PREPARED FOR

AZHD-EPD-EIS-72-6D
VOLUME 2 OF 2

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

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

Prepared by

ARIZONA HIGHWAY DEPARTMENT

DRAFT

ENVIRONMENTAL STATEMENT

JUN 19 72
RECEIVED
FLOOD CONTROL
DISTRICT

ADMINISTRATIVE ACTION

for

INTERSTATE & DEFENSE HIGHWAY 10

PROJECT NO. I-10-2(59)
EHRENBERG – PHOENIX HIGHWAY (67TH AVENUE – GRAND AVENUE)

PROJECT NO. I-10-3(122)
PHOENIX – CASA GRANDE HIGHWAY (GRAND AVENUE – JUNCTION I-17)
MARICOPA COUNTY, PHOENIX, ARIZONA

THIS HIGHWAY IMPROVEMENT IS PROPOSED FOR FUNDING UNDER TITLE 23, U.S.C. THIS STATEMENT FOR THE IMPROVEMENT WAS DEVELOPED IN CONSULTATION WITH THE FEDERAL HIGHWAY ADMINISTRATION AND IS SUBMITTED PURSUANT TO:

SECTION 102(2)(C)
PUBLIC LAW 91-190
and
SECTION 309 OF THE CLEAN AIR ACT
PUBLIC LAW 91-604

6-19-72 — T. Fitzhadwick
Date — Arizona Highway Department

CLEARED BY FHWA FOR CIRCULATION AND COMMENTS

6-19-72 — H C Tilzey
Date — Federal Highway Administration

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ARIZONA RELOCATION ACT OF 1970 . . . . . A-11

Following are two letters between the Arizona Highway Department and the City of Phoenix concerning the status of West Moreland Parkway.

JACK WILLIAMS
GOVERNOR

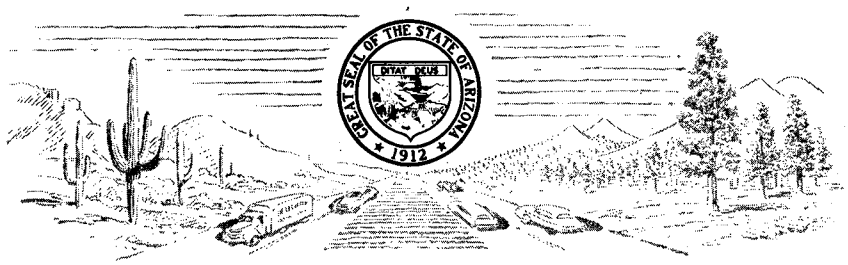
LEW DAVIS
CHAIRMAN

RUDY E. CAMPBELL
VICE CHAIRMAN

WALTER W. SURRETT
MEMBER

WALTER A. NELSON
MEMBER

LEN W. MATTICE
MEMBER



JUSTIN HERMAN
STATE HIGHWAY DIRECTOR

WM. N. PRICE
STATE HIGHWAY ENGINEER

ARIZONA HIGHWAY DEPARTMENT

May 11, 1972

City of Phoenix
Parks & Recreation Department
Room 401 Municipal Building
251 West Washington Street
Phoenix, Arizona 85003

Attention - Mr. Charles M. Christiansen:

Re: Project I-10-3(95)
7th Avenue-7th Street
West Moreland Parkway

Gentlemen:

We are requesting your interpretation regarding the status of the West Moreland Parkway as defined under Section 1653 (F) of 40 U.S.C. 1/Section 138 and Section 4(F) of the Department of Transportation Act.

The statute indicates that parks involved with Federally-Aided projects will be determined to be of national, state or local significance.

The 1937 quit claim deed signed by the residents of abutting properties on West Moreland with the City of Phoenix is so restrictive in nature that normal park functions are prohibited. For example, the deed stipulates "that no active recreation shall ever be permitted therein; that benches may be placed therein at each end only in each of the parks and persons permitted to sit thereon only; but picnic lunches and/or picnic parties, or the congregation of crowds thereupon, shall never be had or permitted."

An inspection of the subject area revealed that there are no park benches, drinking fountains or any other items normally associated as park equipment on the property. No recreational facilities are provided nor seemingly, is there intent for any.

The narrow strips of greenery are located in the middle of the street functioning as either traffic control islands or medians.

It appears that the land was not, nor was ever intended to be a public park in the semantic sense of the definition - park; but rather it appears to have been an act on the part of the grantors to insure an aesthetic enhancement to their property maintenanced at city expense.

It is our understanding that West Moreland Parkway will be incorporated into a 25 acre park to be constructed under the Papago Freeway. This addition of approximately five acres will allow the City to enlarge its park potential and enable the Parks and Recreation Department to serve a larger population, thus providing enrichment for the entire Central Phoenix area.

Very truly yours,

WM. N. PRICE
State Highway Engineer

CARTER A. CLARK
Chief Right of Way Agent

WJH/hc

CITY OF PHOENIX
ARIZONA

PARKS & RECREATION DEPARTMENT • 401 MUNICIPAL BUILDING • 251 WEST WASHINGTON • PHOENIX, ARIZONA 85003

May 12, 1972

RE: Project I-10-3 (95)
7th Avenue - 7th Street
West Moreland Parkway

Mr. Carter A. Clark
Chief Right of Way Agent
Arizona Highway Department
Phoenix, Arizona 85007

Dear Mr. Clark:

This letter is in response to your request about the "local significance" of West Moreland Parkway as it relates to the construction of the Papago Freeway.

As you know, West Moreland Parkway was dedicated to the City of Phoenix for park-type purposes, with some rather restrictive clauses. These restrictions assured an attractive greenbelt through this area but, in effect, did not permit active recreational usage. The City has maintained this area for better than 30 years.

A large park is planned underneath the freeway from 3rd Avenue to 3rd Street. West Moreland Parkway will be encompassed by this larger, urban park that will offer community programs and facilities to a large segment of our population; therefore, West Moreland Parkway will, in fact, be part of a much larger park that will have far more utilization by Phoenicians.

In summary, the loss of West Moreland Parkway is of no significance, since it has been only a greenbelt area. However, implementation of the large, central park which encompasses West Moreland Parkway will be a vast improvement in the over-all aesthetic appearance of this entire area and will offer cultural activities for a large section of the City.

This letter has been approved by the Parks and Recreation Board at its meeting on May 16, 1972.

Sincerely,

Charles M. Christiansen

CHARLES M. CHRISTIANSEN
Parks and Recreation Director

CMC:jj

Following are two letters between the Arizona Highway Department and the City of Phoenix concerning the local significance of Berney Park.

JACK WILLIAMS
GOVERNOR

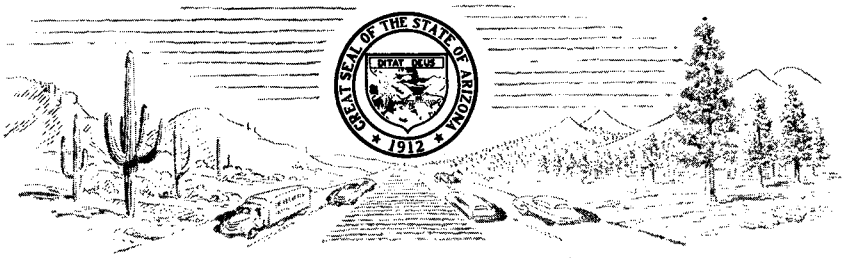
LEW DAVIS
CHAIRMAN

RUDY E. CAMPBELL
VICE CHAIRMAN

WALTER W. SURRETT
MEMBER

WALTER A. NELSON
MEMBER

LEN W. MATTICE
MEMBER



JUSTIN HERMAN
STATE HIGHWAY DIRECTOR

WM. N. PRICE
STATE HIGHWAY ENGINEER

ARIZONA HIGHWAY DEPARTMENT

May 11, 1972

Mr. Edward M. Hall
Deputy City Manager
City Manager's Office
251 West Washington
Phoenix, Arizona

RE: Project I-10-3(108)PE
Phoenix - Casa Grande Highway

Dear Mr. Hall:

As you will recall, in a right-of-way transaction dated August 7, 1967, the Arizona Highway Department deeded 2.31 acres of land located adjacent to the north boundary of Berney Park to the City of Phoenix for 2.03 acres of Berney Park land which was located in the I-10 right-of-way corridor. Also, in addition to the new land, the city received the sum of $36,000 to clear it off and relocate their park facilities on the new Berney Park land. Further the state agreed the city could continue to use the exchanged Berney Park land as a park until such time as it would be required for construction of the highway, at no cost to the city. In this way, the city need not expend the $36,000 on the new land of Berney Park until it was absolutely necessary. As of this time the city has had the use of the new land and the $36,000 for five years plus it has had the free use of the 2.03 acres we purchased for the same period.

Since the above transaction took place, the Federal Highway Act of 1968 has been passed into law. A portion of this act, 23 U.S.C. 138 requires that certain conditions be met in order to obtain FHWA approval of federally financed highway improvements which will require the use of park lands of "local significance." These requirements are described in FHWA Policy and Procedure Memorandum 90-1, dated August 24, 1971. Of particular concern to us is the memorandum's definition of publicly owned park land as, "Section 4(f) land", and the restrictions on the use of that land.

In spite of the fact that the 2.03 acres in question was purchased in fee simple prior to enactment of the Federal Highway Act of 1968, because public use of that land as a park has been allowed to continue, there is some question as to whether or not we must comply with the acts provision.

In order to do so, we came to the conclusion that the best thing for us to do was to request from you a determination of the "local significance" of the 2.03 acres of land on which you were allowed to continue in park use at our sufferance.

In addition, it has been observed that a 59 ft. by 355 ft. parcel of park land located east of the property we purchased in 1967 may be needed for the highway as now conceived. Ownership of the strip of land would allow us greater flexibility in location and construction of the Squaw Peak facility (providing room to move the highway away from the new Berney Park location, thereby allowing flatter slopes for the purpose of landscaping). We would also request your determination of the "local significance" of this strip in order that we would know whether or not we will have to file a 4(f) statement under the Federal Aid Highway Act of 1968.

While we doubt that the strip can have "local significance" after the construction of the highway on the property we purchased in 1967, that determination must come from your department as the whole area is under your jurisdiction and the federal act requires the determination from you.

If you have any questions on this matter please do not hesitate to inquire.

Very truly yours

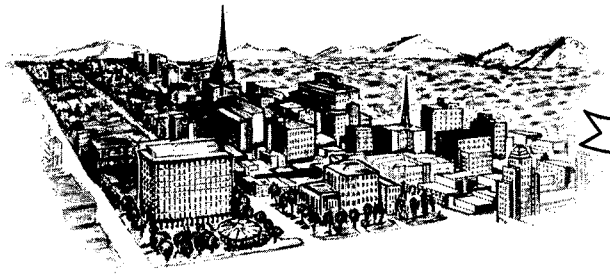
WM. N. PRICE
State Highway Engineer

W A Ross

W. A. ROSS
Principal Engineer
Papago Freeway

WAR:mm

cc: H. C. Tilzey



CITY OF PHOENIX
ARIZONA

PARKS & RECREATION DEPARTMENT • 401 MUNICIPAL BUILDING • 251 WEST WASHINGTON • PHOENIX, ARIZONA 85003

May 12, 1972

RE: Project I-10-3(108)PE
Phoenix-Casa Grande Highway

Mr. W. A. Ross
Principal Engineer
Papago Freeway
Arizona Highway Department
Phoenix, Arizona 85007

Dear Mr. Ross:

This letter is in response to your request for our determination of "local significance" of the Berney Park area and the 59-foot strip of property that is on the far side of the freeway from the park but owned by the City of Phoenix.

Berney Park is a very fine neighborhood park. It provides fine recreation programs and the facilities are used continually throughout the year by residents of the area. When it appeared that the freeway was going to need half of the acreage of the park, serious negotiations were held to determine how the park could be saved. In summary, the State agreed to purchase an equal amount of land immediately adjacent to the park to replace that portion lost for freeway construction.

The City has prepared a new site plan for the park, and we will totally be capable of replacing all the facilities that are on the present park that will eventually have to be removed. The State of Arizona already has paid the City of Phoenix $36,000 toward the cost of improving this new section of the park to completely replace these same facilities.

In addition, the State of Arizona has allowed us to continue usage of the present park until such a time as construction is imminent. We are satisfied that we will be able to completely rebuild the park and replace all the lost facilities whenever it is necessary to do this. Thus, the park area taken is of no significance since adequate land and financial resources have been provided to completely replace this portion of the park.

We appreciate the cooperation of the Arizona Highway Department in allowing us to continue usage of the land that is to be taken for a freeway. We have not

as yet transferred the recreational facilities over to the new portion of the park simply because it hasn't been convenient.

The 59' x 355' strip of land on the other side of the freeway from the park is of no significance to our department. The only usage anticipated, ever, was some possible landscaping treatment. Since the freeway apparently needs to be realigned slightly and this property is necessary for this realignment, we agree completely that this property should be used for this purpose. Since it is planned by the Arizona Highway Department to landscape along the freeway, anyway, it would appear that the strip will be used for the same purpose except that it will be accomplished by the Arizona Highway Department rather than the City of Phoenix. This strip has no potential for park or recreation activities and we feel that, if the freeway must be realigned in this area, it is far better to do it on this strip than to encroach any further on the Berney Park side.

This letter has been approved by the Parks and Recreation Board at its meeting on May 16, 1972.

We will be glad to elaborate on this matter. If you have any questions, please contact Mr. Alex Cordova, Director of the Real Estate and General Services Department, telephone number 262-7166.

Sincerely,

Charles M Christiansen

CHARLES M. CHRISTIANSEN
Parks and Recreation Director

CMC:jj

Following is a copy of the 1970 Arizona Relocation Act.

