.1 - 6.4	4.5	78 - 106	95
McMullen Valley	189 - 420	300	48 - 206	85	0.6 - 15.0	2.8	80 - 95	86
Harquahala Basin	417 - 864	600	45 - 160	100	0.6 - 32.0	3.2	76 - 102	90
Tonopah Valley	253 - 971	480	36 - 138	65	2.4 - 10.0	6.0	79 - 129	96
Arlington Valley	343 - 4,901	1200	60 - 1,635	130	0.4 - 10.0	2.3	73 - 95	87
Lower Hassayampa Valley	198 - 347	260	51 - 160	140	0.2 - 1.1	0.5	76 - 82	78

Source: Present and Future Water Use and Its Effect on Planning in Maricopa County, Arizona

Therefore it is apparent that increased effort and expenditures to develop other ways to augment the state's usable water supplies, and to increase the efficiency of their use, is necessary. Some measures that can be carried out now in the area of agriculture are: proper water management, land leveling practices, and lining of on-the-farm irrigation ditches. A major technological breakthrough in water demineralization could substantially alter present projections for the state and county usable water supplies.

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WATER AND SEWER PLAN

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## WATER AND SEWER PLAN

### General

The Water and Sewer Plan herein presented covers the results of research, study and analysis of the Planning Area as previously described. From the information presented in Section III of this report, there are two large areas in the Planning Area that, due to their topography, current use, and availability for development, have been excluded from further consideration in the Water and Sewer Plan within the time period of this study. The two areas excluded are the Tonto National Forest in northeast Maricopa County and the Gila Bend Gunnery Range in the southwest portion of the county. The remaining area covered in this report is a small but rapidly growing area north of the Valley Metropolitan Study Area and a vast expanse of sparsely settled territory amenable to development in the western portion of Maricopa County.

Virtually all of the area covered in this report has been and remains economically dependent on agriculture and ranching. Under this rural influence, most major communities have grown slowly over the years while the lesser communities have generally demonstrated no growth, or more usually, a slight decline in population during the last decade.

The area north of Phoenix, including Deer Valley, New River, and the Cave Creek-Carefree region, has begun to develop more quickly in response to the close proximity to the Phoenix Urban Area and its present northward expansion trend. It is generally anticipated that this area will continue to grow at a considerably accelerated rate compared to most other communities in the Planning Area.

As a result of the vigorous activity currently being experienced in the Avondale-Litchfield Park area it is expected that the contiguous fringes of the Planning Area will feel the effects of this aggressive expansion during the next decade. The time and significance of the impact that may occur in this fringe area is beyond projection of this report since the core of the growth in the area is outside the geographic scope of the Planning Area. Considering the degree of local interest by governing bodies and citizen involvement, as evidenced by the well organized Westside Coordinating Council, it should be expected that this closely interrelated growth will continue. We have, therefore, recommended that the Avondale-Litchfield Park area and the surrounding fringes of this area be the subject of special study to up-date prior reports and accurately evaluate the new potential of the area.

Wickenburg, which is still predominantly oriented to the agricultural and ranching industry, does have growing activity towards urban identification and economy. The city has historically enjoyed the benefit of active civic leadership with the result that tourism is growing in Wickenburg and the future may well be directed toward increased urban activities, and to light industry and manufacturing, unless civic interest responds to the increasing concern for the protection of environment as expressed at the 1970 Arizona Town Hall meeting. In this event, the city may direct its efforts towards a more selective growth pattern.

It is natural to expect that in the planned growth and expansion of the Phoenix Metropolitan Area there will be extensive residential, commercial, and industrial developments in the next 20 years. It is equally natural to assume that these developments will first be initiated in the more central location of the Valley Metropolitan Study Area and extend later to the Planning Area of this report. The planning difficulty lies in being able to predict where such developments will take place.

The previously mentioned Avondale-Litchfield Park area is an outstanding example of this phenomenon of very rapid development in an area considered dormant a few years ago. The Queen Creek area east of Chandler is another example of an unpredictable change. Within a two year period this area changed from an agriculturally oriented economy to a thriving suburban area with numerous mobile home and residential subdivisions containing literally thousands of transient and permanent homes. Many more are being planned.

Several years ago, McCulloch Development Company started a completely new town at a previously uninhabited site in Arizona along the Colorado River, to be named Lake Havasu City. This city is now a thriving, prosperous community that is continuing to grow and expand. This same developer is now well along with planning and initial site construction of another entirely new community located in the northeast part of the Valley Metropolitan Study Area, to be known as Fountain Hills. Their projections indicate a population of 78,000 by the year 2000. This

community is outside the scope of this report, but its expansion may extend into the Planning Area and its suburban influence is sure to be felt in areas such as Cave Creek and Carefree, if it achieves the growth predicted. Furthermore, it is not unrealistic to anticipate the possibility of other similar total community development in the Planning Area in the next 20 years. In any event, it does serve as an example of how quickly projected planning can change, and why planning programs must be continuously updated.

Where similar developments will occur in the future is extremely difficult to predict. However, some areas because of their resources and geographic locations, seem to have more potential than other areas.

It is expected that all other communities in the Planning Area will continue to be agriculturally oriented. Their growth patterns will be slow at best, and in many cases dormant or declining. It is known that the rural communities have not shared equally in the almost explosive prosperity of the urban communities in Maricopa County, particularly in the Phoenix Metropolitan Area.

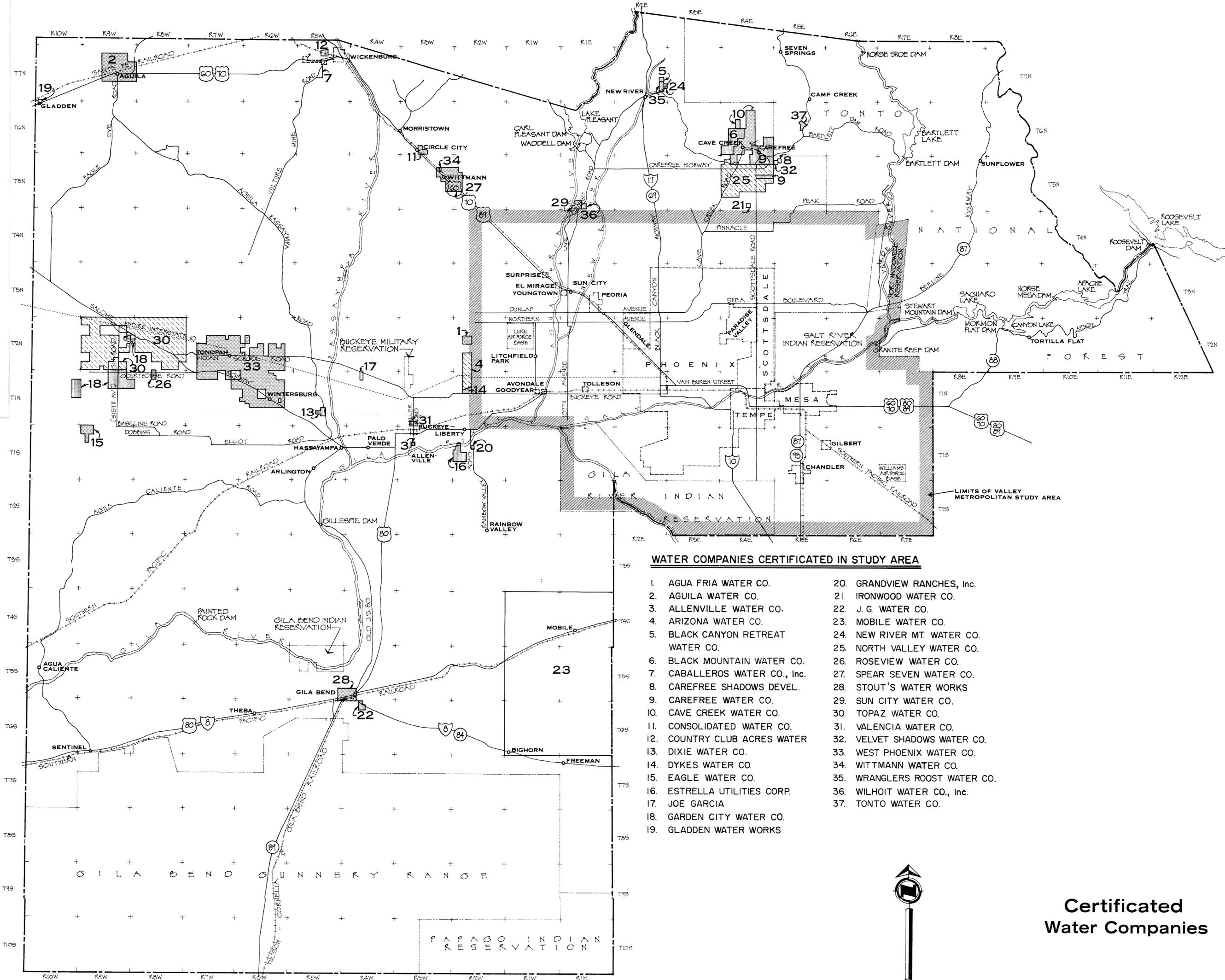
Faced with a dormant or declining growth pattern, most rural communities will not experience rapidly increasing deficiencies in their water and waste-disposal systems. However, the past years of this relatively poor economic base have created and intensified existing deficiencies which will be considerably more difficult to resolve from a financial capability point of view. These communities will continue to have difficulty with low bonding capacity, low tax base and rates, and little hope of significantly

increasing these sources of financing. The inflationary increases in the cost of construction and equipment will continue to create problems for rural communities with a dormant or declining financial base.

The existing communities in the Planning Area have been investigated and examined to identify: the historic development of the community if possible, the existing financial condition, the prevailing attitude and degree of activity of the citizens and local governments, the existing status and capacities of the water and waste-disposal systems, and the existing needs and deficiencies relative to domestic water and waste-disposal requirements.

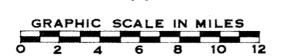
Using the background information developed in Section III and the individual community investigations, we have projected future growth and subsequent future demands for water and sewer facilities. Proposed improvements are recommended as a basis for long range planning to meet the projected future demands.

The Planning Area is characterized by having a great many certificated water companies which cover only a small percentage of the entire land as indicated on Plate 13. A few of these franchises are held by organizations serving large towns or developments but most of them are very small or not in operation. In addition to these domestic water companies, there are organizations controlling irrigation water rights extending over extensive territory. Obviously a consolidation of some



**WATER COMPANIES CERTIFICATED IN STUDY AREA**

- |                                   |                               |
|-----------------------------------|-------------------------------|
| 1. AGUA FRIA WATER CO.            | 20. GRANDVIEW RANCHES, Inc.   |
| 2. AGUILA WATER CO.               | 21. IRONWOOD WATER CO.        |
| 3. ALLENVILLE WATER CO.           | 22. J. G. WATER CO.           |
| 4. ARIZONA WATER CO.              | 23. MOBILE WATER CO.          |
| 5. BLACK CANYON RETREAT WATER CO. | 24. NEW RIVER MT. WATER CO.   |
| 6. BLACK MOUNTAIN WATER CO.       | 25. NORTH VALLEY WATER CO.    |
| 7. CABALLEROS WATER CO., Inc.     | 26. ROSEVIEW WATER CO.        |
| 8. CAREFREE SHADOWS DEVEL.        | 27. SPEAR SEVEN WATER CO.     |
| 9. CAREFREE WATER CO.             | 28. STOUT'S WATER WORKS       |
| 10. CAVE CREEK WATER CO.          | 29. SUN CITY WATER CO.        |
| 11. CONSOLIDATED WATER CO.        | 30. TOPAZ WATER CO.           |
| 12. COUNTRY CLUB ACRES WATER      | 31. VALENCIA WATER CO.        |
| 13. DIXIE WATER CO.               | 32. VELVET SHADOWS WATER CO.  |
| 14. DYKES WATER CO.               | 33. WEST PHOENIX WATER CO.    |
| 15. EAGLE WATER CO.               | 34. WITTMANN WATER CO.        |
| 16. ESTRELLA UTILITIES CORP.      | 35. WRANGLERS ROOST WATER CO. |
| 17. JOE GARCIA                    | 36. WILHOIT WATER CO., Inc.   |
| 18. GARDEN CITY WATER CO.         | 37. TONTO WATER CO.           |
| 19. GLADDEN WATER WORKS           |                               |



**Certificated  
Water Companies**

small rights into one operating agency would provide more dependable service and reduce operating costs in areas where such consolidation is feasible. Some consolidations of this nature are contemplated in certain locations as hereinafter described. Additionally, it should be recognized that other consolidation efforts may be feasible, even necessary, to receive water from the Central Arizona Project.

The following pages contain a more detailed discussion of the major communities in the Planning Area relative to their existing and projected water and sewer systems. To establish the base for community action and planning we have developed a two-stage program for each community: A recommended short range program to be undertaken as soon as possible to correct existing deficiencies and anticipated requirements to the year 1975, and a long range program recommended as a planning basis to satisfy projected requirements to the year 1990.

Some smaller communities are also discussed to describe existing conditions and future potential.

### BUCKEYE-VALENCIA-ALLENVILLE

Primarily because of Interstate Route 10, now being constructed to the north, it is expected that Buckeye will experience substantial growth during the study period. The town's population is projected to increase from the present 2,900 to 9,000 in 1980 and 11,500 in 1990. The principle force behind this growth is the continued expansion of the Phoenix Urban Area and the convenient access to Phoenix that will be provided by Interstate 10 from Buckeye.

Much of the increased population will be derived from families locating in Buckeye with the head of the household working in the Phoenix area. This convenient transportation access should also be attractive to light industry and manufacturing for locating in the lower land cost area of Buckeye, while maintaining easy access to the large metropolitan market place of Phoenix. Development of the Buckeye Airport will further enhance the attraction of business establishments to locate in the Buckeye Area.