CHAPTER 85

Senate Bill 328

AN ACT

RELATING TO HIGHWAYS; PROVIDING INCREASED BENEFITS TO PERSONS DISPLACED BY STATE HIGHWAY PURPOSE CONSTRUCTION; BROADENING DEFINITIONS OF PERSONS ELIGIBLE FOR BENEFITS; PROVIDING AUTHORITY TO HIGHWAY DEPARTMENT TO CONTRACT WITH FEDERAL, STATE AND LOCAL AGENCIES TO FURNISH RELOCATION ADVISORY SERVICES; PROVIDING FOR PAYMENT OF LITIGATION EXPENSES OF CERTAIN PERSONS; PROVIDING FOR CONSTRUCTION OF REPLACEMENT HOUSING AS A LAST RESORT; AMENDING SECTIONS 18-141 TO 18-146, INCLUSIVE, AND 18-148, ARIZONA REVISED STATUTES, AND AMENDING TITLE 18, CHAPTER 1, ARTICLE 2.1, ARIZONA REVISED STATUTES, BY ADDING SECTIONS 18-150.01, 18-150.02 AND 18-150.03.

Be it enacted by the Legislature of the State of Arizona:

Section 1. The article heading for title 18, chapter 1, article 2.1, Arizona Revised Statutes, is changed from "Relocation Assistance" to "Relocation Assistance and Real Property Acquisition Policies".

Sec. 2. Section 18-141, Arizona Revised Statutes, is amended to read:

18-141. Definitions

In this article, unless the context otherwise requires:

1. "Business" means any lawful activity, excepting a farm operation, conducted primarily for the purchase, sale, lease and rental of personal and real property, and for the manufacture, processing or marketing of products, commodities, or any other personal property or for the sale of services to the public or by a nonprofit corporation, or solely for the purposes of Section 18-143, for assisting in the purchase, sale, resale, manufacture, processing or marketing or products, commodities, personal property or services by the erection and maintenance of an outdoor advertising display or displays whether or not such display or displays are located on the premises on which any of the above activities are conducted.

2. "Displaced person" means any person who, on or after the effective date of this article, moves from real property, or moves his personal property from real property, as a result of a written order of the department to vacate real property acquired for state highway purposes, whether or not the department has or will receive federal financial assistance therefor or for a federal-aid highway, and, solely for the purposes of Section 18-142 and Section 18-143, subsections A and B, as a result of the acquisition of or as the result of a written order of the department to vacate other real property on which such person conducts a business or farm operation for such state highway purposes.

3. "Family" means two or more persons living together in the same dwelling unit who are related to each other by blood, marriage, adoption or legal guardianship.

4. "Farm operation" means any activity conducted primarily for the production of one or more agricultural products or commodities for sale and home use, and customarily producing such products or commodities in sufficient quantity to be capable of contributing materially to the operator's support.

5. "Federal financial assistance" means a grant, loan or contribution provided by the United States, except any federal guarantee or insurance.

6. "Individual" means a person who is not a member of a family.

7. "Initiation of negotiations" means the date the Department first makes personal contact with the owner, or his personal representative, of the property sought to be acquired if the price to be paid therefor is discussed.

8. "Mortgage" means such classes of liens as are commonly given to secure advances on, or the unpaid purchase price of, real property, under the laws of the state in which the real property is located, together with the credit instruments, if any, secured thereby.

9. "Person" means any individual, family, partnership, corporation or association.

Sec. 3. Section 18-142, Arizona Revised Statutes, is amended to read:

18-142. Relocation Advisory Service

A. The department may establish and maintain a relocation assistance advisory service for displaced persons in order to:

1. Determine the need, if any, of displaced persons for relocation assistance.

2. Provide current and continuing information on the availability, prices and rentals of comparable decent, safe and sanitary sales and rental housing and of comparable commercial properties and locations for displaced businesses.

3. Assure that, within a reasonable period of time prior to displacement, there will be available in areas not generally less desirable in regard to public utilities and public and commercial facilities and at rents or prices within the financial means of the families and individuals displaced, decent, safe and sanitary dwellings, as defined by the commission, equal in number to the number of and available to such displaced persons who require such dwellings and reasonably accessible to their places of employment, except that the commission may prescribe by regulation situations when such assurances may be waived.

4. Assist a displaced person displaced from his business or farm operation in obtaining and becoming established in a suitable replacement location.

5. Supply information concerning federal housing programs, disaster loan programs and other programs offering assistance to displaced persons.

6. Provide other advisory services to displaced persons in order to minimize hardships to such persons in adjusting to relocation.

7. Insure that a displaced person who makes proper application for a payment authorized by this article shall be paid promptly after a move or, in hardship cases, be paid in advance.

8. Coordinate with other governmental agencies to determine if other construction and acquisition by such agencies might affect carrying out of relocation assistance programs.

9. Assist other persons not eligible under this article who are displaced because of publicly financed construction to the extent time, personnel and facilities allow without interference with required services and functions.

B. The department may establish local relocation assistance offices to carry out the provisions of subsection A.

C. The department may contract with federal, other state, county or local agencies to provide relocation assistance services if such agency is required by law to provide the services and if such services are compatible with those services provided by the department.

Sec. 4. Section 18-143, Arizona Revised Statutes, is amended to read:

18-143. Payment of Moving and Related Expenses

A. On or after the effective date of this article, the department may, as a part of the cost of construction, make a payment to a displaced person, business or farm operation, upon proper application to the department for:

1. Actual reasonable expenses in moving himself, his family, business, farm operation or other personal property.

2. Actual direct losses of tangible personal property as a result of moving or discontinuing a business or farm operation, but not to exceed an amount equal to the reasonable expenses that would have been required to relocate such property, as determined by the department.

3. Actual reasonable expenses in searching for a replacement business or farm.

B. Any displaced person eligible for payments under subsection A of this section who is displaced from a dwelling and who elects to accept the payments authorized by this subsection in lieu of the payments authorized by subsection A may receive a moving expense allowance, determined according to a schedule established by the commission, not to exceed three hundred dollars and in addition a dislocation allowance of two hundred dollars. In establishing the schedule, the commission shall consider the number of rooms in the acquired dwelling, whether the rooms are furnished or unfurnished. In the case of a mobile home, the commission may establish a schedule to move the mobile home based upon its square foot area.

C. Any displaced person who moves or discontinues his business or farm operation, which contributes materially to his total income and who elects to accept the payments authorized by this subsection in lieu of the payment authorized by subsection A, may receive a fixed relocation payment in an amount equal to the average annual net earnings of the business or farm operation, except that such payment shall not be less than twenty-five hundred dollars or more than ten thousand dollars. In the case of a business, no payment shall be made under this subsection unless the department is satisfied that the business cannot be relocated without a substantial loss of patronage and is not a part of a commercial enterprise having at least one other establishment, not being acquired, which is engaged in the same or similar business. For purposes of this subsection, the term "average annual net earnings" means one-half of any net earnings of the business or farm operation, before federal, state and local income taxes, during the two taxable

years immediately preceding the taxable year in which such business or farm operation moves from the real property acquired for such project, or during such other period as the department determines to be more equitable for establishing such earnings and includes any compensation paid by the business or farm operation to the owner, his spouse or his dependents during such two-year period. To be eligible for the payment authorized by this subsection, the business or farm operation shall make its state income tax returns available and its financial statement and accounting records available for audit and for confidential use to determine the payment authorized by this subsection.

Sec. 5. Section 18-144, Arizona Revised Statutes, is amended to read:

18-144. Supplemental Payment to Owners

A. In addition to the payments authorized by section 18-143, the department, as a part of the cost of construction, may make a payment to the owner of real property acquired for state highway purposes, whether or not the department has or will receive federal financial assistance therefor, or the federal-aid highway system which is improved with a dwelling, actually owned and occupied by the displaced person for not less than one hundred eighty days prior to the initiation of negotiations for the acquisition of such property. Such payment, not to exceed fifteen thousand dollars, shall include the following:

1. The amount, if any, which when added to the acquisition cost of the dwelling acquired by the department, equals the reasonable cost of a comparable replacement dwelling which is a decent, safe and sanitary dwelling adequate to accommodate such displaced person, reasonably

accessible to public services and places of employment and available on the private market, all determinations required to carry out this paragraph shall be made in accordance with standards established by the commission.

2. The amount, if any, which will compensate such displaced person for any increased interest costs which such person is required to pay for financing the acquisition of any such comparable replacement dwelling. The amount shall be paid only if the dwelling acquired by the department was encumbered by a mortgage which was a valid lien on such dwelling for not less than one hundred eighty days prior to the initiation of negotiations for the acquisition of such dwelling. The amount shall be equal to the excess in the aggregate interest and other debt service costs of that amount of the principal of the mortgage on the replacement dwelling which is equal to the unpaid balance of the mortgage on the acquired dwelling, over the remaining term of the mortgage on the acquired dwelling, reduced to discounted present value. The discount rate shall be the prevailing interest rate paid on savings deposits by commercial banks in the general area in which the replacement dwelling is located.

3. Reasonable expenses incurred by such displaced person for evidence of title, recording fees and other closing costs incident to the purchase of the replacement dwelling, but not including prepaid expenses.

B. The additional payment authorized by this section shall be made only to such a displaced person who purchases and occupies a replacement dwelling which is decent, safe and sanitary not later than the end of the one-year period beginning on the date on which he received final payment of all costs of the acquired dwelling, or on the date on which he moves from the acquired dwelling, whichever is the later date.

Sec. 6. Section 18-145, Arizona Revised Statutes, is amended to read:

18-145. Expenses Incidental to Transfer of Property

In addition to the payments authorized by sections 18-143 and 18-144, the department as a part of the cost of construction, after the date of payment of the purchase price or the date of deposit in court of funds to satisfy the award or compensation in a condemnation proceeding to acquire real property, whichever is the earlier, shall reimburse the owner to the extent it deems fair and reasonable for expenses he necessarily incurred for:

1. Recording fees, transfer taxes and similar expenses incidental to conveying such real property.

2. Penalty costs of prepayment of any preexisting recorded mortgage entered into in good faith encumbering such real property.

3. The pro rata portion of real property taxes paid which are allocable to a period subsequent to the date of vesting of title in the state, or the effective date of the possession of such real property by the state, whichever is earlier.

Sec. 7. Section 18-146, Arizona Revised Statutes, is amended to read:

18-146. Supplemental Payment to Tenants

A. In addition to the payment authorized by section 18-143, as a part of the cost of construction, the department may make a payment to or for any displaced person displaced from any dwelling not eligible to receive a payment under section 18-144, which dwelling was actually and lawfully occupied by such displaced person for not less than ninety days prior to initiation of negotiations for the

acquisition of such property. Such payment shall be either of the following:

1. The additional amount necessary to enable such displaced person to lease or rent for a period not to exceed four years, a decent, safe and sanitary dwelling of standards adequate to accommodate such person in areas not generally less desirable in regard to public utilities and public and commercial facilities, and reasonably accessible to his place of employment, but not to exceed four thousand dollars.

2. The amount necessary to enable such person to make a down payment, including incidental expenses described in section 18-144, subsection A, paragraph 3, on the purchase of a decent, safe and sanitary dwelling of standards adequate to accommodate such person in areas not generally less desirable in regard to public utilities and public and commercial facilities, but not to exceed four thousand dollars, except that if such amount excees two thousand dollars, such person must equally match any such amount in excess of two thousand dollars in making the down payment.

B. A displaced person who is eligible for benefits pursuant to section 18-144 who does not elect purchase replacement housing may receive benefits under subsection A, paragraph 1 of this section based upon the difference between comparable decent, safe and sanitary housing and the economic rent of the acquired dwelling, but in no event may the payment to such displaced person be more than the amount he would have received had he elected to purchase replacement housing.

C. When displaced persons receive benefits under subsection A, paragraph 1 or subsection B of this section, the commission may provide such amount to be paid periodically or as a lump sum and if paid periodically, the department

shall determine, prior to making payment, that the displaced person is still residing in decent, safe and sanitary housing.

Sec. 8. Section 18-148, Arizona Revised Statutes, is amended to read:

18-148. Authority of Commission; Rules and Regulations; Conflicting Federal Laws, Rules and Regulations

A. The authority of the commission to make the expenditures authorized by sections 18-143, 18-144, 18-145 and 18-146 may be exercised only so long as the federal government continues to fund and participate in all such costs in connection with the construction of federal-aid highways.

B. The commission may adopt rules and regulations to implement this article, and such other rules and regulations relating to relocation assistance as may be necessary or desirable under federal laws and the rules and regulations promulgated thereunder. Any provision of this article which is found to be in conflict with such federal laws and the rules and regulations promulgated thereunder is not applicable and the commission is authorized to adopt such rules and regulations as may be necessary to obtain the fullest federal aid or participation available.

C. The commission may adopt rules and regulations relating to:

1. The standards for comparable housing.

2. The standards for decent, safe, and sanitary dwellings.

3. Procedure for an aggrieved displaced person to have his determination of eligibility or amount of payment reviewed by the director.

4. The eligibility of displaced persons for relocation assistance payments, the procedure for such persons to claim such payments and the amounts thereof.

Sec. 9. Title 18, chapter 1, article 2.1, Arizona Revised Statutes, is amended by adding sections 18-150.01, 18-150.02 and 18-150.03.

New Sec. 18-150.01. Housing Replacement by Department as Last Resort

If a project for state highway purposes cannot proceed to actual construction because comparable replacement sale or rental housing is not available and it is determined such housing cannot otherwise be made available, the department with the approval of the commission may take such action as is necessary or appropriate to provide such housing and make payment therefor as a part of the cost of construction.

New Sec. 18-150.02 Litigation Expenses

A. The court having jurisdiction of a proceeding instituted by the department to acquire real property by condemnation shall award the owner of any right, or title to, or interest in, such real property such sum as will reimburse such owner for his reasonable costs, disbursements and expenses, including reasonable attorney, appraisal and engineering fees actually incurred because of the condemnation proceedings if either of the following occur:

1. The final judgment is that the department cannot acquire the real property by condemnation.

2. The proceeding is abandoned by the department as authorized by subsection H, section 18-155.

B. The court rendering a judgment for the plaintiff in a proceeding brought under section 18-158 awarding compensation for the taking of property by the department or the department in effecting a settlement of any such proceeding, shall determine and award or allow to such plaintiff, as a part of such judgment or settlement, such sum as will in the opinion of the court or the department reimburse such plaintiff for his reasonable costs, disbursements and expenses, including reasonable attorney, appraisal and engineering fees, actually incurred because of such proceeding.

New Sec. 18-150.03. Buildings, Structures and Improvements

A. Notwithstanding any other provision of law, if the state acquires any interest in real property, it shall acquire at least an equal interest in all buildings, structures or other improvements located upon the real property so acquired and which it requires to be removed from such real property or which it determines will be adversely affected by the use to which such real property will be put.

B. For the purpose of determining the just compensation to be paid for any building, structure or other improvement required to be acquired by subsection A, such building, structure or other improvement shall be deemed to be a part of the real property to be acquired notwithstanding the right or obligation of a tenant, as against the owner of any other interest in the real property, to remove such building, structure or improvement at the expiration of his term, and the fair market value which such building, structure or improvement for removal from the real property, whichever is the greater, shall be paid to the tenant therefor.

C. Payment under this section shall not result in duplication of any payments otherwise authorized by law. No such payment shall be made unless the owner of the land involved disclaims all interest in the improvements of the tenant. In consideration for any such payment, the tenant shall assign, transfer and release to the state all his right, title and interest in and to such improvements. Nothing in this section shall be construed to deprive the tenant of any rights to reject payment under this section and to obtain payment for such property interests in accordance with applicable law, other than this section.

Sec. 10. Effective Date Retroactive

This act shall be effective from and after January 2, 1971, as to persons who are in possession or who come into possession of property acquired or to be acquired by the department for highway purposes if such persons otherwise qualify under the provisions of this act.

Sec. 11. Saving Clause

This act shall not affect any benefits to which persons may be entitled prior to the effective date of this act under the existing provisions of title 18, chapter 1, article 2.1.

Sec. 12. Emergency

To preserve the public peace, health and safety it is necessary that this act become immediately operative. It is therefore declared to be an emergency measure, to take effect as provided by law.

Approved by the Governor - April 16, 1971

Filed in the Office of the Secretary of State - April 19, 1971

SUPPLEMENTAL MATERIAL

RELATING TO NOISE AND AIR

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LAWS PERTAINING TO NOISE

Investigation of the legal situation with regard to regulation of noise in Phoenix shows that to date there are few limitations placed by law upon the generation of noise. In the preparation of this Environmental Impact Statement, the laws of the State of Arizona and ordinances of the City of Phoenix dealing with noise regulations have been examined. The only statute specifically touching upon this subject is A.R.S. 28-955, which provides as follows:

> Every motor vehicle shall at all times be equipped with a muffler in good working order and in constant operation to prevent excessive or unusual noise, and no person shall use a muffler cutout, by pass or similar device upon a motor vehicle on a highway.

Indirectly dealing with the subject is the state law on public nuisance, which provides as follows:

> Anything which is injurious to health, or is indecent, or offensive to the senses, or an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property by an entire community or neighborhood, or by a considerable number of persons, or which unlawfully obstructs the free passage or use, in the customary manner, of any navigable lake, river, bay, stream, canal or basin, or any public park, square, street or highway, is a public nuisance, and is no less a nuisance because the extent of the annoyance or damage inflicted is unequal.

The City of Phoenix has two ordinances dealing with the problem under Sections 23-12 through 23-14(L), and again under Sections 36-68 through 36-73. Following are pertinent excerpts from the Phoenix City code:

> Sec. 23-12. Creation of unreasonably loud and disturbing noises prohibited.
>
> Subject to the provisions of this Article the creating of any unreasonably loud, disturbing and unnecessary noise within the limits of the City is hereby prohibited.(Code 1962, § 26-1.)

Sec. 23-13. Noises detrimental to life and health, or public peace and welfare prohibited.

Noise of such character, intensity or duration as to be detrimental to the life or health of any individual or in disturbance of the public peace and welfare is hereby prohibited.(Code 1962, 26-2.)

Sec. 23-14. Enumeration of loud, disturbing and unnecessary noises; enumeration not exclusive.

The following acts, among others, are declared to be loud, disturbing and unnecessary noises and noises in violation of this Article, but this enumeration shall not be deemed to be exclusive, namely:

(a) *Blowing horns or signaling devices.* The sounding or blowing of any horn or signal device on any automobile, truck, bus, motorcycle or other vehicle while not in motion, except as a danger signal if another vehicle is approaching, apparently out of control, or if in motion only as a danger signal after or as brakes are being applied and deceleration of the vehicle is intended; the creation by means of any such signal device of any unreasonably loud or harsh sound; and the sounding of such device for any unnecessary and unreasonable period of time.

(b) *Radios, phonographs, etc.* The playing of any radio, phonographh [sic] or any other musical instrument in such a manner or with such volume, particularly between the hours of 11:00 P.M. and 7:00 A.M., as to annoy or disturb the quiet, comfort or repose of persons in any office, hospital or in any dwelling, hotel or other type of residence, or of any persons in the vicinity.

(c) *Yelling, shouting, etc., on streets.* Yelling, shouting, hooting, whistling or singing on the public streets, particularly between the hours of 11:00 P.M. and 7:00 A.M., or at any time or place so as to annoy or disturb the quite, comfort or repose of persons in any hospital, dwelling, hotel or other type of residence, or of persons in the vicinity.

(d) *Pets.* The keeping of any animal, bird or fowl which, by causing frequent or long continued noise, shall disturb the comfort or repose of any person in the vicinity.

(e) *Use of vehicles.* The use of any automobile, truck, bus, motorcycle or other vehicle so out of repair, so loaded or in such manner as to create loud and unnecessary grating, grinding, rattling or other noise.

(f) *Blowing whistles.* The blowing of any steam whistle attached to any stationary boiler except to give notice of the time to begin or stop work, as a warning of fire or danger, or upon request of proper City authorities.

(g) *Exhaust discharge.* To discharge into the open air the exhaust of any steam engine, stationary internal combustion engine, motor vehicle or motorboat engine, except through a muffler or other device which will effectively prevent loud or explosive noises therefrom; *Provided,* however, that the flying of controlled model airplanes, sailing of model boats or racing of model automobiles, having internal combustion engines not to exceed thirty-five hundredths cubic inch piston displacement, when used in the pursuit of a recreation hobby and at such locations as are under the jurisdiction or control of the Parks, Playgrounds and Recreational Board of the City and only at such times as may be designated by the Parks Department shall not be deemed to be within the provisions of this Subsection.

(h) *Building operations; excavation of streets; permit from City Manager.* The erection (including excavating), demolition, alteration or repair of any building in any residential district or section and the excavation of streets and highways in any residential district or section, other than between the hours of 6:00 A.M. and 7:00 P.M. from the first day of May to and incluing the 30th day of September and between the hours of 7:00 A.M. and 7:00 P.M. beginning the first day of October to and including the 30th day of April on weekdays, except

in case of urgent necessity in the interest of public health and safety and then only with a permit from the City Manager, which permit may be granted for a period not to exceed thirty days, while the emergency continues. If the City Manager should determine that the public health and safety will not be impaired by the erection, demolition, alteration or repair of any building or the excavation of streets and highways within the hours specified herein, and if he shall further determine that loss or inconvenience would not result to any party in interest, he may grant permission for such work to be done at times other than specified herein, upon application being made at the time the permit for the work is awarded or during the progress of the work.(Ord. No. G-931.)

(i) *Noises near schools, hospitals, churches, etc.* The creation of any excessive noise on any street adjacent to any school, institution of learning, church or court while the same is in session, or adjacent to any hospital, which unreasonably interferes with the workings or session thereof; *Provided,* that signs must be displayed in such streets indicating that the same is a school, institution of learning, church, court or hospital.

(j) *Loading and unloading operations.* The creation of loud and excessive noise in connection with loading or unloading any vehicle or the opening and destruction of bales, boxes, crates and containers.

(k) *Noises to attract attention.* The use of any drum, loud-speaker or other instrument or device for the purpose of attracting attention by creation of noise to any performance, show or sale or display of merchandise.

(l) *Loud-speakers or amplifiers on vehicles.* The use of mechanical loud-speakers or amplifiers on automobiles, trucks, busses or other moving or standing vehicles for advertising or other purposes. (Code 1962, § 26-3.)

Sec. 36-68. Improper operation of vehicle.

No person shall operate upon a street of this City a vehicle so out of repair, or so loaded as to create loud and unnecessary grating, grinding, rattling, or other noise. (Code 1962, § 37-34.01.)

Sec. 36-69. Unnecessary vehicle noise.

No person shall intentionally operate any vehicle at such a speed on a curve or turn or accelerate or decelerate such vehicle in such a manner as to create loud and unnecessary noise through the squealing of tires upon the pavement or to cause damage to the roadway.

Sec. 36-72. Blowing horns or signaling devices.[5]

No person shall sound or blow any horn or signal device on any automobile, truck, motorcycle or other vehicle while not in motion, except as a danger signal if another vehicle is approaching, apparently out of control, or, if in motion, only as a danger signal after or as brakes are being applied and deceleration of the vehicle is intended. No person shall create by means of any such signal device any unreasonably loud or harsh sound nor sound any such device for an unnecessary and unreasonable period of time. (Code 1962, § 37-34.02.)

[5] Cross reference.- As to noise generally, see §§ 23-12 through 23-17.

AIR SAMPLING TECHNIQUES AND METHODS OF CHEMICAL ANALYSIS

Carbon Monoxide. Continuous sampling, determination, and recording of carbon monoxide levels were acheived by means of the well known non-dispersive infra-red technique (NDIR) using the Model 315A Long Path unitized assembly manufactured by Beckman Instruments, Inc. This determination is based on the differential measurement of the absorption of infra-red energy between the suspect atmosphere and a standard reference gas. Continuous line readings are recorded on a strip chart in units of parts per million parts of air (ppm). Average hourly values were obtained by planimeter measurements and converted to the more recently used units of mg/m^3.

Hydrocarbons. Continuous sampling, determination, and recording of hydrocarbon levels were accomplished by means of the familiar flame ionization technique using the Model 400 Hydrocarbon Analyzer manufactured by Beckman Instruments, Inc. This determination is based on the ion current resulting from the combustion of hydrocarbons, the magnitude of ion current being proportional to the number of carbon atoms being burned. Continuous line readings are recorded on a strip chart in units of parts of methane per million part of air (ppm). Average hourly values were obtained by planimeter measurements and converted to ug/m^3 in conformity with recent practice. The State of Arizona ambient air quality standards are expressed in terms of non-methane hydrocarbons but unfortunately at the time of this study only a methane-sensitized

instrument was available. However, the data are of significance in suggesting orders of magnitude of pollution from hydrocarbons at the several test sites.

Particulates. Atmospheric loadings of particulate matter were determined by 24-hour samplings using the "Hi-Vol" Sampler manufactured by the General Metals Co. This unit is essentially a vacuum cleaner drawing ambient air at the rate of 50 - 60 cfm through an 8" x 10" glass fiber filter. The difference in weight between the clean filter and the loaded filter represents the mass loading of the atmosphere and is expressed in ug/m^3 of the 24-hour sampling period.

Lead. A known fraction of the filter used for particulate sampling was extracted with acid and after adjustment to known volume, the lead was measured by absorption spectroscopy. This procedure is highly specific and involves only the determination of absorption of radiation of excited lead by the unknown sample, the degree of absorption being proportional to the concentration of the unknown.

Wind. The meteorological variables of significance, namely wind velocity and wind direction, were obtained with the battery-powered continuous recording MRI Weatherometer manufactured by Meteorological Research Instruments.

LOCAL CLIMATOLOGICAL DATA

Following are the complete local Climatological Data Sheets for 1971.

LOCAL CLIMATOLOGICAL DATA

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
ENVIRONMENTAL DATA SERVICE

A UNITED STATES DEPARTMENT OF COMMERCE PUBLICATION

PHOENIX, ARIZONA
SKY HARBOR AIRPORT
JANUARY 1971

Latitude 33 °26 ′N Longitude 112 ° 01 ′ W Elevation (ground) 1117 ft. Standard time used: MOUNTAIN WBAN #23183