The future growth of Buckeye will probably tend to move outward along main traffic arteries; north through Valencia toward the Freeway, east and west along Route 80, and possibly south toward Allenville. For this reason, Valencia and Allenville have been included in the analysis of this area since it appears likely that Buckeye could and should provide water and sewer services to these communities at some stage of their growth and improvement.

### Existing Conditions

During the 1960's growth and expansion in Buckeye were relatively dormant, and it is not expected to change appreciably until Interstate Route 10 is open to traffic. This dormant period has caused existing water and sewer services in Buckeye to remain adequate for that community. However, the smaller communities of Valencia and Allenville are in generally poor condition for both water and waste-disposal facilities.

The present water supply for Buckeye is derived from wells that produce water which is unsatisfactory for domestic use due to excessive mineralization. Raw water is treated in a modern plant by electro dialysis, with a design capacity of 630,000 gallons per day of good quality water. The treated water is stored in two tanks having a combined capacity of 400,000 gallons. Three pumps with respective capacities of 350 gpm, 700 gpm, and 1,150 gpm supply treated water to a pressure tank connected to the distribution system for normal water use. These pumps are so connected that they can pump raw water directly into the distribution system in case of large fire demand. Since the raw water is acceptable for domestic use except for mineral content, the temporary inconvenience to customers is offset by the financial savings of not using treated water for fire demands.

The present water supply to Valencia and the surrounding area served by the Valencia Water Company, and the present water supply to Allenville are furnished untreated from wells with a mineral content so high as to be unpalatable for human consumption. In both communities the water furnished is used for sanitation purposes, watering lawns, etc. Bottled water is purchased separately for drinking and cooking purposes.

The Buckeye sewer system has been recently improved and consists of adequately sized collector lines, serving all of the developed areas in the town. Sewage collection lines lead to two oxidation ponds located south of the town.

Valencia and Allenville do not have sewer lines or treatment facilities at the present time.

#### Short Range Recommendations (1975)

The existing water system and treatment plant should be more than adequate for the town of Buckeye during this period. In fact the present system has sufficient capacity to furnish potable water to Valencia and Allenville, which would greatly improve conditions in these two communities and increase the efficiency of the Buckeye system.

With recognition that there may be unforeseen political and jurisdictional difficulties concerning the Valencia Water Company, it is recommended that the town of Buckeye begin immediately to start the necessary action to take responsibility for supplying water to Valencia, and to surrounding areas including a portion within the Buckeye town limits now being served by the Valencia Water Company. It is likely that this area will be completely annexed in the future; however, the need for good water exists now and should be satisfied as quickly as possible. Service to this area could easily be attained by constructing a connection from the 12-inch Buckeye main to the 6-inch loop around the area, along with such additional local distribution mains as may be necessary.

It is recommended that Buckeye provide limited water service to Allenville during this period by construction of a 6-inch supply main connected to their existing system. This would allow Allenville to abandon their present well for normal domestic use.

The existing sewer system for Buckeye appears adequate during this period with the possible need for some attention being given to the odor problem emanating from the lagoons. A program of preventive maintenance would probably reduce this condition to an infrequent occurrence. However, if the condition becomes increasingly objectionable the addition of aeration pipes to improve oxidation in the lagoons could be a feasible solution.

It is recommended that a new sewage system, which could be connected to the Buckeye trunk sewer, should be provided as soon as possible for the community of Valencia. However, it may not be financially possible until after 1975.

A reasonable method of extending the Buckeye sewer system to provide service for Allenville does not appear feasible in the near future. However, with the increased quantity of available water as recommended previously, the health aspects of the existing sanitation conditions could be improved by installing more effective individual waste-disposal systems, such as septic tanks, or small package treatment plants.

#### Long Range Planning (1990)

With a projected population in 1990 of almost triple the existing population and the anticipation of new industrial development, it is expected

that the well water supply and treatment plant capacities will have to be increased approximately 25 per cent to meet the demand. Of course, additional water mains and distribution lines will be required to service the new residential and industrial districts.

By the end of the study period it is expected that the strong northward expansion will have grown beyond Valencia, and if that community is not annexed completely, it will probably be totally integrated into the Town of Buckeye for water and sewer services.

Future studies of growth patterns of Buckeye and the development of Allenville will be necessary to determine what should be done in Allenville. Perhaps enough development will take place to justify an expanded water distribution system. On the other hand, time may indicate a declining growth pattern of Allenville residents moving to the more convenient locale of Buckeye to the extent that the community will ultimately disappear or lose its separate identity.

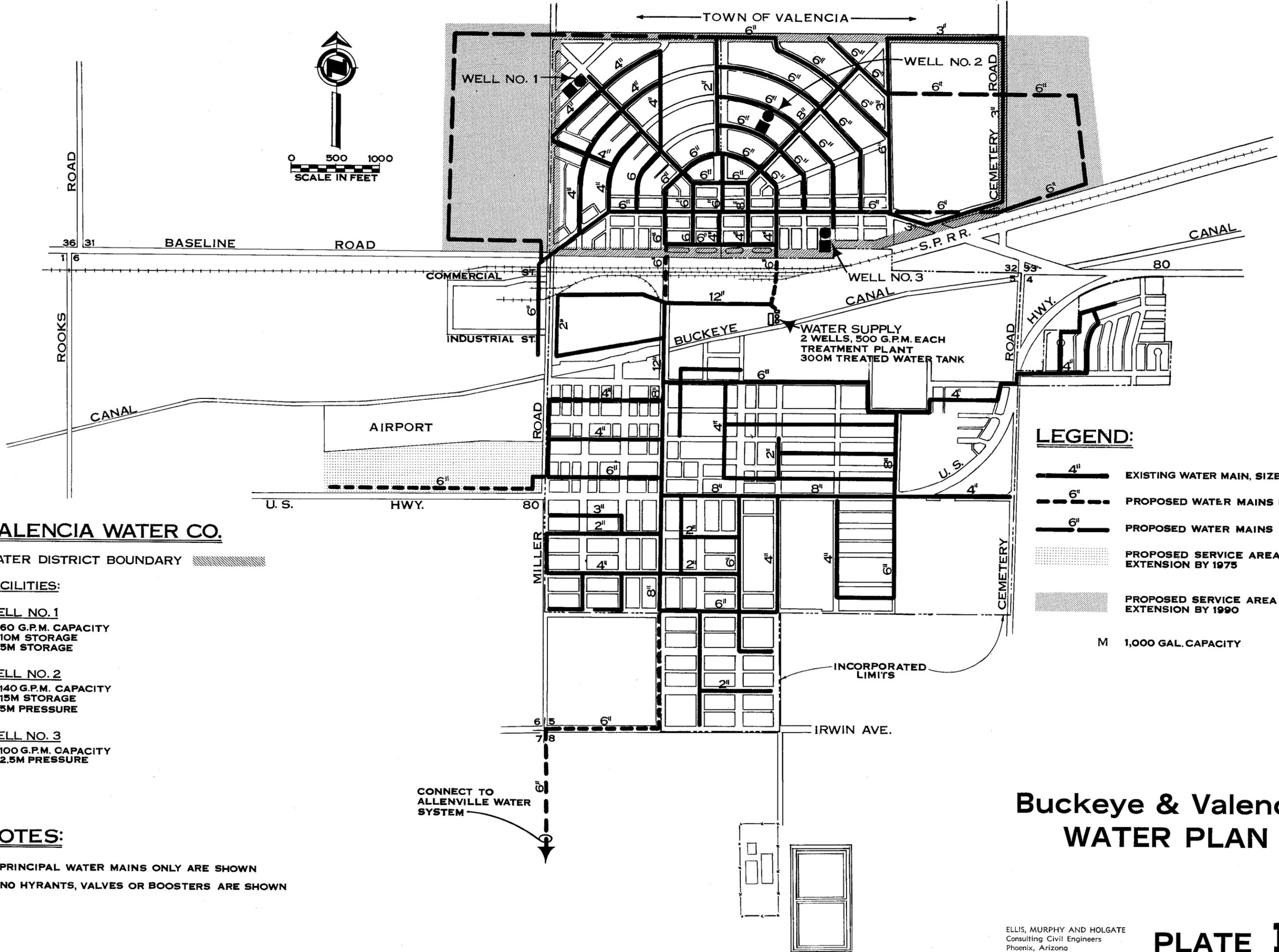
As the direction and type of growth in Buckeye becomes more defined, a review of conditions will determine the most effective way of meeting increased sewage demands. As of now it is difficult to predict precisely the best method of sewage treatment at the end of the study period. It is likely that a simple enlargement of the existing lagoons would not be preferred and probably would not be acceptable. It may be that improved oxidation ponds at a more remote location would be acceptable.

A package treatment plant or other method of providing more complete reduction might prove feasible and certainly more preferrable.

The results of this continuing planning for Buckeye sewage treatment will determine the feasibility of improvements in Allenville, if indeed improvement of sewage treatment is warranted at all. The relocation of oxidation ponds or the location of a new treatment plant will have considerable effect on the economic feasibility of including Allenville in the system, since it is below Buckeye in elevation and does not have gravity access to the existing treatment lagoons.

Long range planning should also investigate the potential of forming, or including Buckeye in, a large Sanitary District as previously suggested, as a more efficient and reliable organization for water and sewer management and control.

Plates 14 and 15 show the existing water and sewer systems for Buckeye and Valencia, and the proposed improvements required by 1975 and by 1990. Plate 16 shows the existing water system in Allenville and the recommended connection to the Buckeye system to be accomplished by 1975.



**VALENCIA WATER CO.**

WATER DISTRICT BOUNDARY

**FACILITIES:**

**WELL NO. 1**

60 G.P.M. CAPACITY  
10M STORAGE  
5M STORAGE

**WELL NO. 2**

140 G.P.M. CAPACITY  
15M STORAGE  
5M PRESSURE

**WELL NO. 3**

100 G.P.M. CAPACITY  
2.5M PRESSURE

**NOTES:**

1. PRINCIPAL WATER MAINS ONLY ARE SHOWN
2. NO HYDRANTS, VALVES OR BOOSTERS ARE SHOWN

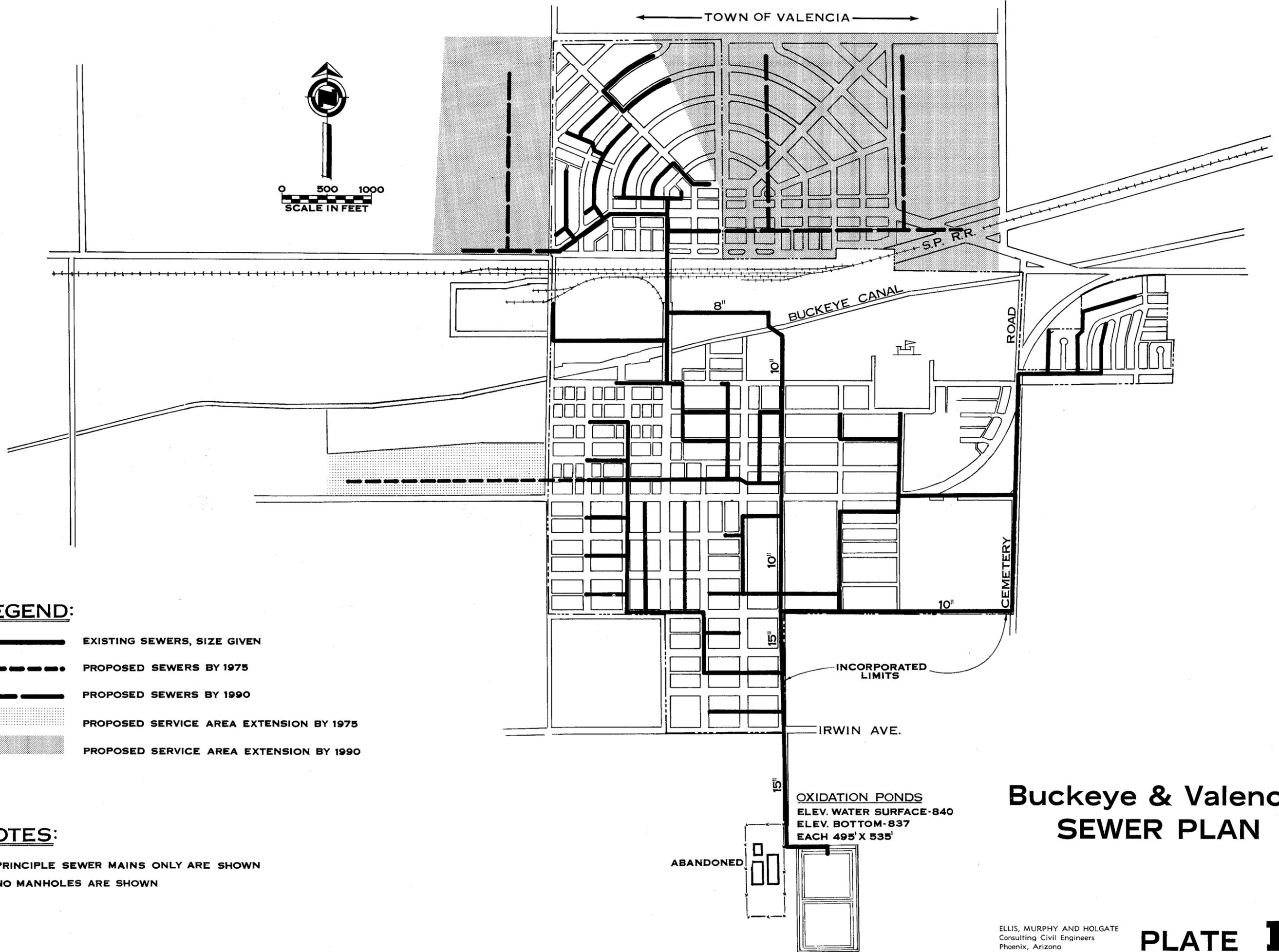
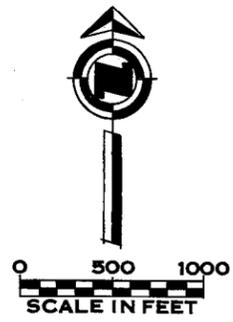
**LEGEND:**