Date	Temperature °F Maximum	Minimum	Average	Departure from normal	Average dew point	Degree days Base 65° Heating	Cooling	Weather types on dates of occurrence (1 Fog, 2 Heavy fog x, 3 Thunderstorm, 4 Ice pellets, 5 Hail, 6 Glaze, 7 Duststorm, 8 Smoke, Haze, 9 Blowing snow)	Snow, ice pellets or ice on ground at 05AM In.	Precipitation Water equivalent In.	Snow, ice pellets In.	Avg. station pressure In. Elev. 1107 feet m.s.l.	Wind Resultant direction	Resultant speed m.p.h.	Average speed m.p.h.	Fastest mile Speed m.p.h.	Direction	Sunshine Hours and tenths	Percent of possible	Sky cover Tenths Sunrise to sunset	Midnight to midnight	Date
1	2	3	4	5	6	7A	7B	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	66	35	51	0	35	14	0	8	0	0	0	28.73	11	3.3	5.8	12	ESE/	7.1	71	9	5	1
2	60	36	48	-2	37	17	0	1 8	0	.22	0	28.45	26	5.7	9.5	28	W/	3.4	34	6	6	2
3	46	33	40	-10	18	25	0		0	0	0	28.79	26	7.6	10.5	22	W/	10.0	100	0	1	3
4	45	26	36	-14	11	29	0		0	0	0	29.05	35	1.1	6.6	17	ENE/	10.0	100	0	0	4
5	46	24	35	-15	4	30	0		0	0	0	29.00	06	3.0	6.2	14	NNW/	10.0	100	0	0	5
6	46	22	34	-16	1	31	0		0	0	0	29.04	06	7.2	9.2	21	ENE/	10.0	100	0	0	6
7	46	19*	33*	-17	1	32	0		0	0	0	29.08	04	2.7	6.0	22	NE/	10.1	100	0	0	7
8	52	20	36	-14	10	29	0		0	0	0	28.99	19	1.5	4.9	13	ENE/	9.5	95	3	3	8
9	58	26	42	-8	17	23	0		0	0	0	28.89	11	3.7	5.6	14	ESE/	10.1	100	0	0	9
10	64	30	47	-3	18	18	0		0	0	0	28.93	11	5.3	6.3	12	ESE/	10.1	100	0	0	10
11	68	34	51	1	25	14	0		0	0	0	28.85	12	4.3	5.0	12	ESE/	10.1	100	1	2	11
12	67	34	51	1	24	14	0		0	0	0	28.82	10	2.5	7.5	15	NW/	7.8	77	3	2	12
13	63	35	49	-1	32	16	0		0	0	0	28.95	22	.2	6.0	10	W/	8.8	87	4	5	13
14	64	35	50	0	33	15	0		0	0	0	29.05	12	2.3	4.3	10	ESE/	9.5	93	2	4	14
15	76	34	55	6	29	10	0		0	0	0	29.12	12	1.1	6.0	12	WNW/	10.2	100	9	6	15
16	77	38	58	9	26	7	0		0	0	0	29.05	24	.9	3.7	10	SE/	9.6	94	8	6	16
17	76	40	58	9	26	7	0		0	0	0	28.95	09	3.4	6.0	10	ESE/	10.2	100	5	4	17
18	80	46	63	13	32	2	0	8	0	0	0	28.84	15	1.5	6.0	10	E/	9.9	97	1	2	18
19	88*	47	68	18	37	0	3		0	0	0	28.80	10	4.9	5.9	13	ESE/	10.3	100	0	0	19
20	83	54	69*	19	38	0	4		0	0	0	28.80	10	3.0	5.3	15	ESE/	8.2	80	3	3	20
21	78	51	65	15	39	0	0		0	0	0	28.81	08	3.5	6.5	12	E/	6.8	66	10	9	21
22	72	48	60	10	40	5	0		0	0	0	28.77	11	1.7	4.8	12	E/	7.8	75	10	7	22
23	71	40	56	6	32	9	0		0	0	0	28.77	18	1.5	5.0	14	SW/	10.4	100	0	0	23
24	71	37	54	4	27	11	0		0	0	0	28.87	14	3.7	6.2	12	SW/	10.3	99	0	0	24
25	71	34	53	3	26	12	0		0	0	0	29.02	13	3.9	5.6	10	ESE/	10.4	100	0	0	25
26	78	37	58	8	28	7	0		0	0	0	29.01	17	1.6	5.8	12	W/	10.4	100	0	0	26
27	81	40	61	11	28	4	0		0	0	0	28.92	10	1.4	5.6	10	WSW/	10.5	100	1	0	27
28	83	45	64	14	28	1	0		0	0	0	28.90	30	1.8	3.7	12	W/	8.9	85	2	2	28
29	82	43	63	13	23	2	0		0	0	0	28.90	06	2.7	6.8	13	WNW/	8.3	79	9	5	29
30	78	39	59	9	24	6	0		0	0	0	28.91	12	4.2	6.0	12	E/	10.5	100	0	0	30
31	76	41	59	8	25	6	0		0	0	0	28.79	11	4.6	7.2	12	E/	8.5	81	2	3	31
	Sum	Sum				Total	Total			Total	Total	For the month:						Total	%	Sum	Sum	
	2112	1123				396	7	Number of days		.22	0	28.90	11	1.7	6.1	28	W/	287.7	for	88	75	
	Avg.	Avg.	Avg.	Dep.	Avg.	Dep.	Dep.	Precipitation		Dep.						Date: 02		Possible	month	Avg.	Avg.	
	68.1	36.2	52.2	2.5	25	-78		≧ .01 inch 1		-0.51								317.0	91	2.8	2.4	

Number of days				Season to date		Snow, ice pellets		Greatest in 24 hours and dates		Greatest depth on ground of snow, ice pellets or ice and date
Maximum Temp.		Minimum Temp.		Total	Total	≧ 1.0 inch 0		Precipitation	Snow, ice pellets	
≦ 90° ‡	≧ 32°	≧ 32°	≧ 0°	910	7	Thunderstorms 0				
				Dep.	Dep.	Heavy fog X 0		.22	2	0
0	0	7	0	-235		Clear 22	Partly cloudy 3	Cloudy 6		0

HOURLY PRECIPITATION (Water equivalent in inches)

Date	A. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	P. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	Date
1																									1
2															.02	.02	.06	.12	T		T				2
3																									3
4																									4
5																									5
6																									6
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30																									30
31																									31

* Extreme temperatures for the month. May be the last of more than one occurrence.
– Below zero temperature or negative departure from normal.
‡ ≧ 70° at Alaskan stations.
\+ Also on an earlier date, or dates.
X Heavy fog restricts visibility to ¼ mile or less.
T In the Hourly Precipitation table and in columns 9, 10, and 11 indicates an amount too small to measure.

The season for degree days begins with July for heating and with January for cooling.
Data in columns 6, 12, 13, 14, and 15 are based on 8 observations per day at 3-hour intervals.
Wind directions are those from which the wind blows. Resultant wind is the vector sum of wind directions and speeds divided by the number of observations. Figures for directions are tens of degrees from true North; i.e., 09 = East, 18 = South, 27 = West, 36 = North, and 00 = Calm. When directions are in tens of degrees in Col. 17, entries in Col. 16 are fastest observed 1-minute speeds. If the / appears in Col. 17, speeds are gusts.
Any errors detected will be corrected and changes in summary data will be annotated in the annual summary.

Subscription Price: Local Climatological Data $1.00 per year including annual summary if published. Single copy: 10 cents for monthly summary; 15 cents for annual summary. Checks or money orders should be made payable and remittances and correspondence should be sent to the Superintendent of Documents, U. S. Goverment Printing Office, Washington, D. C. 20402.

I certify that this is an official publication of the National Oceanic and Atmospheric Administration, and is compiled from records on file at the National Climatic Center, Asheville, North Carolina 28801.

William H. Haggard
Director, National Climatic Center

SUMMARY BY HOURS

Hour Local time	Sky cover Tenths	Averages: Station pressure In.	Temperature Air °F	Wet bulb °F	Dew Pt. °F	Relative humidity %	Wind speed m.p.h.	Resultant wind Direction	Speed m.p.h.
02	1	28.90	43	36	25	52	6.5	10	4.2
05	2	28.90	40	34	25	57	7.0	11	4.0
08	2	28.93	38	33	25	59	6.1	10	4.2
11	2	28.96	56	43	25	32	6.8	10	4.3
14	3	28.88	66	47	24	21	6.0	23	1.7
17	4	28.85	66	47	23	21	6.8	28	4.4
20	3	28.87	56	43	26	34	4.8	22	.3
23	2	28.90	48	39	26	43	5.0	11	2.6

USCOMM — NOAA — ASHEVILLE 325

OBSERVATIONS AT 3-HOUR INTERVALS

HOUR	SKY COVER Tenths	CEILING Hnds. of ft.	VISIBILITY Whole Miles	VISIBILITY Halves Mile	WEATHER	TEMPERATURE AIR °F	TEMPERATURE WET BULB °F	TEMPERATURE DEW PT. °F	REL. HUM. %	WIND DIR.	WIND SPEED Knots
DAY 01											
02	0	UNL	15			41	38	35	79	10	6
05	0	UNL	15			38	36	33	82	13	5
08	8	250	7			36	34	32	85	09	3
11	8	UNL	20			50	43	36	59	12	7
14	10	UNL	8			63	49	35	35	15	5
17	8	250	6		KH	65	50	35	33	27	6
20	4	UNL	10			54	45	36	51	03	3
23	1	UNL	10			44	40	35	71	07	5
DAY 02											
02	0	UNL	10			40	37	33	76	07	5
05	1	UNL	10			39	36	33	79	08	8
08	0	UNL	3		GFH	37	35	33	85	00	0
11	2	UNL	5		KH	58	47	35	42	24	5
14	10	90	20			59	48	37	44	26	11
17	10	28	7		RW	49	47	46	89	26	8
20	10	65	12			48	45	42	80	25	14
23	10	70	15			45	41	35	68	27	15
DAY 03											
02	9	120	15			42	36	28	58	25	13
05	0	UNL	15			36	31	22	57	25	10
08	0	UNL	60			34	28	14	44	27	12
11	0	UNL	60			40	31	15	36	27	11
14	0	UNL	60			45	34	16	31	30	8
17	1	UNL	60			44	33	14	30	24	7
20	1	UNL	15			35	31	23	62	12	8
23	0	UNL	15			36	29	14	40	34	4
DAY 04											
02	0	UNL	15			31	26	15	51	22	7
05	0	UNL	15			29	25	14	53	26	7
08	0	UNL	60			27	23	14	58	22	2
11	0	UNL	60			38	30	13	36	05	9
14	0	UNL	70			43	32	08	24	29	4
17	0	UNL	70			44	32	06	21	32	4
20	0	UNL	15			38	29	10	31	08	6
23	0	UNL	15			34	27	10	37	05	7
DAY 05											
02	0	UNL	15			32	24	04	30	34	7
05	0	UNL	15			28	23	09	45	23	6
08	0	UNL	60			28	22	07	41	34	2
11	0	UNL	60			38	27	01	21	06	9
14	0	UNL	60			44	31	00	16	10	3
17	0	UNL	70			45	31	00	15	12	3
20	0	UNL	15			37	28	08	30	08	10
23	0	UNL	15			33	25	05	30	07	3
DAY 06											
02	0	UNL	15			30	23	04	33	07	6
05	0	UNL	15			25	20	06	44	23	3
08	0	UNL	60			24	20	08	50	19	4
11	0	UNL	70			38	27	-05	16	07	12
14	0	UNL	70			44	31	-01	15	05	9
17	0	UNL	70			44	31	-01	15	07	9
20	0	UNL	15			37	26	-02	19	05	13
23	0	UNL	15			33	24	-05	19	04	8
DAY 07											
02	0	UNL	15			32	23	-03	22	05	3
05	0	UNL	15			26	20	03	37	24	5
08	0	UNL	60			27	21	01	32	32	5
11	0	UNL	60			38	27	-02	18	06	10
14	0	UNL	70			44	30	-04	13	07	8
17	0	UNL	70			44	31	-01	15	04	3
20	0	UNL	15			38	28	03	23	28	5
23	0	UNL	15			30	24	08	39	07	3
DAY 08											
02	0	UNL	15			27	23	12	53	06	3
05	0	UNL	15			25	21	09	50	20	4
08	0	UNL	45			23	20	12	63	14	3
11	0	UNL	60			42	31	08	24	07	7
14	2	UNL	60			50	35	06	16	21	4
17	9	UNL	45			52	36	05	15	28	4
20	10	250	15			44	33	14	30	20	4
23	4	UNL	15			41	32	14	33	25	5
DAY 09											
02	0	UNL	15			33	27	15	48	10	7
05	0	UNL	15			28	25	16	61	06	6
08	0	UNL	50			28	25	17	63	08	8
11	0	UNL	40			45	34	16	31	04	3
14	0	UNL	25			55	40	17	22	18	4
17	1	UNL	20			57	40	14	18	17	3
20	0	UNL	15			47	36	19	33	19	4
23	0	UNL	15			38	32	23	55	14	4
DAY 10											
02	0	UNL	15			34	29	21	59	10	6
05	0	UNL	15			33	29	20	59	10	7
08	0	UNL	30			31	27	19	61	11	5
11	0	UNL	45			52	40	22	31	11	8
14	0	UNL	35			61	43	15	16	14	4
17	0	UNL	45			64	43	10	12	12	4
20	0	UNL	15			54	40	18	24	33	3
23	0	UNL	15			42	34	21	43	14	7
DAY 11											
02	0	UNL	15			39	33	22	51	12	6
05	0	UNL	15			36	31	23	59	09	3
08	0	UNL	35			36	32	25	64	09	4
11	0	UNL	25			55	43	26	33	11	7
14	2	UNL	20			65	47	24	21	13	7
17	1	UNL	20			67	47	23	19	13	5
20	6	UNL	15			53	42	27	37	22	3
23	2	UNL	15			45	38	27	49	00	0
DAY 12											
02	0	UNL	15			37	33	26	65	09	7
05	0	UNL	15			36	32	25	64	09	8
08	0	UNL	30			37	32	25	62	10	10
11	0	UNL	30			55	42	24	30	10	6
14	6	250	25			66	46	18	16	29	4
17	10	180	45			63	45	20	19	29	11
20	0	UNL	15			52	41	27	38	18	6
23	0	UNL	15			45	38	28	51	00	0
DAY 13											
02	0	UNL	15			43	37	27	53	07	4
05	0	UNL	15			38	34	27	65	07	7
08	0	UNL	30			38	34	27	65	11	6
11	1	UNL	30			54	45	34	47	12	4
14	8	UNL	30			63	49	35	35	27	8
17	8	UNL	30			61	48	35	38	28	7
20	9	250	15			54	45	36	51	25	6
23	10	250	15			50	43	36	59	00	0
DAY 14											
02	9	UNL	15			42	39	34	73	12	3
05	10	250	15			37	35	32	82	12	7
08	1	UNL	30			36	34	31	82	13	6
11	2	UNL	15			51	43	34	52	07	4
14	0	UNL	20			63	49	35	35	24	5
17	3	UNL	30			64	48	29	27	34	3
20	3	UNL	15			54	45	34	47	00	0
23	2	UNL	15			48	41	33	56	11	2
DAY 15											
02	1	UNL	15			39	35	30	70	15	4
05	0	UNL	15			37	34	29	73	05	4
08	10	UNL	45			35	32	28	76	11	8
11	10	UNL	45			59	46	31	35	13	4
14	10	UNL	45			72	51	27	19	09	3
17	6	UNL	20			73	51	25	17	29	10
20	10	UNL	15			60	46	30	32	30	5
23	6	UNL	15			52	42	28	40	16	4
DAY 16											
02	2	UNL	15			45	38	28	51	07	4
05	3	UNL	15			46	37	24	42	21	6
08	5	UNL	45			42	35	25	51	11	3
11	4	UNL	45			63	46	26	25	00	0
14	10	UNL	20			74	51	24	15	28	6
17	10	UNL	15			75	51	23	14	28	5
20	10	UNL	15			62	47	29	29	11	2
23	1	UNL	15			50	40	27	41	00	0
DAY 17											
02	3	UNL	15			47	38	26	44	09	7
05	1	UNL	15			43	36	26	51	09	8
08	1	UNL	45			42	36	27	55	07	6
11	5	UNL	20			62	46	27	26	12	5
14	5	UNL	15			73	50	24	16	09	3
17	9	250	15			75	51	24	15	28	6
20	10	250	15			67	49	28	23	23	3
23	1	UNL	15			55	43	28	36	10	4
DAY 18											
02	6	UNL	15			49	40	28	44	09	5
05	7	UNL	15			49	40	29	46	09	7
08	7	250	20			47	40	30	52	11	7
11	0	UNL	8			63	47	29	28	23	5
14	0	UNL	4		KH	76	53	30	18	25	7
17	0	UNL	12			80	56	34	19	26	5
20	0	UNL	15			68	52	36	31	30	2
23	0	UNL	15			58	48	37	46	10	4
DAY 19											
02	0	UNL	15			52	44	35	53	09	5
05	0	UNL	15			49	43	36	61	06	6
08	0	UNL	40			49	43	35	59	08	7
11	0	UNL	20			74	55	38	27	07	4
14	0	UNL	45			86	59	37	18	12	6
17	0	UNL	45			86	59	35	16	09	4
20	0	UNL	15			69	53	39	34	18	5
23	0	UNL	15			64	51	37	37	12	4
DAY 20											
02	0	UNL	15			54	45	36	51	08	5
05	8	180	15			59	49	38	46	09	5
08	9	180	45			57	48	39	51	13	2
11	5	UNL	30			71	54	39	31	07	6
14	0	UNL	20			80	57	37	21	16	4
17	0	UNL	15			83	58	36	19	27	5
20	1	UNL	15			70	55	41	35	36	2
23	2	UNL	15			61	50	40	46	12	8
DAY 21											
02	10	UNL	15			56	48	39	53	09	8
05	8	UNL	15			52	45	37	57	09	9
08	9	UNL	20			52	45	38	59	08	7
11	10	UNL	15			67	53	40	37	09	6
14	10	UNL	8			77	56	38	25	28	4
17	10	250	15			76	57	40	27	29	5
20	7	UNL	15			68	54	41	38	18	2
23	4	UNL	15			57	48	39	51	04	4
DAY 22											
02	3	UNL	15			52	46	39	61	08	6
05	7	UNL	15			50	44	38	64	10	5
08	10	UNL	20			48	43	38	68	11	4
11	10	UNL	15			64	52	41	43	13	6
14	10	UNL	15			72	55	41	33	00	0
17	10	250	15			71	55	41	34	28	8
20	5	UNL	15			64	53	42	45	31	2
23	3	UNL	15			55	48	40	57	14	2
DAY 23											
02	0	UNL	15			47	43	38	71	13	4
05	0	UNL	15			44	41	37	76	14	5
08	0	UNL	25			40	38	35	82	09	5
11	0	UNL	15			60	50	40	48	14	4
14	0	UNL	8			69	51	32	25	26	8
17	0	UNL	30			70	50	26	19	29	7
20	0	UNL	15			60	44	24	25	00	0
23	0	UNL	15			48	39	27	44	16	2
DAY 24											
02	0	UNL	15			45	38	29	54	12	8
05	0	UNL	15			42	36	28	58	16	4
08	0	UNL	30			39	35	28	65	08	6
11	0	UNL	20			57	45	31	37	12	6
14	0	UNL	15			68	49	26	21	14	3
17	0	UNL	20			70	49	23	17	26	7
20	0	UNL	15			61	45	26	26	22	3
23	0	UNL	15			44	36	23	44	12	6
DAY 25											
02	0	UNL	15			42	35	25	51	12	5
05	0	UNL	15			36	32	25	64	09	8
08	0	UNL	45			38	33	26	62	11	5
11	0	UNL	30			57	45	30	36	15	4
14	0	UNL	20			69	49	27	21	12	4
17	0	UNL	15			70	49	22	16	24	7
20	0	UNL	15			59	44	25	27	00	0
23	0	UNL	12			50	40	26	39	12	6
DAY 26											
02	0	UNL	15			45	37	26	47	13	6
05	0	UNL	15			40	34	25	55	10	6
08	0	UNL	35			38	33	25	60	11	6
11	0	UNL	30			59	45	29	32	14	5
14	0	UNL	30			74	52	27	17	27	6
17	0	UNL	12			76	53	30	18	27	7
20	0	UNL	15			66	50	32	28	27	4
23	0	UNL	15			56	45	33	42	00	0
DAY 27											
02	0	UNL	15			49	40	28	44	08	3
05	0	UNL	15			43	37	28	56	12	6
08	0	UNL	45			44	37	27	51	08	8
11	0	UNL	25			64	47	28	26	31	3
14	0	UNL	20			78	53	27	15	25	4
17	4	UNL	15			79	54	27	15	25	8
20	0	UNL	15			68	51	33	27	00	0
23	0	UNL	15			53	42	29	40	08	7
DAY 28											
02	0	UNL	15			52	42	30	43	30	3
05	0	UNL	15			48	41	31	52	00	0
08	0	UNL	45			46	38	28	50	02	3
11	0	UNL	40			70	50	29	22	08	5
14	1	UNL	45			80	54	25	13	26	7
17	6	250	30			77	52	25	14	28	5
20	6	UNL	15			66	48	27	23	30	3
23	0	UNL	15			57	43	25	29	00	0
DAY 29											
02	0	UNL	15			49	39	26	41	14	5
05	3	UNL	15			48	39	26	42	05	7
08	9	250	45			43	36	25	49	08	5
11	9	UNL	45			65	47	24	21	12	5
14	9	250	45			78	52	20	11	34	5
17	9	250	40			78	52	20	11	30	9
20	2	UNL	15			66	47	22	19	02	3
23	0	UNL	15			54	41	22	29	11	8
DAY 30											
02	0	UNL	15			51	40	23	33	10	5
05	0	UNL	15			43	36	25	49	10	10
08	0	UNL	45			41	34	23	49	13	5
11	0	UNL	25			62	46	27	26	13	5
14	0	UNL	25			74	51	23	15	14	4
17	0	UNL	25			77	52	23	13	28	5
20	0	UNL	15			60	44	23	24	07	4
23	0	UNL	15			53	42	27	37	14	4
DAY 31											
02	0	UNL	15			48	38	24	39	11	8
05	0	UNL	15			45	37	24	44	12	7
08	0	UNL	30			43	35	23	45	08	8
11	0	UNL	30			63	46	24	23	13	7
14	0	UNL	20			74	51	23	15	21	4
17	9	250	20			73	50	23	15	30	4
20	10	180	15			64	47	26	24	03	4
23	8	UNL	15			55	43	29	37	12	8

NOTES

CEILING COLUMN—

UNL indicates an unlimited ceiling.

WEATHER COLUMN—

*	Tornado
T	Thunderstorm
Q	Squall
R	Rain
RW	Rain showers
ZR	Freezing rain
L	Drizzle
ZL	Freezing drizzle
S	Snow
SP	Snow pellets
IC	Ice crystals
SW	Snow showers
SG	Snow grains
IP	Ice pellets
A	Hail
F	Fog
IF	Ice fog
GF	Ground fog
BD	Blowing dust
BN	Blowing sand
BS	Blowing snow
BY	Blowing spray
K	Smoke
H	Haze
D	Dust

WIND COLUMNS—

Directions are those from which the wind blows, indicated in tens of degrees from true North; i. e., 09 for East, 18 for South, 27 for West. Entry of 00 in the direction column indicates calm.

Speed is expressed in knots; multiply by 1.15 to convert to miles per hour.

ADDITIONAL DATA

Other observational data contained in records on file can be furnished at cost via microfilm, microfiche, or paper copies of the original records. Inquiries as to availability and costs should be addressed to: Director, National Climatic Center, Federal Building, Asheville, North Carolina 28801.

STATION: PHOENIX ARIZONA YEAR & MONTH: 71 01

LOCAL CLIMATOLOGICAL DATA

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
ENVIRONMENTAL DATA SERVICE

PHOENIX, ARIZONA
SKY HARBOR AIRPORT
FEBRUARY 1971

Latitude 33° 26′ N Longitude 112° 01′ W Elevation (ground) 1117 ft. Standard time used: MOUNTAIN WBAN #23183

Date	Temperature °F Maximum	Minimum	Average	Departure from normal	Average dew point	Degree days Base 65° Heating	Cooling	Weather types on dates of occurrence (1 Fog, 2 Heavy fog x, 3 Thunderstorm, 4 Ice pellets, 5 Hail, 6 Glaze, 7 Duststorm, 8 Smoke, Haze, 9 Blowing snow)	Snow, ice pellets or ice on ground at 05AM In.	Precipitation Water equivalent In.	Snow, ice pellets In.	Avg. station pressure In. - - - Elev. 1107 feet m.s.l.	Wind Resultant direction	Resultant speed m.p.h.	Average speed m.p.h.	Fastest mile Speed m.p.h.	Direction	Sunshine Hours and tenths	Percent of possible	Sky cover Tenths Sunrise to sunset	Midnight to midnight	Date
1	2	3	4	5	6	7A	7B	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	77	45	61	10	25	4	0		0	0	0	28.74	11	4.2	5.6	16	ESE/	10.1	95	1	3	1
2	77	42	60	9	24	5	0		0	0	0	28.68	13	2.9	5.9	13	W/	10.3	97	3	2	2
3	68	44	56	5	14	9	0	8	0	0	0	28.75	29	11.6	15.8	46	WNW/	8.6	81	4	2	3
4	61	35	48	-4	5	17	0		0	0	0	28.98	04	1.4	7.5	22	NNW/	10.7	100	3	2	4
5	65	32	49	-3	11	16	0		0	0	0	28.82	10	3.1	5.5	12	E/	10.3	96	5	5	5
6	70	38	54	2	17	11	0		0	0	0	28.72	11	2.7	8.3	16	W/	10.4	97	0	2	6
7	72	35	54	2	18	11	0		0	0	0	28.83	17	2.1	6.2	16	W/	10.8	100	0	0	7
8	72	36	54	2	14	11	0		0	0	0	28.90	08	4.0	7.6	14	SE/	10.6	98	4	4	8
9	75	40	58	5	11	7	0		0	0	0	29.01	08	3.2	7.6	26	ENE/	10.8	100	0	0	9
10	76	40	58	5	14	7	0		0	0	0	28.99	09	2.2	6.2	13	ESE/	10.9	100	0	0	10
11	79	40	60	7	21	5	0		0	0	0	28.91	10	4.5	6.3	15	E/	10.0	92	8	5	11
12	84	46	65	12	18	0	0		0	0	0	28.98	06	4.8	6.9	22	NE/	10.9	100	0	0	12
13	84*	48	66	13	21	0	1		0	0	0	28.85	12	2.3	5.6	16	E/	11.0	100	0	0	13
14	83	45	64	10	25	1	0		0	0	0	28.76	11	5.0	6.8	13	ESE/	11.0	100	4	3	14
15	83	47	65	11	26	0	0		0	0	0	28.70	08	3.4	8.3	15	E/	10.4	95	4	4	15
16	80	51	66*	12	28	0	1	7	0	0	0	28.64	10	3.9	9.1	31	SW/	6.3	57	9	8	16
17	66	48	57	3	43	8	0	3 5	0	.30	0	28.66	16	.9	8.6	31	WNW/	1.7	16	9	9	17
18	64	50	57	2	45	8	0		0	.04	0	28.89	16	1.6	8.2	16	WNW/	7.1	64	6	6	18
19	71	42	57	2	38	8	0		0	.01	0	28.74	18	5.9	13.4	35	NW/	10.1	90	1	3	19
20	58	44	51	-4	28	14	0	1	0	T	0	28.63	26	9.1	12.2	28	W/	9.0	80	5	5	20
21	62	35	49	-6	29	16	0		0	0	0	28.85	13	3.4	7.5	15	W/	11.0	98	0	0	21
22	64	37	51	-4	27	14	0		0	0	0	28.75	10	5.6	6.2	14	E/	8.3	74	6	3	22
23	64	41	53	-2	29	12	0		0	T	0	28.67	14	5.1	8.2	20	S/	7.3	65	9	8	23
24	71	47	59	3	33	6	0		0	0	0	28.77	28	2.2	6.5	18	NE/	10.9	96	1	3	24
25	74	43	59	3	31	6	0		0	0	0	28.74	23	3.2	9.2	28	WSW/	11.3	100	0	0	25
26	65	47	56	0	9	9	0		0	0	0	28.86	29	10.5	11.4	26	WNW/	11.4	100	0	0	26
27	62	33	48	-8	6	17	0		0	0	0	28.87	25	7.6	8.6	22	W/	11.1	98	0	0	27
28	61	31*	46*	-11	12	19	0		0	0	0	28.81	19	1.9	10.5	25	WSW/	11.4	100	0	0	28

Sum	Sum	—	—	—	Total	Total		Total	Total	For the month:							Total	%	Sum	Sum	
1988	1162	—	—	—	241	2	Number of days	.35	0	28.80	14	.9	8.2	46	WNW/		273.7	for	82	77	
Avg.	Avg.	Avg.	Dep.	Avg.	Dep.	Dep.	Precipitation	Dep.						Date: 03			Possible	month	Avg.	Avg.	
71.0	41.5	56.3	2.8	22	-87		≥ .01 inch 3	-0.50									307.8	89	2.9	2.8	

Number of days				Season to date Total	Total	Snow, ice pellets ≥ 1.0 inch 0	Greatest in 24 hours and dates		Greatest depth on ground of snow, ice pellets or ice and date
Maximum Temp.		Minimum Temp.		1151	9	Thunderstorms 1	Precipitation	Snow, ice pellets	
≥ 90° ‡	≤ 32°	≤ 32°	≤ 0°	Dep.	Dep.	Heavy fog X 0	.34 17-18	0	0
0	0	2	0	-322		Clear 16 Partly cloudy 8 Cloudy 4			

HOURLY PRECIPITATION (Water equivalent in inches)

Date	A. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	P. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	Date
1																									1
2																									2
3																									3
4																									4
5																									5
6																									6
7																									7
8																									8
9																									9
10																									10
11																									11
12																									12
13																									13
14																									14
15																									15
16																									16
17		T	T	T	T	T	T	T					T	.14	.15	.01	T	T							17
18			.02	.01	.01	T																			18
19																						T	T	.01	19
20	T																								20
21																									21
22																									22
23																								T	23
24																									24
25																									25
26																									26
27																									27
28																									28

* Extreme temperatures for the month. May be the last of more than one occurrence.
– Below zero temperature or negative departure from normal.
‡ ≥ 70° at Alaskan stations.
+ Also on an earlier date, or dates.
X Heavy fog restricts visibility to ¼ mile or less.
T In the Hourly Precipitation table and in columns 9, 10, and 11 indicates an amount too small to measure.