- 4" EXISTING WATER MAIN, SIZE GIVEN
- 6" PROPOSED WATER MAINS BY 1975
- 6" PROPOSED WATER MAINS BY 1990
- PROPOSED SERVICE AREA EXTENSION BY 1975
- PROPOSED SERVICE AREA EXTENSION BY 1990
- M 1,000 GAL. CAPACITY

**Buckeye & Valencia  
WATER PLAN**

ELLIS, MURPHY AND HOLGATE  
Consulting Civil Engineers  
Phoenix, Arizona

TOWN OF VALENCIA



**LEGEND:**

- EXISTING SEWERS, SIZE GIVEN
- PROPOSED SEWERS BY 1975
- PROPOSED SEWERS BY 1990
- PROPOSED SERVICE AREA EXTENSION BY 1975
- PROPOSED SERVICE AREA EXTENSION BY 1990

**NOTES:**

1. PRINCIPLE SEWER MAINS ONLY ARE SHOWN
2. NO MANHOLES ARE SHOWN

# Buckeye & Valencia SEWER PLAN

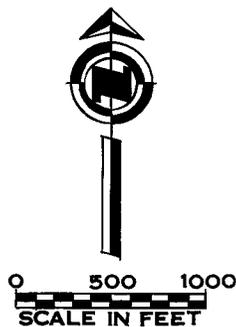
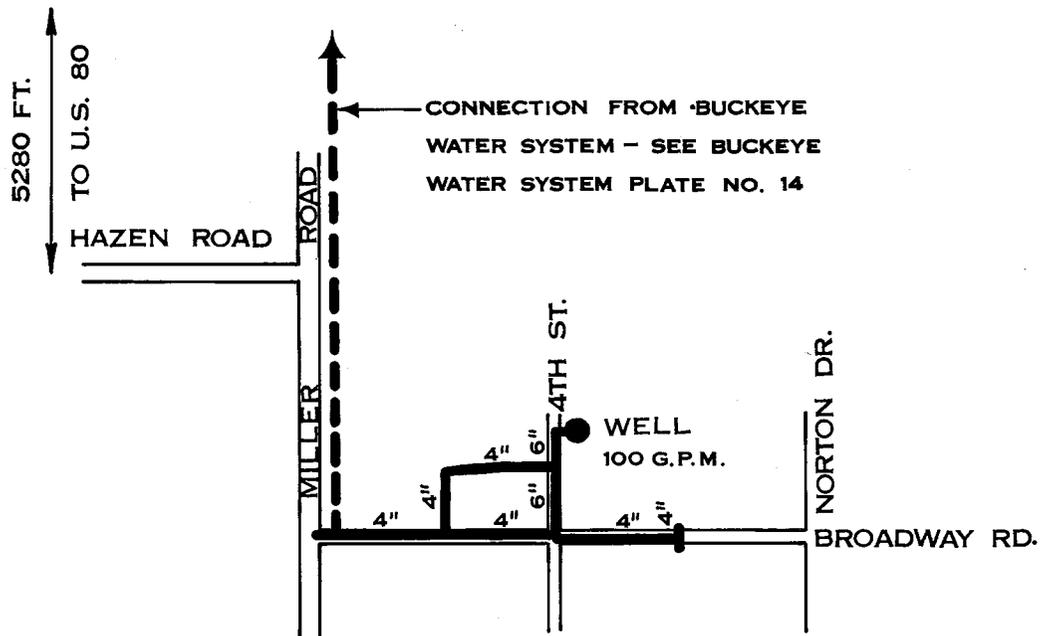
ELLIS, MURPHY AND HOLGATE  
Consulting Civil Engineers  
Phoenix, Arizona

**NOTES:**

- 1. THERE IS NO SANITARY SEWER SYSTEM
- 2. PRINCIPAL MAINS ONLY ARE SHOWN

**LEGEND:**

-  EXISTING WATER MAIN, SIZE GIVEN
-  PROPOSED WATER MAIN BY 1975
-  EXISTING WELL



**ALLENVILLE  
WATER PLAN**

ELLIS, MURPHY AND HOGATE  
Consulting Civil Engineers  
Phoenix, Arizona

**PLATE 16**

## CAVE CREEK-CAREFREE

It is expected that the communities of Cave Creek and Carefree will grow into each other, and growth in this entire area is expected to be comparatively rapid. For this reason the analysis of these two communities has been combined. Long range planning and interim development is directed toward the formation of a single utility district for administering water and sewer service to both communities and the surrounding area.

Immediate and interim needs will most probably be resolved independently by each community. However, these interim developments should always be reviewed for compatible inclusion in the future plan for a consolidated utility district. Therefore, existing conditions and future improvements will be described separately for each community followed by a general description and map for the consolidated district which is contemplated.

In response to the pressure of the northward expansion of Metropolitan Phoenix, growth in the Cave Creek-Carefree area is expected to be rapid. In fact, recent events have rendered growth in this area almost impossible to project. Arizona State University is considering the feasibility of establishing a branch campus in the area. The City of Phoenix proposes to acquire Deer Valley Airport and implementation of planned improvements will certainly stimulate further growth, not only in population but also the additional demands of industrial services. The success of the entirely

new community of Fountain Hills being developed northeast of Scottsdale will also have an effect on the Cave Creek-Carefree area. Fountain Hills will be discussed in more detail elsewhere in this report.

Without these recent events and their potential effect, the Cave Creek-Carefree area had a projected population growth from the present 1,850 to 7,465 in 1980 and 12,000 in 1990. It now appears likely that these figures will be exceeded. It is expected that in the immediate future this growth will thrust outward from the town centers of each community.

#### Existing Conditions

The water supply and the limited distribution system in Cave Creek is privately owned at present. Water company maps indicate that there are five wells connected to three separate distribution systems, with storage and pressure tanks on each system. Active capacity of the water supply is not known, nor is data available to determine if any of the wells are inactive or of marginal productivity. The distribution systems consist basically of 6-inch pipes but total service is limited to 235 metered connections plus supply to 15 tank trucks hauling water.

In Carefree there are currently three water supply wells with a combined capacity of more than 1,000 gpm connected to the system; both quantity and quality are satisfactory. Total storage is 200,000 gallons supplied to three pressure zones but the highest tank, with a capacity of 150,000 gallons experiences excessive pressure losses due to a long run of pipe connecting the tank to the active system. Water for golf course irrigation is furnished by a completely separate system.

Cave Creek does not have an existing sewer system. Individual waste-disposal systems are used extensively at the present time.

In Carefree there is neither a comprehensive sewerage system nor a central sewage treatment plant at the present time. The shopping center is connected to a septic tank. The lodge and associated cottages are served with a Walker process package plant having a daily treatment capacity of 100,000 gallons, which appears to be considerably in excess of the requirement. The 50-unit townhouse area is connected to a Defiance oxygen process treatment unit of 15,000 gallons per day capacity discharging into a disposal bed. All other sewage is disposed of in septic tanks.

#### Short Range Recommendations (1975)

It is recommended that the Cave Creek water supply be remodeled by interconnecting the systems, adding necessary local mains to serve adjacent development areas, providing adequate fire hydrants, and changing to a gravity system based on a steel storage tank located at a suitable elevation on the high land below Black Mountain. Depending on growth of the areas served by the independent water systems to the northeast and to the southwest of the town center and the intervening territory, it may be necessary to incorporate and improve these systems also in the intermediate rather than in the 1990 development phase.

It is recommended that exploratory steps be taken immediately toward consolidating these three separate systems into one system. The single system could function satisfactorily in the longer range planning necessary to consolidate the Cave Creek community system with the Carefree system, and ultimately form a larger Utility District.

For Carefree it is recommended that reliable storage capacity in the water system be increased by 250,000 gallons to insure adequate water for fire protection. This additional tank should be connected into a looped system with a pipe large enough to allow full fire flow from the tank.

For Cave Creek it is recommended that action should be initiated on the planning of a comprehensive sewer system. A main sewer line should be constructed through the town center northward toward Galloway Wash where it would join an interceptor running westward along the wash to discharge into two sewage lagoons each with an area of one acre and a nominal liquid depth of 4 feet. Reports indicate a high groundwater level in this area. Design of the recommended sewage lagoons must provide protection against contamination of this groundwater supply source from lagoon seepage, even if the lagoons are considered temporary, until a future plant is constructed for an ultimate consolidated district.

In Carefree the most pressing need for sewage handling is construction of some type of temporary treatment system to process waste from the shopping area until an overall plan of sewage collection and treatment

is developed. Probably the most feasible interim solution would be the construction of a packaged oxidation process treatment unit with a capacity of 50,000 gallons per day. This equipment is more likely to have some ultimate salvage value.

#### Long Range Planning (1990)

Underground water in the area appears to be sufficient in both quantity and quality to support a sizable population. Ground surface generally slopes in a southwesterly direction from elevation 2700 in the northwest corner of the future Carefree area, to 2100 at the lower end of Cave Creek. A series of pressure reducing stations could be located to supply water at satisfactory pressure to various zones; adequately sized mains supplemented by storage tanks would provide necessary fire flows in the lower and less densely populated sections.

As population increases toward the 1990 projection, the water systems of the two communities should be connected by installing a new main along Cave Creek Road. Additional storage of 350,000 gallons should be provided to bring total storage up to a reasonable figure. All tanks should be connected into a looped system to insure full fire flow at all times. If financially feasible, it might be more economical to provide this storage addition in a single tank built now, which would require installation of the Cave Creek Road connection at the same time. In this period it would also be advisable to connect another well to the system so that the daily domestic demand of 700 gpm could be satisfied assuming the highest capacity well was out of service.

The natural drainage of the entire area is westward to Cave Creek but a divide through Black Mountain directs most of the surface flow from the developed area north to Galloway Wash. Sewers from this area could be connected to a gravity interceptor near the wash, which would discharge into a district treatment plant adjacent to Cave Creek. Indicated daily capacity of the treatment plant is 600,000 gallons, and B.O.D. reduction should be in the order of 90-95 per cent.

This single district sewer system would gather most of the waste generated by both communities, including some anticipated growth south of Carefree. The system as herein conceived would not include growth to the south of Cave Creek. For this area a small package treatment plant is recommended as being the most economical waste-disposal method, even if the area should experience considerable growth, which is not anticipated at this time.

Scottsdale is extending a sewer trunk northward toward the Carefree area in anticipation of continuing growth in that direction. The single district system planned for this area would include growth expansion outward from Cave Creek-Carefree communities. There is little doubt that the area south of these limits to the Phoenix Metropolitan Area will also develop as a result of the anticipated Phoenix Urban expansion. It must be assumed that water and sewer facilities will be extended from Phoenix and Scottsdale to serve these areas.

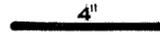
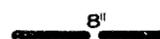
Note that one interceptor trunk is planned to run south from Carefree, to connect into the Scottsdale trunk. It should be recognized that if there is a limit on the quantity of sewage that the Scottsdale trunk can accept, it may be necessary to construct an additional interceptor trunk along the south side of the Cave Creek area, and install a larger treatment plant farther south along Cave Creek.

Existing water and sewer systems, and recommended future extensions and improvements for the study periods of 1975 and 1990 are shown on the following plates:

- Plate 17 . . . . . Cave Creek - Water Plan
- Plate 18 . . . . . Carefree - Water Plan
- Plate 19 . . . . . Cave Creek - Sewer Plan
- Plate 20 . . . . . Carefree - Sewer Plan

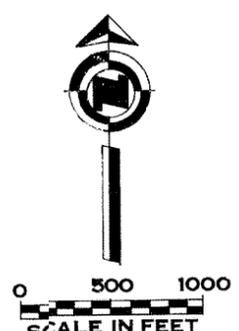
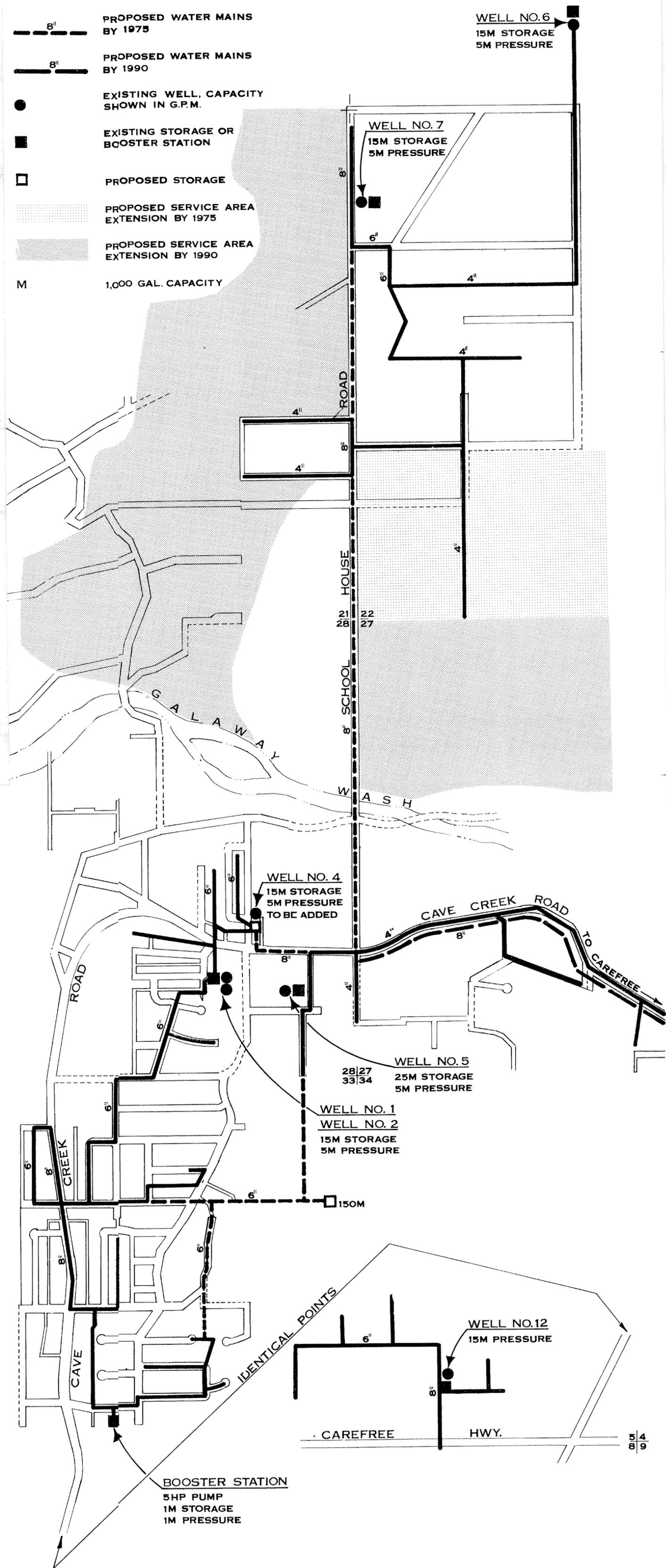
Plate 21 shows a general plan of the sewer interceptor trunks and treatment plant for a Consolidated Utility District and the initial water mains and storage requirements anticipated. The utility district should be formed to administer both sewer and water service, and possibly irrigation water, drainage and flood control as well. A detailed feasibility study should be started at the earliest possible date to establish a workable master plan for future developments.

**LEGEND:**

-  4" EXISTING WATER MAINS, SIZE GIVEN
-  8" PROPOSED WATER MAINS BY 1975
-  8" PROPOSED WATER MAINS BY 1990
-  EXISTING WELL, CAPACITY SHOWN IN G.P.M.
-  EXISTING STORAGE OR BOOSTER STATION
-  PROPOSED STORAGE
-  PROPOSED SERVICE AREA EXTENSION BY 1975
-  PROPOSED SERVICE AREA EXTENSION BY 1990
- M 1,000 GAL. CAPACITY

**NOTES:**

1. PRINCIPAL WATER MAINS ONLY ARE SHOWN
2. NO VALVES OR HYDRANTS ARE SHOWN



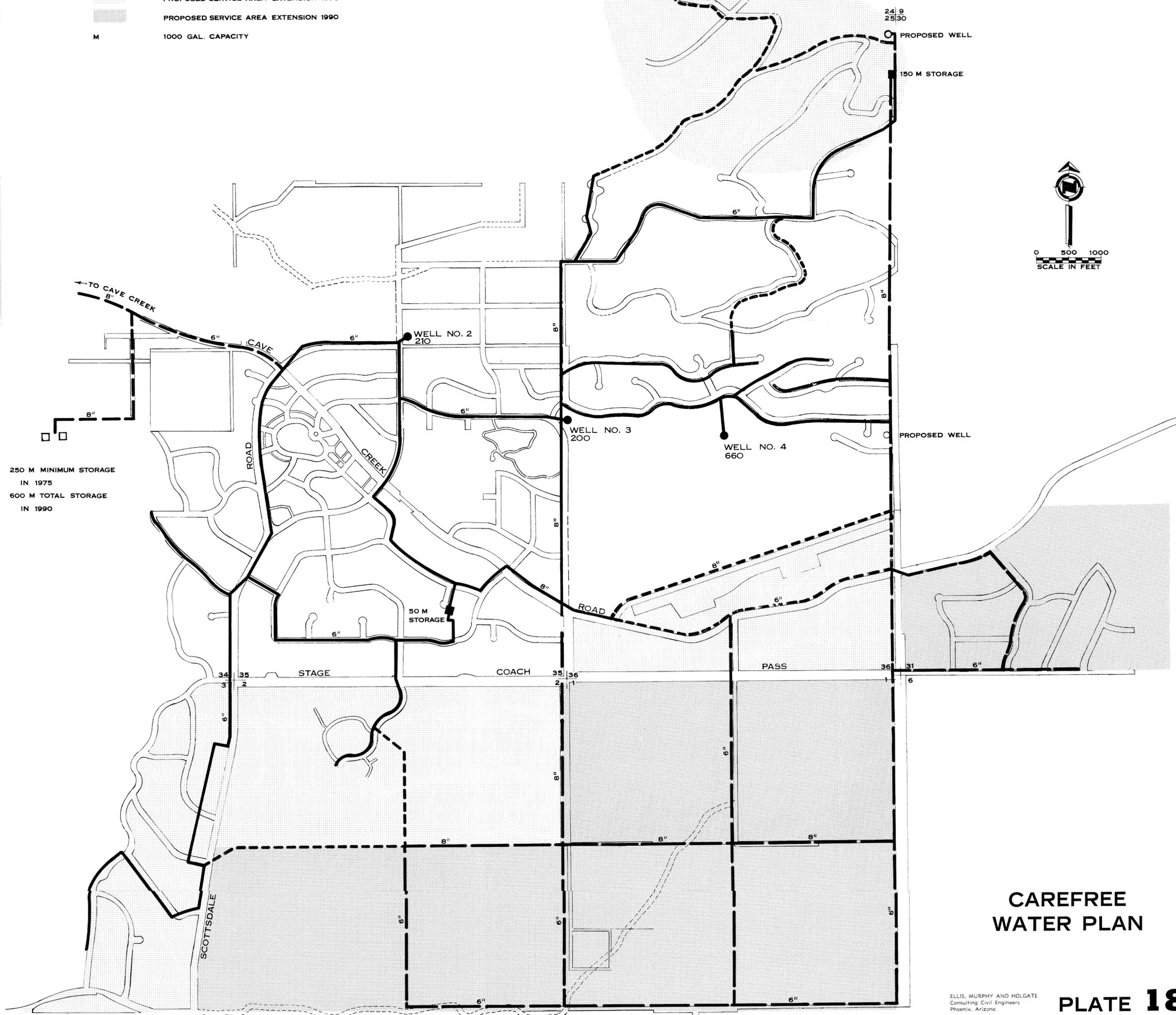
**CAVE CREEK WATER PLAN**

**LEGEND:**

-  EXISTING WATER MAINS, SIZE SHOWN
-  PROPOSED WATER MAINS BY 1975
-  PROPOSED WATER MAINS BY 1990
-  EXISTING WELL, CAPACITY SHOWN IN G.P.M.
-  PROPOSED WELL
-  EXISTING STORAGE
-  PROPOSED STORAGE
-  PROPOSED SERVICE AREA EXTENSION 1975
-  PROPOSED SERVICE AREA EXTENSION 1990
- M** 1000 GAL. CAPACITY

**NOTES:**

1. PRINCIPAL WATER MAINS ONLY ARE SHOWN
2. HYDRANTS, VALVES AND BOOSTER STATIONS NOT SHOWN



250 M MINIMUM STORAGE  
IN 1975  
600 M TOTAL STORAGE  
IN 1990

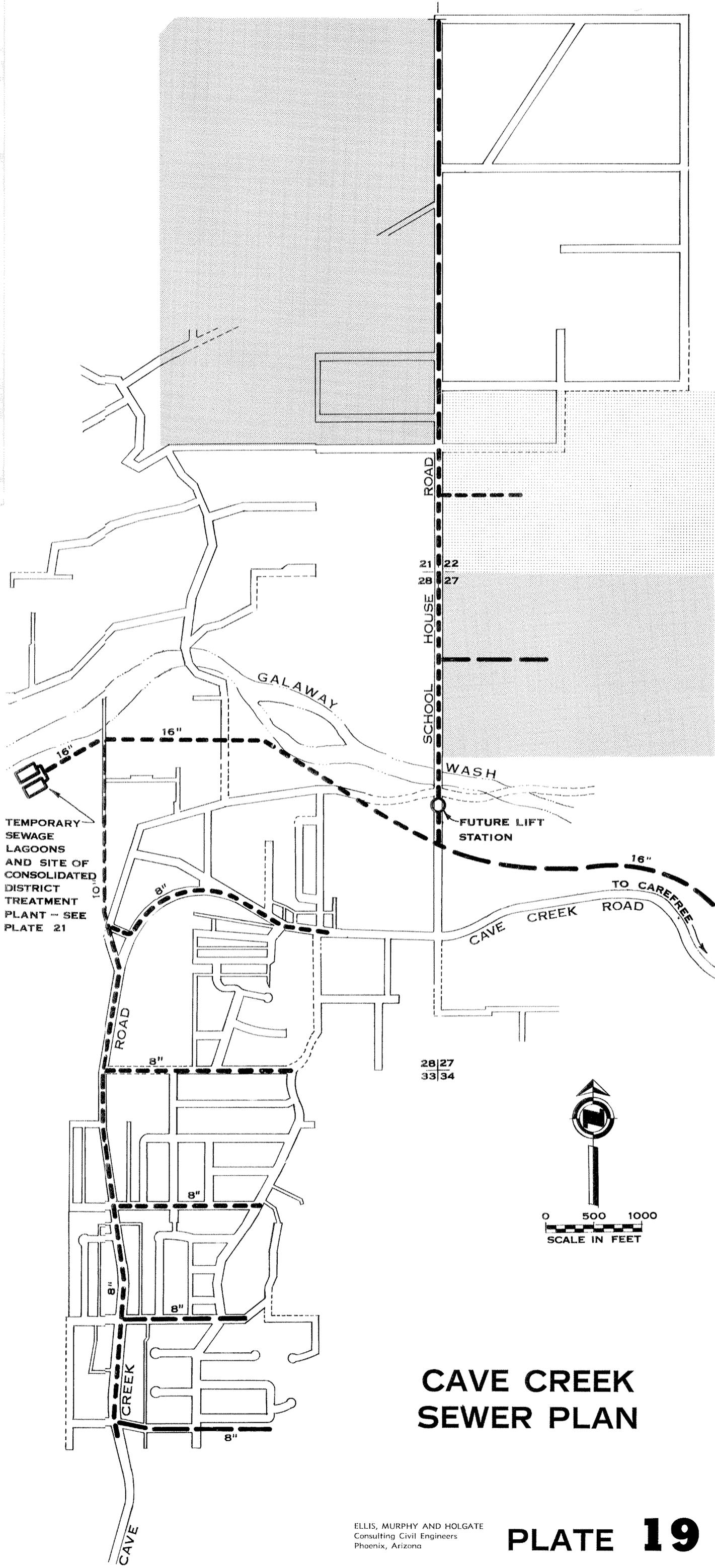
**CAREFREE  
WATER PLAN**

**NOTES:**

- 1. THERE ARE NO EXISTING SEWERS
- 2. PRINCIPAL SEWER MAINS ONLY ARE SHOWN
- 3. MANHOLES NOT SHOWN

**LEGEND:**

-  PROPOSED SEWER MAINS BY 1975
-  PROPOSED SEWER MAINS BY 1990
-  PROP. SERVICE AREA EXTENSION 1975
-  PROP. SERVICE AREA EXTENSION 1990