The season for degree days begins with July for heating and with January for cooling.
Data in columns 6, 12, 13, 14, and 15 are based on 8 observations per day at 3-hour intervals.
Wind directions are those from which the wind blows. Resultant wind is the vector sum of wind directions and speeds divided by the number of observations. Figures for directions are tens of degrees from true North; i.e., 09 = East, 18 = South, 27 = West, 36 = North, and 00 = Calm. When directions are in tens of degrees in Col. 17, entries in Col. 16 are fastest observed 1-minute speeds. If the / appears in Col. 17, speeds are gusts.
Any errors detected will be corrected and changes in summary data will be annotated in the annual summary.

Subscription Price: Local Climatological Data $1.00 per year including annual summary if published. Single copy: 10 cents for monthly summary; 15 cents for annual summary. Checks or money orders should be made payable and remittances and correspondence should be sent to the Superintendent of Documents, U. S. Goverment Printing Office, Washington, D. C. 20402.

I certify that this is an official publication of the National Oceanic and Atmospheric Administration, and is compiled from records on file at the National Climatic Center, Asheville, North Carolina 28801.

William H. Haggard
Director, National Climatic Center

SUMMARY BY HOURS

Hour Local time	Averages: Sky cover Tenths	Station pressure In.	Temperature Air °F	Wet bulb °F	Dew Pt. °F	Relative humidity %	Wind speed m.p.h.	Resultant wind Direction	Speed m.p.h.
02	3	28.81	49	39	24	41	7.4	10	4.5
05	3	28.81	46	37	23	44	7.5	11	2.9
08	3	28.84	45	37	23	46	7.4	09	4.3
11	3	28.86	61	45	23	27	9.2	09	3.6
14	3	28.79	68	48	20	19	9.5	26	4.2
17	3	28.75	69	48	19	17	10.3	27	7.7
20	2	28.77	61	44	21	24	6.6	22	2.2
23	2	28.80	53	41	24	35	7.8	11	2.8

USCOMM—NOAA—ASHEVILLE 325

OBSERVATIONS AT 3-HOUR INTERVALS

HOUR	SKY COVER Tenths	CEILING Hnds. of ft.	VISIBILITY WHOLE MILES	VISIBILITY Hnds. MILE	WEATHER	TEMPERATURE AIR °F	TEMPERATURE WET BULB °F	TEMPERATURE DEW PT. °F	REL. HUM. %	WIND DIR.	WIND SPEED Knots
DAY 01											
02	10	180	15			53	42	28	38	08	2
05	7	UNL	15			51	40	26	38	11	7
08	6	UNL	20			48	39	26	42	07	9
11	0	UNL	15			66	47	23	19	12	6
14	0	UNL	15			74	51	26	17	18	4
17	0	UNL	20			76	52	24	14	35	3
20	0	UNL	15			64	47	25	23	14	3
23	0	UNL	15			55	42	25	31	12	5
DAY 02											
02	0	UNL	15			51	40	25	36	11	8
05	0	UNL	15			46	37	24	42	14	6
08	0	UNL	25			42	35	25	51	09	5
11	0	UNL	25			64	47	25	23	12	7
14	4	UNL	20			75	50	19	12	28	4
17	2	UNL	50			75	53	29	18	29	5
20	2	UNL	15			63	46	24	23	20	3
23	1	UNL	15			56	42	24	29	13	3
DAY 03											
02	4	UNL	15			47	38	25	42	08	7
05	1	UNL	15			48	38	24	39	18	4
08	6	100	10			48	39	26	42	35	5
11	0	UNL	5		KH	61	48	34	36	25	18
14	7	UNL	1	8	BD	67	44	03	08	29	26
17	2	UNL	2		BD	62	41	00	08	30	27
20	0	UNL	15			56	37	-02	09	29	18
23	0	UNL	15			50	35	03	14	01	5
DAY 04											
02	0	UNL	15			49	34	03	15	35	11
05	0	UNL	15			45	32	03	17	31	6
08	0	UNL	45			37	27	05	26	18	3
11	1	UNL	50			51	36	07	17	06	6
14	7	UNL	50			59	40	08	13	14	7
17	3	UNL	40			60	40	-03	07	30	8
20	0	UNL	15			51	36	07	17	12	4
23	0	UNL	15			43	32	12	28	12	7
DAY 05											
02	0	UNL	15			39	30	13	34	09	7
05	0	UNL	15			35	28	13	40	11	4
08	0	UNL	40			34	27	11	38	09	5
11	1	UNL	25			53	38	13	20	09	5
14	7	UNL	25			62	41	05	10	22	4
17	10	UNL	15			64	43	09	11	27	5
20	10	250	15			60	41	08	12	00	0
23	10	UNL	15			51	38	17	26	08	8
DAY 06											
02	10	140	15			47	35	15	28	12	6
05	9	140	15			43	33	16	34	09	9
08	0	UNL	20			39	31	17	41	07	8
11	0	UNL	15			58	41	15	18	11	6
14	0	UNL	12			67	45	14	13	26	8
17	0	UNL	15			69	47	17	14	26	11
20	0	UNL	15			57	41	18	22	07	5
23	0	UNL	15			50	38	20	31	11	5
DAY 07											
02	0	UNL	15			43	34	19	38	14	5
05	0	UNL	15			40	32	17	39	00	0
08	0	UNL	30			39	32	18	43	11	5
11	0	UNL	30			58	42	20	23	12	4
14	0	UNL	40			68	47	18	15	29	8
17	0	UNL	60			72	48	14	11	25	10
20	0	UNL	15			59	42	15	18	11	4
23	0	UNL	15			49	38	20	32	13	7
DAY 08											
02	1	UNL	15			44	34	16	32	10	7
05	10	UNL	15			45	34	13	27	07	7
08	10	UNL	45			40	31	14	35	11	5
11	10	UNL	45			62	43	14	15	07	9
14	0	UNL	45			69	46	11	10	30	5
17	0	UNL	30			71	47	12	10	29	7
20	0	UNL	15			57	40	13	17	12	5
23	0	UNL	15			51	37	15	24	10	8
DAY 09											
02	0	UNL	15			47	36	19	33	12	3
05	0	UNL	15			40	31	15	36	22	4
08	0	UNL	60			52	38	13	21	24	4
11	0	UNL	60			67	44	07	09	05	17
14	0	UNL	60			73	47	03	06	07	12
17	0	UNL	60			75	47	00	05	18	4
20	0	UNL	15			64	44	15	15	29	4
23	0	UNL	15			52	38	14	22	11	5
DAY 10											
02	0	UNL	15			45	34	12	26	07	8
05	0	UNL	15			47	35	14	26	31	4
08	0	UNL	60			42	33	15	33	08	5
11	0	UNL	45			64	44	15	15	19	4
14	0	UNL	30			74	48	11	09	07	5
17	0	UNL	25			75	49	12	09	28	7
20	0	UNL	15			64	45	17	16	11	3
23	0	UNL	15			55	41	19	24	12	7
DAY 11											
02	0	UNL	15			46	35	17	31	07	9
05	7	UNL	15			46	35	17	31	14	7
08	6	UNL	45			42	33	18	38	09	7
11	9	UNL	30			62	44	20	20	09	6
14	8	UNL	15			74	50	19	12	00	0
17	9	UNL	20			78	52	22	12	24	5
20	1	UNL	15			66	48	26	22	12	4
23	3	UNL	15			57	44	28	33	07	6
DAY 12											
02	0	UNL	15			52	40	22	31	36	2
05	0	UNL	15			53	40	20	27	32	3
08	0	UNL	60			50	39	24	36	04	4
11	0	UNL	60			77	50	14	09	07	14
14	0	UNL	60			83	52	10	06	07	10
17	0	UNL	60			84	53	14	07	20	5
20	0	UNL	15			70	48	20	15	36	2
23	0	UNL	15			56	42	21	26	06	8
DAY 13											
02	0	UNL	15			55	41	19	24	15	5
05	0	UNL	15			53	40	22	30	00	0
08	0	UNL	60			51	38	19	28	11	3
11	0	UNL	45			75	50	20	13	10	11
14	0	UNL	30			81	54	23	12	25	4
17	0	UNL	30			83	54	22	10	27	7
20	2	UNL	15			68	48	24	19	08	5
23	1	UNL	15			58	43	21	24	09	4
DAY 14											
02	0	UNL	15			51	40	25	36	12	8
05	0	UNL	15			49	38	23	36	13	6
08	0	UNL	45			49	39	25	39	11	8
11	0	UNL	25			68	49	26	21	11	8
14	3	UNL	25			79	52	21	11	10	5
17	10	UNL	25			82	54	24	12	29	6
20	6	UNL	15			70	50	26	19	00	0
23	2	UNL	15			59	45	27	29	11	6
DAY 15											
02	0	UNL	15			54	42	27	35	11	9
05	0	UNL	15			50	39	24	36	08	12
08	1	UNL	35			47	38	25	42	10	7
11	3	UNL	30			68	49	28	22	09	8
14	1	UNL	30			80	53	23	12	28	6
17	9	UNL	35			82	54	23	11	32	9
20	10	150	15			74	51	26	17	23	4
23	10	130	15			67	49	28	23	11	3
DAY 16											
02	10	120	15			64	48	29	27	03	6
05	0	UNL	15			55	43	26	33	07	7
08	3	UNL	45			53	41	25	34	10	4
11	10	UNL	35			71	52	31	23	10	9
14	10	UNL	40			79	54	27	15	18	12
17	10	130	35			77	52	25	14	10	7
20	10	150	15			67	48	26	21	07	8
23	10	150	15			69	52	35	29	27	10
DAY 17											
02	10	90	15			63	50	37	38	12	6
05	10	130	15			59	51	43	56	09	8
08	8	90	45			60	51	42	52	16	9
11	10	55	35			63	52	42	46	23	10
14	10	31	7		RW	54	51	48	80	30	13
17	8	49	35		RW	52	48	45	77	02	10
20	9	150	15			52	48	44	74	00	0
23	10	36	15			52	48	44	74	16	4
DAY 18											
02	10	44	15			51	48	45	80	10	8
05	10	31	7		RW	50	48	47	89	11	5
08	10	26	20			50	48	46	86	08	5
11	10	15	20			56	52	48	75	11	5
14	7	25	20			62	54	47	58	28	10
17	1	UNL	20			63	52	42	46	25	11
20	0	UNL	15			60	51	43	54	25	6
23	0	UNL	15			52	48	44	74	11	7
DAY 19											
02	0	UNL	15			47	45	42	83	09	6
05	0	UNL	15			45	43	41	86	10	9
08	0	UNL	10			44	42	40	86	09	10
11	0	UNL	15			56	50	44	64	15	8
14	5	UNL	30			66	53	40	39	17	14
17	0	UNL	45			71	50	27	19	21	14
20	8	70	15			66	48	28	24	22	16
23	10	39	7		RW	51	47	42	71	29	16
DAY 20											
02	6	UNL	7			49	46	42	77	15	5
05	6	100	8			47	40	32	56	26	13
08	5	UNL	12			45	38	27	49	26	13
11	3	UNL	20			51	39	22	32	26	13
14	5	UNL	40			57	42	19	23	27	15
17	6	70	45			54	41	24	31	28	12
20	0	UNL	15			52	42	28	40	28	7
23	0	UNL	15			46	40	31	56	08	7
DAY 21											
02	0	UNL	15			41	37	31	68	13	5
05	0	UNL	15			38	35	31	76	10	7
08	0	UNL	60			39	36	32	76	13	7
11	0	UNL	60			51	41	28	41	11	5
14	0	UNL	45			61	46	29	30	27	8
17	0	UNL	40			62	46	26	25	24	8
20	0	UNL	15			54	43	28	37	10	5
23	0	UNL	15			46	39	30	54	09	7
DAY 22											
02	0	UNL	15			42	37	30	63	11	5
05	0	UNL	15			40	36	31	70	13	4
08	9	160	30			41	37	31	68	08	9
11	10	250	20			51	42	31	46	08	5
14	6	230	30			62	45	24	23	16	3
17	0	UNL	40			63	44	17	17	14	3
20	1	UNL	15			53	41	25	34	08	6
23	0	UNL	15			48	39	26	42	10	8
DAY 23											
02	0	UNL	15			43	36	26	51	08	8
05	10	130	15			44	37	28	53	14	10
08	6	220	25			44	37	28	53	10	9
11	10	60	20			52	42	28	40	17	4
14	10	UNL	30			61	46	29	30	14	4
17	10	200	30			62	46	27	26	27	8
20	10	90	15			59	46	30	33	18	6
23	10	43	15			57	46	33	40	13	8
DAY 24											
02	10	90	15			52	45	37	57	06	5
05	10	70	15			52	45	37	57	25	7
08	6	60	25			50	44	38	64	00	0
11	0	UNL	40			65	49	31	28	04	10
14	0	UNL	45			68	50	29	23	19	4
17	0	UNL	30			70	50	27	20	28	6
20	0	UNL	15			64	49	33	32	25	8
23	0	UNL	15			58	47	34	41	27	5
DAY 25											
02	0	UNL	15			54	45	34	47	27	3
05	0	UNL	15			44	39	32	63	09	6
08	0	UNL	25			46	41	34	63	07	9
11	0	UNL	20			61	48	35	38	05	6
14	0	UNL	20			71	51	30	22	24	6
17	0	UNL	30			72	50	25	17	25	15
20	0	UNL	15			66	48	28	24	22	10
23	0	UNL	15			61	47	30	31	23	9
DAY 26											
02	0	UNL	15			57	45	30	36	29	8
05	0	UNL	15			52	38	13	21	31	12
08	0	UNL	45			49	36	13	23	31	9
11	0	UNL	50			59	40	08	13	32	12
14	0	UNL	60			62	40	-09	05	31	10
17	1	UNL	60			62	41	03	09	26	10
20	0	UNL	15			55	38	09	16	26	8
23	0	UNL	15			48	34	08	19	28	10
DAY 27											
02	0	UNL	15			44	33	11	26	25	8
05	0	UNL	15			39	30	11	31	25	5
08	0	UNL	50			38	29	12	34	17	4
11	0	UNL	60			53	37	08	16	32	4
14	0	UNL	45			60	40	01	09	25	11
17	0	UNL	45			60	40	01	09	27	12
20	0	UNL	15			52	35	00	12	24	10
23	0	UNL	15			46	32	03	17	27	6
DAY 28											
02	0	UNL	15			38	28	06	26	10	9
05	0	UNL	15			32	25	09	38	10	11
08	0	UNL	40			36	27	08	31	06	8
11	0	UNL	20			51	37	14	23	20	3
14	0	UNL	20			59	42	18	20	25	14
17	0	UNL	25			60	42	12	15	26	16
20	0	UNL	15			53	38	13	20	24	6
23	0	UNL	15			43	33	15	32	09	6

NOTES

CEILING COLUMN—

UNL indicates an unlimited ceiling.