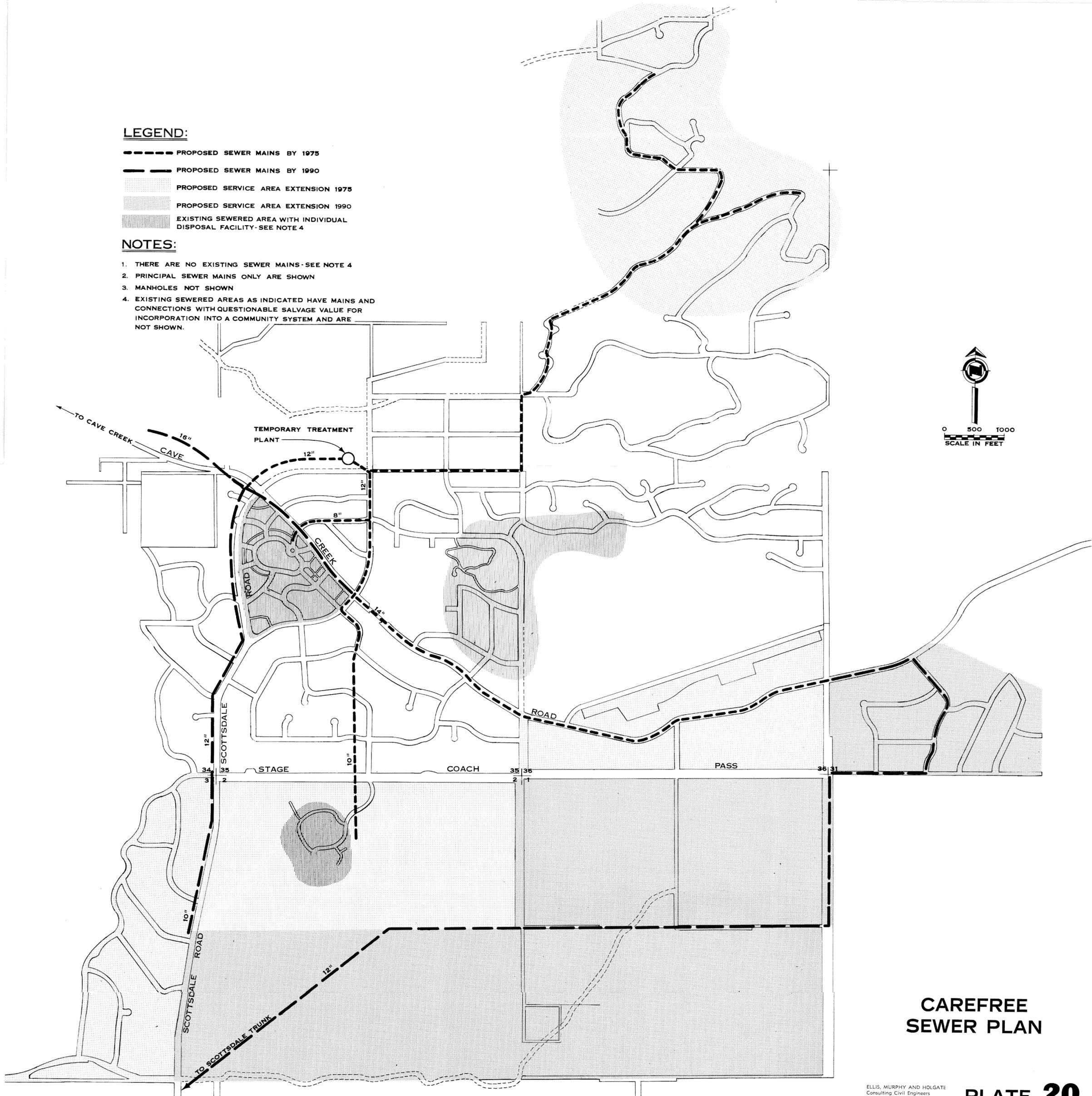
**CAVE CREEK SEWER PLAN**

**LEGEND:**

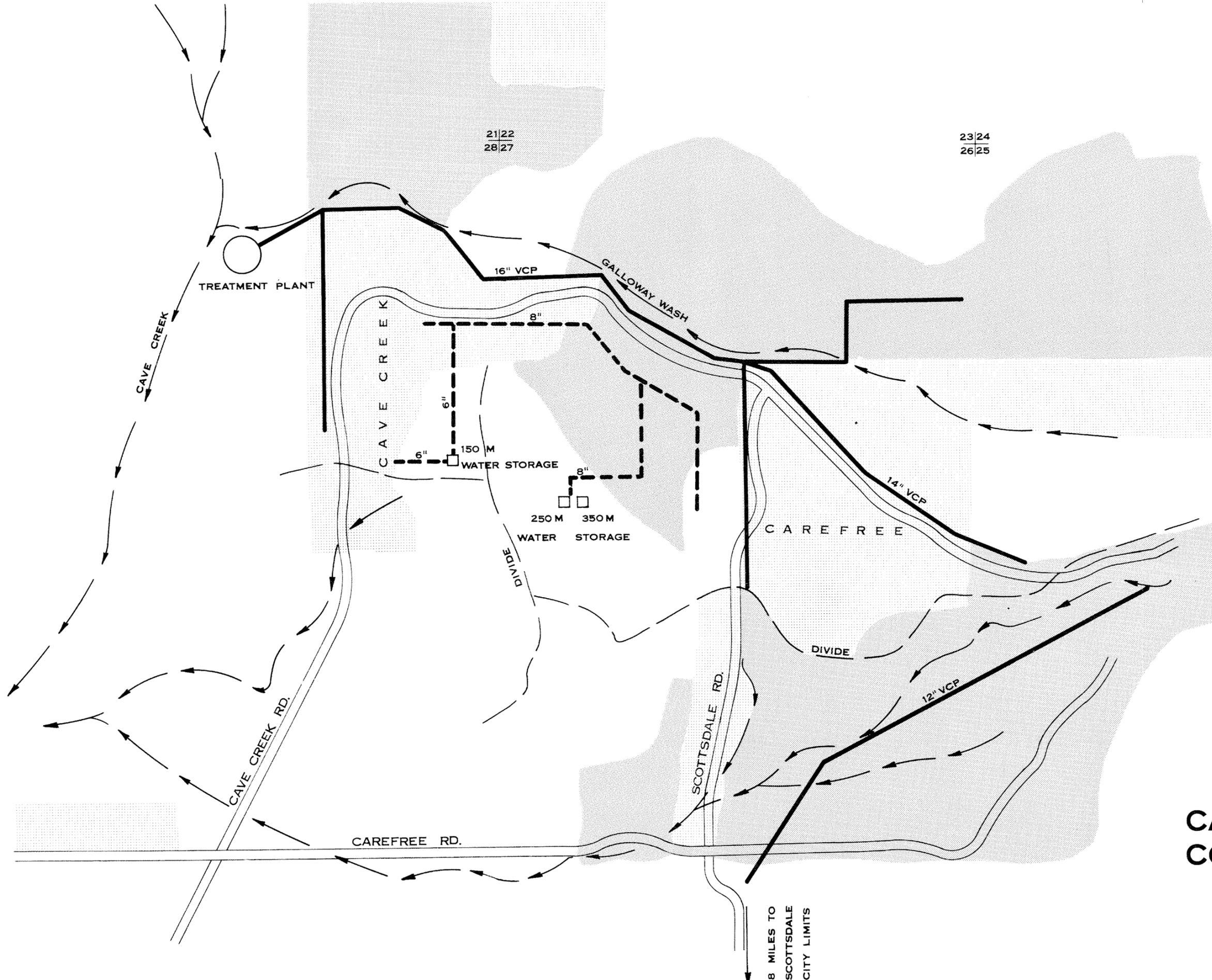
- PROPOSED SEWER MAINS BY 1975
- PROPOSED SEWER MAINS BY 1990
- ..... PROPOSED SERVICE AREA EXTENSION 1975
- ..... PROPOSED SERVICE AREA EXTENSION 1990
- ..... EXISTING SEWERED AREA WITH INDIVIDUAL DISPOSAL FACILITY-SEE NOTE 4

**NOTES:**

1. THERE ARE NO EXISTING SEWER MAINS-SEE NOTE 4
2. PRINCIPAL SEWER MAINS ONLY ARE SHOWN
3. MANHOLES NOT SHOWN
4. EXISTING SEWERED AREAS AS INDICATED HAVE MAINS AND CONNECTIONS WITH QUESTIONABLE SALVAGE VALUE FOR INCORPORATION INTO A COMMUNITY SYSTEM AND ARE NOT SHOWN.

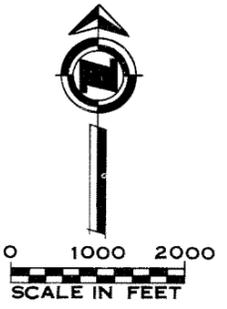


**CAREFREE  
SEWER PLAN**



**LEGEND:**

- — — — — WATERSHED DIVIDE
- → → → → WATER COURSE
- INTERCEPTOR SEWER
- ▨ SETTLED AREA
- ▩ SETTLED BY 1990
- - - - - WATER SYSTEM INTERCONNECTION
- PROPOSED STORAGE
- M 1000 GALLONS



**CAVE CREEK - CAREFREE  
CONSOLIDATED UTILITY  
DISTRICT**

ELLIS, MURPHY AND HOLGATE  
Consulting Civil Engineers  
Phoenix, Arizona

## GILA BEND

Gila Bend has not shown significant growth since 1960. Although prior projections had indicated a rather firm growth pattern, the 1970 census figures did not support these projections. More recent projections still indicate that Gila Bend will grow from its present population of 1,726 to 3,200 by 1990. We are inclined to think that even this growth projection is doubtful, however many imponderables will influence growth and expansion and the projections are satisfactory for planning purposes.

Airport improvements and some school expansion are presently planned. Both of these are favorable indicators for projecting a strengthening economy and stronger growth potential.

With the completion of Interstate Route 8, Gila Bend should benefit from increased tourist trade, and present an attractive location for certain types of manufacturing and distribution industries.

Much of the success of local government bodies and civic activities to achieve growth and an improved economy will be contingent upon their resolution of some serious and rather difficult problems with their water supply and distribution system.

### Existing Conditions

At the present time the water distribution system is owned and operated by a certificated water company. The company owns all supplementary equipment, such as pumps and pressure tanks, and it leases three wells

and one raw water storage tank from the Southern Pacific Railroad. The quantity of the water supply and storage capacity are adequate for present needs. However, the distribution system is inadequate for domestic use in many areas and for fire protection in all areas. At the present time raw water is supplied to the system untreated and water quality is poor because of excessive amounts of fluorides and total dissolved solids. Residents must supplement their metered water with bottled drinking water, which costs them \$10 to \$15 per month. Furthermore, the system does not serve all of the residences in Gila Bend; residents without water service must rely on bottled water for all of their water needs.

The distribution system is in poor condition with undersized mains, loss of pressure through leakage, lost and buried meters, and other signs of poor maintenance and deterioration.

The Town of Gila Bend is willing to assume ownership of the water system but has thus far been unsuccessful in arriving at agreement on terms of a transfer of ownership.

A sewage system including collection lines and mains leading to oxidation ponds has been installed since 1962 and a third pond has recently been added and put into service. The system is functioning satisfactorily and service is provided to all parts of the town.

There are now 25 Indian residences close to the town limits that are presently using unsatisfactory leaching beds for sewage disposal.

Short Range Recommendations (1975) AND Long Range Planning (1990)

Due to the difficult nature of resolving the water system problems, the anticipated difficulties with funding the recommended improvements, and the doubtful nature of the future growth of Gila Bend, we have combined the two time periods with the belief that execution of the recommendations is needed as quickly as possible, and once completed will satisfy the projected requirements for this community for the study period to 1990.

In April, 1970 a comprehensive report covering a study of necessary water treatment for the Town of Gila Bend was prepared for the Arizona Corporation Commission by John Carollo Engineers of Phoenix, Arizona. The report is very extensive and complete in its coverage and evaluation of the subject. We agree with the results of this report insofar as the type of treatment recommended, which was the main thrust of the study; namely, demineralization by electro dialysis and defluoridation by the activated ammonia process.

The recommendations made herein assume that the Town of Gila Bend has acquired ownership of the present water system and is legally free to commence with the desired improvements, and that a source of better quality water is not available.

Present needs to upgrade the water system to acceptable standards is more than can reasonably be funded in the immediate future and possibly during the 20-year study period. Therefore, priorities must be established and work accomplished not only on the basis of social and engineering requirements, but also on the basis of available funds.

The following recommendations are listed in the order of their priority starting with highest priority first and descending in importance:

1. The present distribution system must be expanded and/or improved to supply adequate water to residents receiving none or very poor service now. While the raw water now being furnished is below established standards of the Health Department, there is no evidence over several years that this water has caused any serious or communicable health problems. From a health standpoint, more good can be accomplished by furnishing residents an adequate supply of water than by furnishing them little or no treated water.
2. After the distribution is satisfactorily expanded to serve the community with water, the next step should be the installation of an electro dialysis unit for demineralization of the raw water. The capacity of this unit should be reviewed for the updated population figures and revised growth projections of the community.
3. The distribution system will probably require nearly complete replacement. We recommend that the replacement project start with the oldest and smallest water mains as a basis for installing complete adequately sized distribution system.

Replacement of water pipes is scheduled behind installation of the demineralization unit to avoid corrosion of new piping.

4. When completed the upgraded distribution system should have installed not less than 6-inch mains in areas where fire hydrants are considered necessary. Additional new distribution mains should be added to newly developed areas as part of the overall program.

During this period of replacement the defluoridation unit, using the activated ammonia process, should be installed when financing is available. The capacity of the defluoridation unit should be established just prior to installation using current data for design.

If the preceding recommendations for water system improvements are accomplished, it should provide adequate delivery of good quality water through the study period to 1990. Implementation of these recommendations will also improve the economic well-being of both the Town of Gila Bend and its residents.

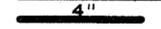
The recently installed third oxidation pond and the installation of an outfall line should provide sufficient capacity to adequately handle sewage disposal demands through the 20-year study period. Additional collection lines will be required during this time to serve new residential and industrial areas.

The 25 Indian Reservation residents now located near the town limits, and future residential units on the reservation in this same area (perhaps 25 more), should be connected to the community sewer system if at all possible.

Plate 22 shows the existing water system facilities and recommended improvements and expansion of the water system.

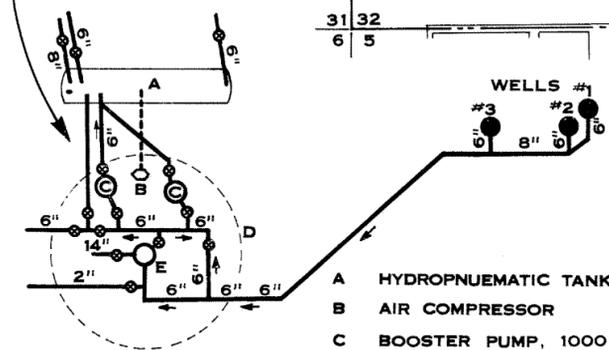
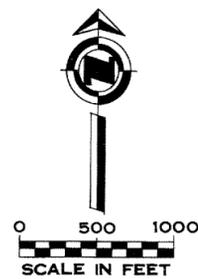
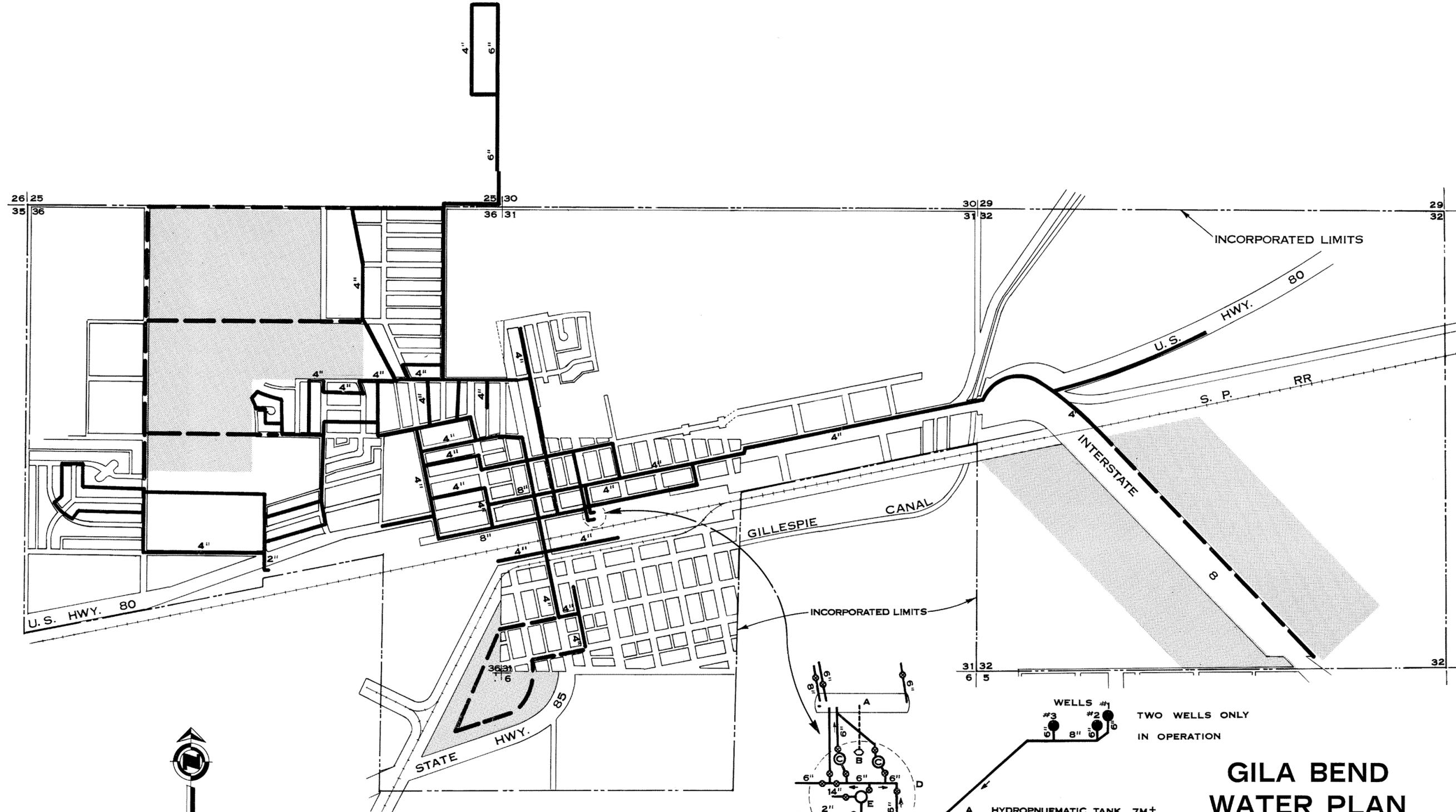
Plate 23 shows the existing sewer system and projected possible expansion of the system during the design periods to 1975 and 1990.

**LEGEND:**

-  4" EXISTING WATER MAIN, SIZE GIVEN
-  POSSIBLE WATER MAINS BY 1990
-  POSSIBLE SERVICE AREA EXTENSION BY 1990

**NOTES:**

1. PRINCIPAL WATER MAINS ONLY ARE SHOWN
2. HYDRANTS, VALVES AND BOOSTER STATIONS NOT SHOWN



- A HYDROPNEUMATIC TANK, 7M±
- B AIR COMPRESSOR
- C BOOSTER PUMP, 1000 GPM
- D ELEVATED TANK, 360 M
- E RISER TO ELEV. TANK

**GILA BEND WATER PLAN**

22|23  
 27|26  
 1 NEW OXIDATION POND  
 2 OXIDATION PONDS  
 BOTTOM AREAS 4.71 & 3.32 AC.  
 BOTTOM ELEV 658.4  
 L.W. 661.4  
 H.W. 663.4

23|24  
 26|25

27|26  
 34|35

26|25  
 35|36

29|28  
 32|33

32|33  
 5|4

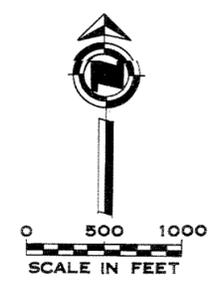
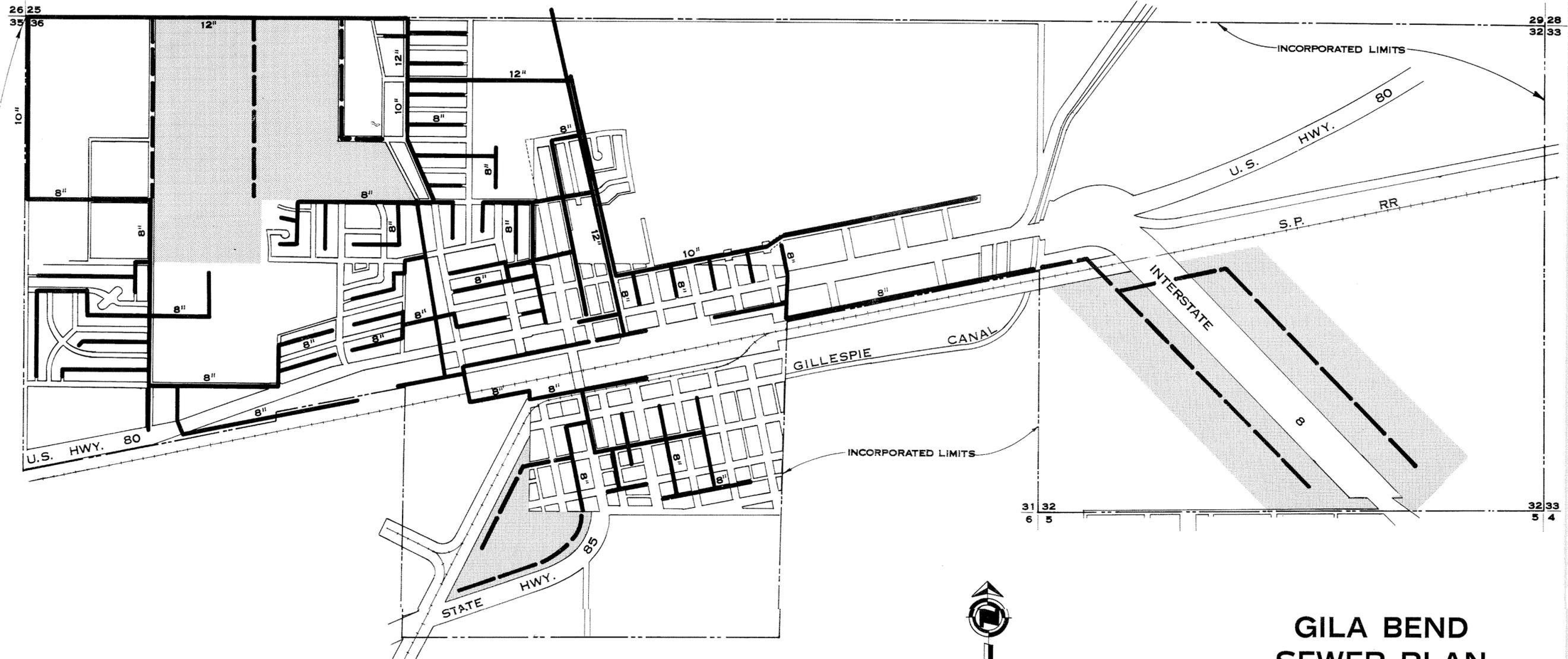
**LEGEND:**

- 8" EXISTING SEWERS, SIZE GIVEN
- POSSIBLE SEWER MAINS BY 1990
- POSSIBLE SERVICE AREA EXTENSION BY 1990

**NOTES:**

1. PRINCIPAL SEWER MAINS ONLY ARE SHOWN
2. MANHOLES NOT SHOWN

IDENTICAL POINTS



**GILA BEND SEWER PLAN**

## WICKENBURG

Wickenburg has demonstrated a steady growth pattern over the last decade. The loss to the community that might be expected when Interstate 10 (locally referred to as the Brenda Cutoff) is completed, causing a rerouting of a large volume of car and truck traffic away from Wickenburg, will be more than offset by other local factors.

Wickenburg has long been an active and well organized community that has tenaciously retained its historical western atmosphere. Through this type of civic activity the town has developed a thriving transient tourist trade as well as a growing population of loyal winter residents.

Further expansion of the municipal airport is anticipated in the near future. There are already two industrial plants located at the airport and with improved airport facilities, it is expected that industrial development will become an increasing source of economic improvement and population growth.

School attendance is continuing to increase, and an expansion of school facilities is planned.

These indicators, supported by Wickenburg's history of civic and community involvement, have stimulated a projected population increase from the present 2,640 to 3,250 in 1980 and 4,000 in 1990. The town is expected to grow outward along major thoroughfares, with subsequent development of areas between thoroughfares.

### Existing Conditions

The existing water supply is pumped from three wells with a combined capacity of 2,500 gpm into the system, on which two storage tanks with a total capacity of 900,000 gallons are floated. The quality of water from these wells is acceptable without treatment. The water distribution system in the town is now adequate to meet the current needs and all residential areas within the incorporated limits are adequately served.

The municipal airport, which is within the town limits and is the site of two industrial plants, is served only by water from an on-site well. This well water is unacceptably high in fluorides and it is now used for industrial purposes only, without treatment.

Substantially all settled areas of the town are adequately served by sewers. The three exceptions are the Wickenburg West subdivision, the mobile home court to the west, and the housing area to the east of the Hassayampa River. Sewage is treated in a plant using a homogeneous activated sludge process, with a 1.25 million gallon holding pond located in the river flats. This plant was designed for a connected population of 6,000, but had not been producing consistently satisfactory results, apparently due to inadequate performance of the oxygen activation process, and to reduced holding pond capacity as a result of a partial failure during a flood prior to the major flood damage incurred in September, 1970.

A storm of unprecedented intensity struck the Wickenburg area over the Labor Day weekend in September, 1970. The Hassayampa River, filling rapidly from the excessive runoff, veered toward its west bank and over-topped its channel. Flood damage in the Wickenburg area was extensive and widespread, running into thousands of dollars.

The outfall sewer line to the treatment plant was completely washed out for a distance of 1,200 to 1,400 feet. The treatment plant was completely inundated, running several feet deep at the crest. Much of the boundary fence was washed out, including posts set in concrete.

The subsiding flood waters deposited a heavy layer of silt in the oxidation ponds. Underground piping was nearly filled with silt. The laboratory building was flooded, and all machinery and electric motors were damaged and plugged with silt.

With raw sewage now being dumped into the Hassayampa River, an emergency measure was instituted immediately by the Maricopa County Health Department to introduce chlorine into the outfall line and a sizeable sump was constructed to contain the sewage.

Under a "crash" program, reconstruction of the washed out pipe, damaged oxidation pond, and treatment plant facilities was undertaken as quickly as possible. The outfall line was replaced in a new location farther away from the river channel. The oxidation pond was mucked-out, and sections of the washed out berms rebuilt in such a manner as to restore the pond to its original design capacity. The treatment

plant building and machinery were thoroughly cleaned and overhauled to restore them to first class operating condition. The work has been completed and the plant is back in operation.

#### Short Range Recommendations (1975)

A water main should be extended to the airport during this period to serve potable water to that area, which does not now have an acceptable domestic water supply. To be consistent with plans for airport expansion, and the value of these improvements to the growth of the community, the need for delivery of good water will continue to increase.

The same main would also provide an opportunity to offer service connections to residential areas between the town and the airport.

To improve the efficiency of the municipal water system, it is recommended that Wickenburg start now to investigate the feasibility of acquiring the Country Club Acres Water Company to consolidate their service area into the municipal system.

The existing sewage system could be considered adequate for short term needs. However, if funds can be acquired it would be recommended that the system be expanded to include those developed areas in the town that are not now being served. It should be noted that sewer service to the residential area east of the river may require a lift station.

The reconstruction just completed to repair flood damage to the treatment plant may have resolved the unsatisfactory operating results previously experienced. The holding pond capacity has been restored to original

design capacity, and the equipment has been cleaned and reconditioned. It is recommended that the operational characteristics of the plant be carefully checked during the next several months, and if the plant continues to operate at below design capacity, an investigation should be conducted to determine the causes and recommend corrective measures.

#### Long Range Planning (1990)

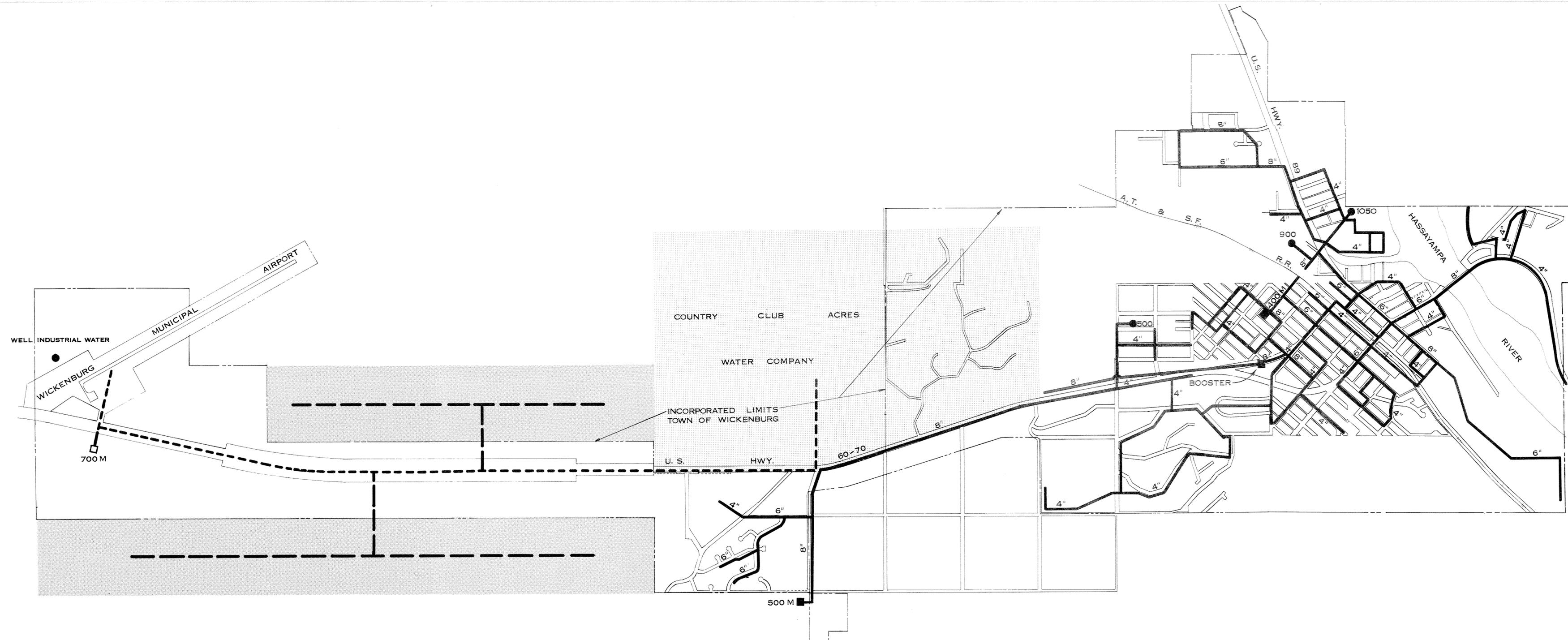
Assuming the existing wells remain productive, it is not anticipated that expansion of the water supply system will be necessary within the study period. In planning for the projected growth of the community and the additional demand of industrial development probably concentrating in the airport area, it is expected that an additional elevated storage tank having a capacity of approximately 700,000 gallons will become necessary. Additional water mains will be required in newly developed areas.