WEATHER COLUMN—

- * Tornado
- T Thunderstorm
- Q Squall
- R Rain
- RW Rain showers
- ZR Freezing rain
- L Drizzle
- ZL Freezing drizzle
- S Snow
- SP Snow pellets
- IC Ice crystals
- SW Snow showers
- SG Snow grains
- IP Ice pellets
- A Hail
- F Fog
- IF Ice fog
- GF Ground fog
- BD Blowing dust
- BN Blowing sand
- BS Blowing snow
- BY Blowing spray
- K Smoke
- H Haze
- D Dust

WIND COLUMNS—

Directions are those from which the wind blows, indicated in tens of degrees from true North; i. e., 09 for East, 18 for South, 27 for West. Entry of 00 in the direction column indicates calm.

Speed is expressed in knots; multiply by 1.15 to convert to miles per hour.

ADDITIONAL DATA

Other observational data contained in records on file can be furnished at cost via microfilm, microfiche, or paper copies of the original records. Inquiries as to availability and costs should be addressed to: Director, National Climatic Center, Federal Building, Asheville, North Carolina 28801.

STATION: PHOENIX ARIZONA YEAR & MONTH: 71 02

LOCAL CLIMATOLOGICAL DATA

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
ENVIRONMENTAL DATA SERVICE

PHOENIX, ARIZONA
SKY HARBOR AIRPORT
MARCH 1971

Latitude 33° 26′ N Longitude 112° 01′ W Elevation (ground) 1117 ft. Standard time used: MOUNTAIN WBAN #23183

Date	Temperature °F Maximum	Minimum	Average	Departure from normal	Average dew point	Degree days Base 65° Heating	Cooling	Weather types on dates of occurrence (1 Fog, 2 Heavy fog x, 3 Thunderstorm, 4 Ice pellets, 5 Hail, 6 Glaze, 7 Duststorm, 8 Smoke, Haze, 9 Blowing snow)	Snow, ice pellets or ice on ground at 05AM In.	Precipitation Water equivalent In.	Snow, ice pellets In.	Avg. station pressure In. (Elev. 1107 feet m.s.l.)	Wind Resultant direction	Resultant speed m.p.h.	Average speed m.p.h.	Fastest mile Speed m.p.h.	Direction	Sunshine Hours and tenths	Percent of possible	Sky cover Tenths Sunrise to sunset	Midnight to midnight	Date
1	2	3	4	5	6	7A	7B	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	56	39	48	-9	17	17	0		0	0	0	28.81	28	10.9	13.7	36	W/	7.8	68	6	4	1
2	58	30*	44*	-13	10	21	0		0	0	0	29.16	24	7.1	7.6	20	SW/	11.5	100	0	0	2
3	68	31	50	-7	10	15	0		0	0	0	29.05	24	2.1	5.0	13	S/	11.5	100	1	2	3
4	76	36	56	-1	15	9	0		0	0	0	28.71	12	5.3	8.3	14	ESE/	11.6	100	0	1	4
5	72	46	59	2	14	6	0		0	0	0	28.76	29	7.8	11.4	33	W/	11.6	100	0	2	5
6	70	37	54	-3	5	11	0		0	0	0	29.01	22	1.8	6.6	22	E/	11.6	100	0	0	6
7	78	37	58	0	9	7	0		0	0	0	28.86	09	.7	5.9	23	ENE/	11.7	100	0	0	7
8	80	40	60	2	15	5	0		0	0	0	28.75	18	.9	7.6	17	W/	11.4	97	3	2	8
9	79	43	61	3	18	4	0		0	0	0	28.85	12	3.2	6.8	14	SE/	11.7	100	0	0	9
10	79	44	62	4	19	3	0		0	0	0	28.79	12	1.3	6.6	13	W/	11.4	97	4	5	10
11	78	47	63	5	23	2	0		0	0	0	28.75	12	1.4	7.3	15	W/	11.7	99	5	4	11
12	80	47	64	6	27	1	0		0	0	0	28.73	11	4.1	6.3	14	ESE/	11.8	100	0	0	12
13	75	50	63	5	32	2	0		0	T	0	28.62	26	6.9	14.2	39	W/	8.9	75	4	2	13
14	70	40	55	-4	24	10	0		0	0	0	28.93	26	1.8	5.8	16	SW/	11.9	100	2	2	14
15	77	40	59	0	21	6	0		0	0	0	28.96	13	2.3	4.2	14	WSW/	12.0	100	0	0	15
16	84	43	64	5	20	1	0		0	0	0	28.90	13	1.5	4.6	12	N/	12.0	100	3	2	16
17	86	50	68	9	20	0	3		0	0	0	28.72	19	.9	10.1	25	W/	10.9	91	4	4	17
18	78	51	65	6	8	0	0		0	0	0	28.91	26	1.3	6.3	18	ENE/	11.8	98	6	5	18
19	81	49	65	5	5	0	0		0	0	0	28.92	06	.6	7.5	25	ENE/	10.8	90	10	9	19
20	80	50	65	5	13	0	0		0	0	0	28.76	25	3.8	6.9	22	W/	11.8	97	0	2	20
21	82	42	62	2	14	3	0		0	0	0	28.85	11	2.8	6.3	15	W/	12.2	100	0	0	21
22	85	47	66	6	20	0	1		0	0	0	28.88	11	4.9	7.2	14	NW/	12.0	98	2	2	22
23	88	49	69	8	21	0	4		0	0	0	28.79	12	3.9	7.3	14	WNW/	11.2	91	4	4	23
24	86	55	71	10	24	0	6		0	0	0	28.66	11	2.1	8.1	16	W/	9.1	74	10	9	24
25	85	52	69	8	29	0	4		0	0	0	28.70	10	3.9	6.2	12	WNW/	11.9	96	9	7	25
26	90	55	73	12	27	0	8		0	0	0	28.76	11	3.5	6.8	16	W/	12.2	99	1	1	26
27	90	60	75	14	35	0	10		0	0	0	28.75	21	1.9	8.3	17	WSW/	12.4	100	1	1	27
28	90	56	73	11	32	0	8		0	0	0	28.80	25	3.6	7.3	16	WSW/	12.0	97	1	2	28
29	95*	55	75	13	25	0	10		0	0	0	28.78	04	3.6	5.2	17	E/	12.4	100	0	0	29
30	94	59	77*	15	28	0	12		0	0	0	28.61	22	3.7	7.2	25	WSW/	12.0	96	1	2	30
31	89	61	75	12	16	0	10		0	0	0	28.66	27	6.3	9.8	23	W/	8.9	71	5	5	31
	Sum	Sum				Total	Total			Total	Total	For the month:						Total	%	Sum	Sum	
	2479	1441				123	76	Number of days		T	0	28.81	21	.9	7.5	39	W/	351.7	for	82	79	
	Avg.	Avg.	Avg.	Dep.	Avg.	Dep.	Dep.	Precipitation		Dep.						Date: 13		Possible	month	Avg.	Avg.	
	80.0	46.5	63.3	4.3	19	-94		≥ .01 inch	0	-0.66								371.4	95	2.6	2.5	

Number of days				Season to date Total	Total	Snow, ice pellets		Greatest in 24 hours and dates			Greatest depth on ground of snow, ice pellets or ice and date
Maximum Temp.		Minimum Temp.		1274	85	Thunderstorms	0	Precipitation	Snow, ice pellets		
≥ 90° ‡	≤ 32°	≤ 32°	≤ 0°	Dep.	Dep.	Heavy fog X	0	T 13	0		0
5	0	2	0	-416		Clear 20	Partly cloudy 8	Cloudy 3			

HOURLY PRECIPITATION (Water equivalent in inches)

Date	A. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	P. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	Date
1																									1
2																									2
3																									3
4																									4
5																									5
6																									6
7																									7
8																									8
9	•																								9
10																									10
11																									11
12																									12
13															T										13
14																									14
15																									15
16																									16
17																									17
18																									18
19																									19
20																									20
21																									21
22																									22
23																									23
24																									24
25																									25
26																									26
27																									27
28																									28
29																									29
30																									30
31																									31

* Extreme temperatures for the month. May be the last of more than one occurrence.
– Below zero temperature or negative departure from normal.
‡ ≥ 70° at Alaskan stations.
\+ Also on an earlier date, or dates.
X Heavy fog restricts visibility to ¼ mile or less.
T In the Hourly Precipitation table and in columns 9, 10, and 11 indicates an amount too small to measure.

The season for degree days begins with July for heating and with January for cooling.
Data in columns 6, 12, 13, 14, and 15 are based on 8 observations per day at 3-hour intervals.
Wind directions are those from which the wind blows. Resultant wind is the vector sum of wind directions and speeds divided by the number of observations. Figures for directions are tens of degrees from true North; i.e., 09 = East, 18 = South, 27 = West, 36 = North, and 00 = Calm. When directions are in tens of degrees in Col. 17, entries in Col. 16 are fastest observed 1-minute speeds. If the / appears in Col. 17, speeds are gusts.
Any errors detected will be corrected and changes in summary data will be annotated in the annual summary.

Subscription Price: Local Climatological Data $1.00 per year including annual summary if published. Single copy: 10 cents for monthly summary; 15 cents for annual summary. Checks or money orders should be made payable and remittances and correspondence should be sent to the Superintendent of Documents, U. S. Goverment Printing Office, Washington, D. C. 20402.

I certify that this is an official publication of the National Oceanic and Atmospheric Administration, and is compiled from records on file at the National Climatic Center, Asheville, North Carolina 28801.

William H. Haggard
Director, National Climatic Center

SUMMARY BY HOURS

Hour Local time	Sky cover Tenths	Station pressure In.	Temperature Air °F	Wet bulb °F	Dew Pt. °F	Relative humidity %	Wind speed m.p.h.	Resultant wind Direction	Speed m.p.h.
	AVERAGES								
02	3	28.82	55	41	21	29	6.5	12	2.6
05	2	28.81	50	38	21	32	7.2	11	3.8
08	2	28.85	53	40	22	31	6.2	10	4.0
11	2	28.87	69	48	18	15	8.2	13	2.5
14	2	28.80	77	51	16	11	8.8	26	4.4
17	4	28.76	79	51	15	10	10.2	27	8.2
20	3	28.77	71	48	19	15	6.4	26	4.2
23	2	28.81	62	44	20	22	6.5	09	1.4