Extension of sewer service to existing unsewered areas that are not connected during the short-range period should certainly be planned for installation during the period after 1975.

It is suggested that planning for this period include a new trunk interceptor sewer to be constructed in the low area, approximately one-half mile north of U. S. Highway 60, to connect the airport and other intermediate residential areas into the municipal system. This expansion of the system may require enlargement of the aeration facilities and the oxidation pond capacity.

Plate 24 shows the existing water system and facilities, and proposed expansion for the two time periods of the study.

Plate 25 shows a similar plan for the municipal sewer system.

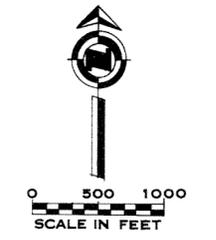


**LEGEND:**

- EXISTING WATER MAINS, SIZE SHOWN
- - - PROPOSED WATER MAINS BY 1975
- - - PROPOSED WATER MAINS BY 1990
- EXISTING WELL, CAPACITY SHOWN IN G.P.M.
- EXISTING STORAGE
- PROPOSED STORAGE
- ▨ PROPOSED SERVICE AREA EXTENSION 1975
- ▩ PROPOSED SERVICE AREA EXTENSION 1990
- M 1,000 GAL. CAPACITY

**NOTES:**

1. PRINCIPAL WATER MAINS ONLY ARE SHOWN
2. HYDRANTS AND VALVES NOT SHOWN

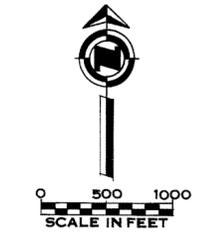


**WICKENBURG  
WATER PLAN**



- LEGEND:**
- EXISTING SEWERS, SIZE SHOWN
  - - - - PROPOSED SEWERS BY 1975
  - · - · - PROPOSED SEWERS BY 1990
  - EXISTING TREATMENT PLANT OR LIFT STATION
  - PROPOSED TREATMENT PLANT OR LIFT STATION
  - ▨ PROPOSED SERVICE AREA EXTENSION 1975
  - ▩ PROPOSED SERVICE AREA EXTENSION 1990

- NOTES:**
1. PRINCIPAL SEWER MAINS ONLY ARE SHOWN
  2. MANHOLES NOT SHOWN



SEWAGE TREATMENT PLANT, HOMOGENOUS ACTIVATED SLUDGE. CAPACITY: 600,000 GAL. PER DAY

# WICKENBURG SEWER PLAN

## POTENTIAL NEW DEVELOPMENT AREAS

### New River Area

Most of the area adjacent to Black Canyon Freeway (Interstate Route 17) from the Valley Metropolitan Study Area to the community of New River is suitable for development with the exception of mountainous areas and deep washes. Convenient access to an excellent transportation corridor and to Deer Valley Airport, and interesting topography make this area ideal for all forms of land development.

There are two relatively serious drawbacks to development along this corridor; an inadequate water supply to support a consolidated water system of any significant size, and a rocky surface that is not suitable for sewage disposal using septic tanks.

A local water source that can produce an adequate supply for any substantial development in this area may never be found. It may be that the solution to an adequate water supply will be connections to more remote underground water sources, or by connection to the Metropolitan Phoenix system. Suitable sewage disposal will present another difficult problem to be solved. Either a treatment plant suitably located would be required, or again there is the possibility of connecting into the Phoenix system. In either case the installation of collection lines and mains will generally be difficult and expensive in the rocky terrain prevalent in this area.

The alternative solutions to these problems are all very expensive. For this reason it is expected that development in this area will be slow for the next several years, possibly for the entire study period. However, the pressure of expansion from the Phoenix Area will eventually increase to the point where the necessary improvements to resolve the water and waste-disposal problems in this otherwise prime area will be financially justified. Once these two necessary elements have been resolved and adequate services are available, it is expected that this entire corridor from Phoenix to New River and the community of New River itself will develop rapidly.

#### Harquahala Valley Area

The Harquahala Valley has long been considered an ideal location for real estate development. Over the years developers have continuously investigated this area. Apparently the major items that have stifled development to date are the questionable quality of available raw water, and the considerable distance from the Phoenix area. The latter of these drawbacks will be materially reduced when Interstate 10 (Brenda Cutoff) is completed. With convenient access to this major traffic artery along the north side of the valley, it is reasonable to expect that its potential for major land development of all types will be greatly enhanced. When this area will start to develop or how rapid its growth will be cannot be accurately predicted, but plans are now being prepared for subdivisions of considerable size located in Harquahala Valley.

## SMALL COMMUNITIES

### General

There are many small communities in the Planning Area. With few exceptions these communities are economically oriented to adjacent agriculture, and residences are widely separated. As established in Section III, the number of farms is steadily decreasing due to the increasing size of mechanized farms. As this agricultural evolution continues, the small communities will tend to disappear unless, due to geographic location or other influences, they become part of a suburban development or a new land development project.

Several small communities have some type of rural water supply and in a few cases there exists a limited distribution system. These existing systems are generally substandard and would have to be completely replaced if subdivision activity developed requiring additional demands on the system.

None of these small communities have a sewage collection system or treatment facility. Sewage disposal is handled on an individual basis by whatever means the individual deems appropriate.

### Aguila

Aguila is a small community located west of Wickenburg on U. S. Routes 60 and 70. It has experienced declining population for several years. The community is almost totally oriented to the adjacent agricultural

industry, and is probably suffering from the general trend of fewer farms. The economy of this small community is so dependent on agriculture that it felt the effects of changing the local crop from lettuce to cotton, because lettuce requires manual labor to harvest, and cotton harvesting is mechanized.

The future of this community looks relatively bleak. Further loss in economy and population will probably take place when the Brenda Cutoff is opened, and a great volume of traffic that passes through Aguila now will be rerouted by the faster more direct route between Phoenix and California.

Aguila had a small well, a 10,000 gallon storage tank, and limited distribution system. The original well has been abandoned and a new well has been drilled east of the central community which is now in service. It is doubtful that increased demands will be required of this system within the study period.

Plate 26 shows the existing water system and supply locations.

#### Morristown - Circle City - Wittman

These three towns are located southeast of Wickenburg on U. S. Highways 60, 70 and 89. Morristown is about 11 miles from Wickenburg with Circle City being 2 miles southeast of Morristown and Wittmann another 5 miles from Circle City.

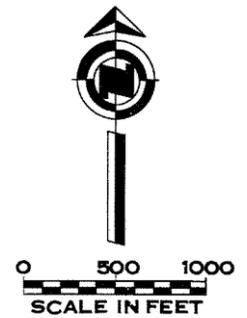
Morristown has a limited water distribution system of unknown pipe size and condition that is supplied by water delivered in tank cars by the

**LEGEND:**

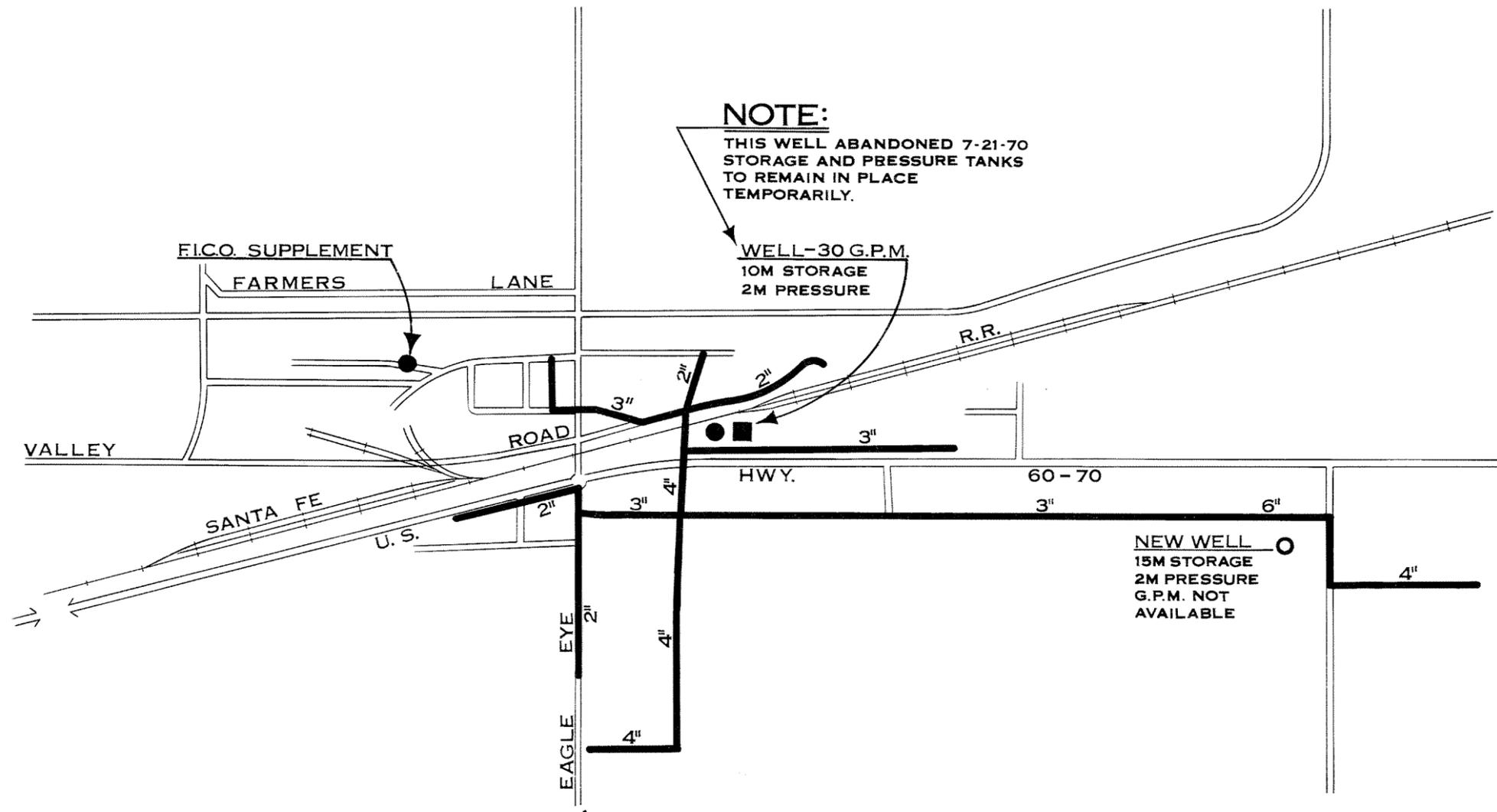
-  EXISTING WATER MAINS, SIZE GIVEN
-  EXISTING WELL
-  EXISTING STORAGE
- M 1,000 GAL. CAPACITY

**NOTES:**

1. PRINCIPAL MAINS ONLY ARE SHOWN
2. NO VALVES OR HYDRANTS ARE SHOWN



**AGUILA  
WATER PLAN**



Santa Fe Railroad and discharged into a concrete wet well. From here the water is pumped through a small pipe to most of the houses in the community.

Circle City and Wittmann also have water systems with distribution lines that are limited in extent and pipe size. The extent of these systems with well locations and storage capacities are shown on Plate 27 for Circle City, and Plate 28 for Wittmann.

All three communities are suffering from loss of commercial revenue due to the continuing decrease in the agricultural labor force, and will also feel the effects of the Brenda Cutoff when it is opened. There is little or no incentive for young people to stay in these communities, with the result that the remaining population largely consists of retired persons and families on welfare. It is expected that these communities will continue to decline in population with no reason to believe that improvement to their water systems will be warranted.

The one change that may be required would be in Morristown. It is our understanding that the Santa Fe Railroad would like to discontinue delivery of water. If they are allowed to do so, an alternative source of water supply would be required. It seems likely that Federal Aid could be arranged to finance a project of some kind in this event. See Section V for more detailed reference to possible sources of financial assistance.

29|28  
32|33

28|27  
33|34



WELL  
14M STORAGE  
5M PRESSURE

### LEGEND

-  4" EXISTING WATER MAIN, SIZE GIVEN
-  EXISTING WELL
-  EXISTING STORAGE
- M 1,000 GAL. CAPACITY

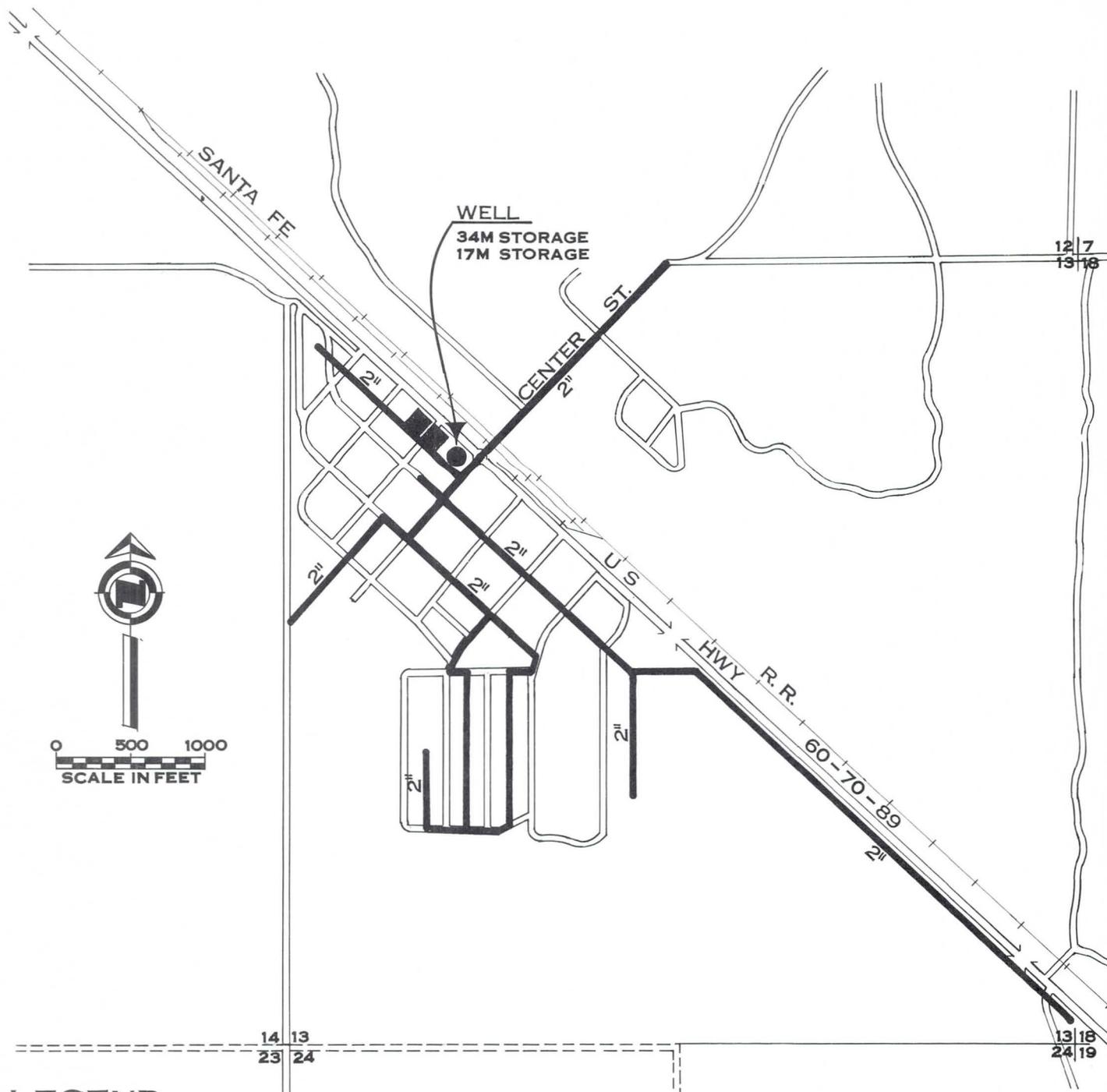
### NOTES

1. PRINCIPAL MAINS ONLY ARE SHOWN
2. NO HYDRANTS OR VALVES ARE SHOWN.

# CIRCLE CITY WATER PLAN

ELLIS, MURPHY AND HOLGATE  
Consulting Civil Engineers  
Phoenix, Arizona

# PLATE 27



**LEGEND:**

-  EXISTING WATER MAIN, SIZE GIVEN
-  EXISTING WELL
-  EXISTING STORAGE
- M 1,000 GAL. CAPACITY

**NOTES:**

1. PRINCIPAL WATER MAINS ONLY ARE SHOWN
2. NO VALVES OR HYDRANTS ARE SHOWN

**WITTMANN  
WATER PLAN**

### Theba

Theba is a small community about 10 miles west of Gila Bend on Interstate 8. The population of Theba, and also its elementary school population, has remained relatively stable in recent years. Perhaps this stability is due to its location on Interstate 8. If Theba can maintain this stable condition for the next few years, and if Gila Bend does experience a significant growth starting in the near future, the community of Theba might expect to get some suburban type of development. However, Theba presently has unacceptable water because of high flouride content. Water quality must be improved before additional subdivisions can legally be approved by the Maricopa County Health Department. The status of the community is not likely to change rapidly in the next several years, but should be re-analyzed in future planning studies.

## GENERAL RECOMMENDATIONS

It is generally accepted that the larger water or sewer systems can be more efficiently operated, and therefore can usually furnish better service at lower cost to its customers. It is therefore recommended that planning agencies routinely investigate the possibilities of enlarging the systems by acquiring ownership of smaller companies, or merging several smaller companies to form one larger district under one administrative organization. This recommendation is made with the acknowledgment that there may be overriding legal, jurisdictional, and financial ramifications that would negate the consolidation of systems in some areas.

As a result of our investigations for this report, we believe it would generally be in the best interest of the community and its residents to acquire ownership of certificated water companies operating within or adjacent to their jurisdictional boundaries, providing reasonable agreements can be reached and funds are available.

We have also found a tendency of incorporated towns with an adequate water supply to withhold service to potential customers outside the town limits as an inducement for them to request annexation. Strictly from the point of view of improving the efficiency of distributing water, it is recommended that this policy be reversed. Again we acknowledge that this general recommendation is made without regard to legal aspects or other items of consideration that may make the recommendation undesirable in specific communities.

SECTION V

APPENDICES

APPENDIX A - FINANCING AND AVAILABLE ASSISTANCE . . . . .	5-1
APPENDIX B - GENERAL OUTLINE FOR EXECUTION OF COMPREHENSIVE PLAN . . . . .	5-5
APPENDIX C - GENERAL OUTLINE FOR KEEPING THE PLAN CURRENT . . . . .	5-7

APPENDIX A

FINANCING AND AVAILABLE ASSISTANCE

For most of the municipalities and communities in the Planning Area, financing will play a vital role in the effectiveness and success of the planned improvements. Therefore, it is considered prudent to emphasize the importance of sound financial planning and good management to those who are charged with the execution of the planning program.

Water systems are generally financed through the sale of revenue bonds if the administrating agency is publicly owned, or by secured loans or bonds for privately owned water companies. Water rates are established to retire principal and interest on the indebtedness, but often do not provide for the accumulation of sufficient reserve funds. Thus, as capital expenditures become necessary, it is probable that reserve funds will not be sufficient unless advance planning for such expenditures has been anticipated.

All sewage systems in the Planning Area are in the Public Works category. Sewage facilities are usually financed through formation of public sewer districts where improvement costs are assessed against property in the district. However, sewage improvements are sometimes financed totally, or partially, through sale of revenue bonds which are retired by direct charges to the customer for sewer service.

Regardless of the type of financing for water and sewer systems, the management agency must carefully study its particular system and community to establish charges or rates that are adequate to properly operate and maintain the facilities, pay principal and interest on indebtedness, and accumulate an adequate reserve fund for planned capital expenditures in the future.

All of the communities in the Planning Area qualify for consideration of financial assistance from Farmers Home Administration, being predominantly rural in character and having a population of less than 5,500, which is not part of an urban area. Grants from FHA can be arranged to help finance up to 50% of the development cost, and FHA loans may be available to cover the remaining costs up to a maximum of 4,000,000 dollars. Interest rates vary but may not exceed 5 per cent. Additional information on qualification requirements, how funds may be used, where and how to file applications, and other assistance and guidance is available by contacting:

*FARMERS HOME ADMINISTRATION  
ARIZONA STATE OFFICE  
230 NORTH FIRST AVENUE  
PHOENIX, ARIZONA 85003*

*TELEPHONE NO. 261-3191*

The Department of Housing and Urban Development (HUD) has an assistance program to aid municipalities, Indian tribes, and public agencies in building new water or sewer systems or in improving present systems. This program is outlined in a new publication entitled "*BASIC WATER AND SEWER FACILITIES GRANTS*". HUD grants can help finance systems to store, supply, treat, purify, or distribute water for domestic, commercial, and industrial

use. Sanitary and storm sewer projects (except sewage treatment works) are also eligible for HUD assistance. The brochure points out that, in addition to satisfying water and sewer needs, new and upgraded systems can fulfill a social function by providing employment, promoting the potential housing supply, contributing to economic expansion, and otherwise furthering orderly community development. Single copies of this publication are available from:

*PUBLICATIONS SERVICES CENTER  
SUPPLIES AND FACILITIES MANAGEMENT BRANCH  
ROOM B-258, HUD  
WASHINGTON, D. C. 20410*

Sewage treatment plants may qualify for financial assistance under the Federal Water Pollution Control Act (P.L. 84-660). Information on this program may be obtained by contacting:

*FEDERAL WATER POLLUTION CONTROL ADMINISTRATION  
DEPARTMENT OF THE INTERIOR  
WASHINGTON, D. C.*

- or -

*WATER POLLUTION CONTROL ADMINISTRATION  
COLORADO RIVER - BONNEVILLE BASIN OFFICE  
6122 NORTH SEVENTH STREET  
PHOENIX, ARIZONA 85012*

*TELEPHONE NO. 261-3871*

If it can be demonstrated that proposed water and sewer projects will stimulate expansion and growth leading to new employment opportunities, it is possible that the project may qualify for financial assistance from the Economic Development Administration (EDA). For information and assistance contact:

*ECONOMIC DEVELOPMENT ADMINISTRATION  
FIELD COORDINATOR  
522 NORTH CENTRAL AVENUE  
PHOENIX, ARIZONA 85013*

*TELEPHONE NO. 261-3818*

In most instances the preparation of the application and necessary documentation to apply for federal loans or grants requires considerable time to accumulate the required data, etc. Therefore, the planning agency for proposed water and sewer projects should contact these federal agencies immediately to determine whether or not they qualify, and what is required to make a proper application.

## APPENDIX B

### GENERAL OUTLINE FOR EXECUTION OF THE COMPREHENSIVE PLAN

If this Comprehensive Plan is accepted and then set aside waiting for somebody else to take action, it will simply become so many words bound together gathering dust on numerous shelves. A definite action program is necessary to insure execution of the Comprehensive Plan and accomplish its established goals. Furthermore, the overall plan must have centralized coordination if the purpose of the Plan is to be accomplished. For these reasons it appears incumbent upon Maricopa County, through one of its offices or agencies, to assume leadership and coordination responsibility for the orderly execution of the Plan.

Listed below are our recommended procedures for insuring an orderly execution of this Comprehensive Plan:

1. An office or agency of the Maricopa County government should be authorized immediately to assume the responsibility for coordinating and administering the Comprehensive Plan for the Planning Area.
2. The county administrator for the Plan should prepare a mailing list for distribution of copies of this report, and arrange for county-wide advertising as necessary, to make all interested parties aware of the existence of this report.
3. The county administrator, or his representative, should contact each community where recommendations for water and sewer system improvements have been made, and such other communities as he may deem appropriate, to make

them aware of the county's activity in this field, the existence of his office and its function, and to encourage the community to participate in the Plan.

4. Each community should accept the responsibilities directed to them for improvement of their public domain. A functional organization should be established as quickly as possible, either within the municipal system or through a citizens committee, to direct and administer their planning.
5. The community administrator should immediately contact the county administrator to identify himself and his organization, and contact other federal and county agencies for organizational assistance, financial assistance, and coordination of their planning efforts.
6. The Comprehensive Plan should not be construed as an individual community planning or feasibility study. Each community must conduct or supervise its own advanced planning, and immediate programming, in order to be responsive to its own peculiar problems and capabilities.
7. After definitive short and long range planning has been established, a feasibility study should be conducted for a specific project within the overall plan. Such a study would investigate estimated costs of construction, source and availability of local funds, source and availability of financial assistance programs, review of rates and service charges required to properly finance the project, etc.
8. The county administrator should make continuing periodic contact with the community administrators involved, to check progress, assist in overcoming problems and delays, to make sure each community's program is staying within the county's concept of the Comprehensive Plan, and advise the local communities of any changes, new requirements, or new government programs.

If these general procedures are followed, we believe the Plan can be executed properly and will remain up to date as a matter of procedure.

## APPENDIX C

### GENERAL OUTLINE FOR KEEPING THE PLAN CURRENT

Only the existing deficiencies covered in this report are based on relatively stable factual information, and even these conditions may change to some extent before the operational administering bodies can be organized and functioning. Beyond that, the recommendations and suggested planning items are based on prognostications of historical trends and current data. Growth in Arizona has been characterized by the "unpredictable". For this area it is particularly important to establish procedures for keeping the Comprehensive Plan current.

The following procedures are offered as a reasonable method of insuring that the Comprehensive Plan will be kept current, and remain a reliable reference document for the orderly development of water and sewer systems in the Planning Area:

1. The Comprehensive Plan should be placed on the agenda, at least annually, of a regular meeting of the Maricopa County Board of Supervisors to review progress and current status relative to anticipated goals. The county administrator of the Plan should submit a written report to the Board of Supervisors at least one month prior to the review meeting, and be in attendance at the meeting for a presentation of his report, discussion and to answer questions.
2. Every 5 years the entire Comprehensive Plan should be re-studied and expanded to include long range planning for the ensuing 20-year period. Current or short range plans can be modified in light of recent changes, and long range planning can be redirected, as necessary, based on recent trends and uptodate information.