OBSERVATIONS AT 3-HOUR INTERVALS

HOUR	SKY COVER Tenths	CEILING Hnds. of ft.	VISIBILITY Whole Miles	VISIBILITY 16ths MILE	WEATHER	TEMPERATURE AIR °F	TEMPERATURE WET BULB °F	TEMPERATURE DEW PT. °F	REL. HUM. %	WIND DIR.	WIND SPEED Knots
DAY 01											
02	9	65	15			44	34	18	35	12	6
05	0	UNL	15			46	37	24	42	25	9
08	3	UNL	12			46	38	26	46	15	3
11	10	75	12			53	41	26	35	27	10
14	9	75	20			56	42	21	26	27	20
17	4	UNL	20			53	38	11	18	29	21
20	0	UNL	15			45	32	02	17	29	14
23	0	UNL	15			41	30	08	25	30	12
DAY 02											
02	0	UNL	15			34	26	09	35	22	8
05	0	UNL	15			32	25	09	38	23	7
08	0	UNL	50			34	26	09	35	22	5
11	0	UNL	45			46	33	09	22	28	6
14	0	UNL	50			55	39	11	17	24	11
17	0	UNL	50			58	40	10	15	25	10
20	0	UNL	15			52	37	10	18	28	6
23	0	UNL	15			46	34	11	24	00	0
DAY 03											
02	0	UNL	15			36	29	13	39	22	3
05	0	UNL	15			33	26	12	42	14	5
08	0	UNL	60			38	30	14	37	26	5
11	0	UNL	40			55	38	09	16	27	4
14	0	UNL	50			63	42	02	08	18	6
17	1	UNL	50			67	44	04	08	31	6
20	6	UNL	15			61	42	12	14	27	3
23	5	UNL	15			53	39	17	24	05	3
DAY 04											
02	0	UNL	15			41	32	14	33	10	8
05	0	UNL	15			38	30	14	37	13	5
08	0	UNL	40			41	33	18	40	12	10
11	0	UNL	15			60	42	14	16	10	7
14	0	UNL	12			71	47	14	11	13	7
17	0	UNL	20			75	48	09	08	26	8
20	0	UNL	15			68	46	15	13	22	4
23	6	UNL	15			59	43	22	24	09	9
DAY 05											
02	7	UNL	15			52	40	23	32	10	6
05	7	UNL	15			47	37	22	37	03	4
08	0	UNL	45			51	39	22	32	02	5
11	0	UNL	10			65	46	19	17	28	9
14	0	UNL	15			71	47	13	11	28	15
17	0	UNL	30			70	45	03	07	28	18
20	0	UNL	15			61	40	00	08	29	14
23	0	UNL	15			53	37	07	15	24	8
DAY 06											
02	0	UNL	15			50	35	07	17	31	5
05	0	UNL	15			43	32	10	26	24	7
08	0	UNL	60			43	32	11	27	21	3
11	0	UNL	70			60	40	-01	08	08	6
14	0	UNL	70			68	44	-06	05	15	7
17	0	UNL	70			70	45	-06	04	24	8
20	0	UNL	15			62	42	09	12	24	4
23	0	UNL	15			52	37	12	20	05	6
DAY 07											
02	0	UNL	15			48	35	13	24	22	6
05	0	UNL	15			46	34	13	26	35	4
08	0	UNL	60			47	35	15	28	25	4
11	0	UNL	50			70	45	-01	06	08	13
14	0	UNL	50			76	48	-02	04	15	3
17	0	UNL	50			78	49	03	05	35	4
20	0	UNL	15			69	46	11	10	24	4
23	0	UNL	15			56	41	17	22	08	3
DAY 08											
02	0	UNL	15			49	37	17	28	13	6
05	0	UNL	15			46	35	14	27	11	6
08	0	UNL	45			48	36	15	27	09	7
11	1	UNL	25			66	44	11	12	10	5
14	3	UNL	30			77	50	11	08	27	6
17	9	UNL	35			77	50	15	09	28	12
20	10	180	15			71	48	19	14	22	7
23	0	UNL	15			62	43	16	17	36	4
DAY 09											
02	0	UNL	15			58	41	14	18	24	6
05	0	UNL	15			49	37	17	28	09	7
08	0	UNL	60			50	38	20	31	11	8
11	1	UNL	45			70	48	20	15	11	8
14	0	UNL	45			77	50	15	09	21	6
17	0	UNL	40			78	50	13	08	34	5
20	0	UNL	15			70	48	20	15	00	0
23	0	UNL	15			59	43	21	23	12	7
DAY 10											
02	0	UNL	15			51	40	23	33	11	6
05	1	UNL	15			46	36	21	37	12	9
08	2	UNL	40			50	39	22	33	07	6
11	3	UNL	35			67	47	21	17	12	7
14	0	UNL	40			77	50	15	09	29	6
17	9	UNL	40			78	51	17	10	27	8
20	9	250	15			71	47	13	11	29	4
23	10	250	15			62	44	17	17	00	0
DAY 11											
02	3	UNL	15			54	40	20	26	08	6
05	0	UNL	15			48	37	20	33	09	7
08	3	UNL	40			51	39	20	29	10	5
11	5	UNL	35			68	47	20	16	12	8
14	2	UNL	25			78	53	27	15	29	6
17	9	250	25			77	52	23	13	29	9
20	7	UNL	15			71	50	26	19	24	6
23	0	UNL	15			60	45	26	27	13	4
DAY 12											
02	4	UNL	15			52	40	24	34	10	6
05	0	UNL	15			50	40	26	39	10	5
08	0	UNL	25			52	41	27	38	10	7
11	0	UNL	15			68	49	28	22	11	10
14	0	UNL	15			78	53	27	15	27	7
17	0	UNL	12			80	54	27	14	16	4
20	0	UNL	12			72	51	28	19	00	0
23	0	UNL	15			65	49	30	27	11	5
DAY 13											
02	0	UNL	15			57	44	29	34	07	6
05	0	UNL	15			52	42	30	43	13	10
08	0	UNL	30			55	44	31	40	07	4
11	0	UNL	30			72	51	26	18	21	18
14	6	70	20			73	54	36	26	26	18
17	9	70	15			67	49	30	25	27	17
20	3	UNL	15			61	48	35	38	31	17
23	0	UNL	15			56	46	36	47	30	9
DAY 14											
02	0	UNL	15			52	44	35	53	30	4
05	0	UNL	15			47	41	33	58	33	5
08	0	UNL	60			46	41	34	63	06	3
11	0	UNL	60			61	45	25	25	28	5
14	0	UNL	60			67	46	17	15	24	4
17	9	UNL	60			68	46	14	12	26	7
20	5	UNL	15			63	44	17	17	18	5
23	0	UNL	15			52	39	18	26	11	7
DAY 15											
02	0	UNL	15			47	37	22	37	13	4
05	0	UNL	15			43	35	21	42	11	4
08	0	UNL	60			45	36	21	39	00	0
11	0	UNL	45			64	46	23	21	08	4
14	0	UNL	40			74	49	14	10	16	4
17	0	UNL	30			75	52	26	16	24	6
20	0	UNL	15			67	46	18	15	06	4
23	0	UNL	15			60	44	23	24	14	3
DAY 16											
02	0	UNL	15			52	40	24	34	12	6
05	0	UNL	15			46	36	21	37	13	5
08	0	UNL	35			51	40	23	33	11	5
11	0	UNL	35			73	49	20	13	29	3
14	6	UNL	50			80	50	07	06	02	4
17	5	UNL	45			83	53	16	08	31	3
20	4	UNL	15			72	49	21	14	20	6
23	0	UNL	15			63	46	25	24	00	0
DAY 17											
02	9	UNL	15			52	40	22	31	10	7
05	10	250	15			51	39	20	29	09	11
08	10	UNL	20			54	40	20	26	14	5
11	8	UNL	20			72	49	19	13	12	10
14	0	UNL	25			84	54	19	09	28	10
17	0	UNL	30			84	54	18	08	27	13
20	0	UNL	15			71	50	24	17	24	8
23	0	UNL	15			66	46	21	18	35	6
DAY 18											
02	0	UNL	15			61	44	20	20	25	6
05	0	UNL	15			52	39	18	26	18	7
08	0	UNL	20			56	40	15	20	23	7
11	0	UNL	25			68	45	10	10	33	4
14	6	UNL	35			73	46	-01	05	36	4
17	10	UNL	45			76	48	-06	04	31	4
20	9	UNL	15			69	46	14	12	35	4
23	2	UNL	15			62	41	-03	07	10	8
DAY 19											
02	10	250	15			57	39	08	14	25	4
05	8	UNL	15			54	38	07	15	25	5
08	10	UNL	35			54	38	09	16	31	3
11	9	250	50			70	44	-09	04	06	13
14	10	250	50			78	48	-09	03	07	9
17	10	250	60			80	49	-07	03	11	6
20	9	250	15			72	50	23	16	25	7
23	8	250	15			66	46	19	16	25	5
DAY 20											
02	10	250	15			61	42	13	15	25	7
05	6	UNL	15			58	41	13	17	01	2
08	0	UNL	40			53	39	15	22	08	4
11	0	UNL	30			69	46	11	10	26	5
14	0	UNL	20			79	50	09	07	23	7
17	0	UNL	25			80	50	07	06	26	13
20	0	UNL	15			72	48	17	12	25	5
23	0	UNL	15			58	42	19	22	08	5
DAY 21											
02	0	UNL	15			50	37	16	26	12	6
05	0	UNL	15			46	34	13	26	08	8
08	0	UNL	60			51	37	12	21	09	7
11	0	UNL	45			70	46	09	09	14	6
14	0	UNL	40			80	51	11	07	29	6
17	0	UNL	45			82	52	14	08	28	5
20	0	UNL	15			71	48	18	13	00	0
23	0	UNL	15			59	42	18	20	12	6
DAY 22											
02	0	UNL	15			53	41	24	32	13	6
05	0	UNL	15			49	37	17	28	10	8
08	0	UNL	40			55	41	20	25	11	9
11	4	UNL	30			71	48	18	13	12	8
14	2	UNL	30			81	53	22	11	10	6
17	0	UNL	30			85	54	18	08	32	8
20	6	UNL	15			75	51	21	13	00	0
23	0	UNL	15			61	44	21	21	13	5
DAY 23											
02	0	UNL	15			57	43	23	27	11	4
05	0	UNL	15			54	40	19	25	12	8
08	8	UNL	30			57	42	21	25	09	6
11	0	UNL	35			75	51	21	13	15	6
14	0	UNL	30			85	54	17	08	17	5
17	8	UNL	35			87	55	18	08	30	9
20	10	250	15			76	51	21	13	15	5
23	3	UNL	15			67	49	27	22	08	8
DAY 24											
02	10	UNL	15			62	46	26	25	10	8
05	10	250	15			56	41	20	25	08	8
08	10	250	60			59	43	20	22	09	9
11	10	UNL	50			75	50	16	11	07	4
14	10	250	40			83	55	25	12	24	8
17	10	UNL	20			85	56	27	12	27	11
20	10	UNL	15			75	51	24	15	15	5
23	6	UNL	15			65	49	31	28	02	3
DAY 25											
02	7	UNL	15			58	44	27	31	06	5
05	3	UNL	15			54	42	27	35	12	7
08	6	UNL	30			59	44	26	28	09	8
11	10	250	25			73	52	30	20	10	8
14	10	UNL	25			83	56	31	15	29	5
17	10	UNL	20			84	56	26	12	16	4
20	9	250	15			77	54	30	18	04	3
23	5	UNL	15			69	51	31	24	13	3
DAY 26											
02	2	UNL	15			67	49	30	25	06	5
05	0	UNL	15			58	45	30	35	10	7
08	1	UNL	35			63	48	31	30	09	8
11	0	UNL	35			78	53	24	13	13	5
14	1	UNL	35			86	55	21	09	11	4
17	1	UNL	35			89	57	23	09	26	9
20	1	UNL	15			82	55	28	14	34	2
23	0	UNL	15			71	52	31	23	12	7
DAY 27											
02	0	UNL	15			66	50	33	29	08	7
05	0	UNL	15			60	46	29	31	09	8
08	0	UNL	35			66	48	27	23	08	7
11	0	UNL	30			80	56	34	19	18	6
14	0	UNL	25			88	61	39	18	26	8
17	5	UNL	35			88	62	41	19	25	8
20	2	UNL	15			82	60	42	24	24	7
23	2	UNL	15			75	55	37	25	27	7
DAY 28											
02	7	130	15			73	53	34	24	28	5
05	7	UNL	15			66	51	35	32	24	6
08	1	UNL	35			62	50	38	41	14	5
11	0	UNL	30			78	55	34	20	20	3
14	0	UNL	25			88	59	34	15	27	9
17	0	UNL	40			89	58	28	11	25	10
20	0	UNL	15			82	54	25	12	29	5
23	0	UNL	15			67	48	26	21	07	8
DAY 29											
02	0	UNL	15			60	47	33	36	08	5
05	0	UNL	15			57	45	30	36	04	5
08	0	UNL	45			65	50	33	30	00	0
11	0	UNL	60			87	56	23	10	01	5
14	0	UNL	70			93	57	12	05	04	9
17	0	UNL	60			94	58	16	06	07	6
20	0	UNL	15			85	55	23	10	30	4
23	0	UNL	15			77	53	27	16	23	2
DAY 30											
02	0	UNL	15			63	46	25	24	10	3
05	0	UNL	15			62	45	24	23	13	3
08	0	UNL	20			68	50	29	23	05	4
11	0	UNL	15			87	59	34	15	14	4
14	2	UNL	10			90	59	31	12	18	4
17	3	UNL	25			93	60	28	10	27	10
20	3	UNL	15			85	56	25	11	22	6
23	4	UNL	15			82	55	28	14	24	16
DAY 31											
02	9	250	15			77	52	23	13	24	5
05	10	250	15			66	48	27	23	04	3
08	10	250	20			64	48	30	28	08	5
11	7	UNL	15			78	53	27	15	26	12
14	5	UNL	20			85	55	22	10	28	12
17	0	UNL	20			88	54	02	04	27	13
20	0	UNL	15			77	48	01	05	26	13
23	0	UNL	15			70	45	-06	04	04	5

NOTES

CEILING COLUMN—

UNL indicates an unlimited ceiling.

WEATHER COLUMN—

*	Tornado
T	Thunderstorm
Q	Squall
R	Rain
RW	Rain showers
ZR	Freezing rain
L	Drizzle
ZL	Freezing drizzle
S	Snow
SP	Snow pellets
IC	Ice crystals
SW	Snow showers
SG	Snow grains
IP	Ice pellets
A	Hail
F	Fog
IF	Ice fog
GF	Ground fog
BD	Blowing dust
BN	Blowing sand
BS	Blowing snow
BY	Blowing spray
K	Smoke
H	Haze
D	Dust

WIND COLUMNS—

Directions are those from which the wind blows, indicated in tens of degrees from true North; i. e., 09 for East, 18 for South, 27 for West. Entry of 00 in the direction column indicates calm.

Speed is expressed in knots; multiply by 1.15 to convert to miles per hour.

ADDITIONAL DATA

Other observational data contained in records on file can be furnished at cost via microfilm, microfiche, or paper copies of the original records. Inquiries as to availability and costs should be addressed to: Director, National Climatic Center, Federal Building, Asheville, North Carolina 28801.

STATION: PHOENIX ARIZONA YEAR & MONTH: 71 03

LOCAL CLIMATOLOGICAL DATA

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
ENVIRONMENTAL DATA SERVICE

A UNITED STATES DEPARTMENT OF COMMERCE PUBLICATION

PHOENIX, ARIZONA
SKY HARBOR AIRPORT
APRIL 1971

Latitude 33° 26′ N Longitude 112° 01′ W Elevation (ground) 1117 ft. Standard time used: MOUNTAIN WBAN #23183

Date	Temperature °F Maximum	Minimum	Average	Departure from normal	Average dew point	Degree days Base 65° Heating	Cooling	Weather types on dates of occurrence (1 Fog, 2 Heavy fog x, 3 Thunderstorm, 4 Ice pellets, 5 Hail, 6 Glaze, 7 Duststorm, 8 Smoke, Haze, 9 Blowing snow)	Snow, ice pellets or ice on ground at 05AM In.	Precipitation Water equivalent In.	Snow, ice pellets In.	Avg. station pressure In. Elev. 1107 feet m.s.l.	Wind Resultant direction	Resultant speed m.p.h.	Average speed m.p.h.	Fastest mile Speed m.p.h.	Direction	Sunshine Hours and tenths	Percent of possible	Sky cover Tenths Sunrise to sunset	Midnight to midnight	Date
1	2	3	4	5	6	7A	7B	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	83	50	67	4	9	0	2		0	0	0	28.94	29	3.8	5.2			12.5	100	0	0	1
2	86	49	68	5	15	0	3		0	0	0	28.89	31	4.2	7.1			12.6	100	0	0	2
3	87	47	67	4	14	0	2		0	0	0	28.73	02	1.0	8.1	20	NE/	12.6	100	0	0	3
4	87	56	72	8	7	0	7		0	0	0	28.84	34	2.7	5.9	17	ENE/	12.6	100	0	0	4
5	87	56	72	8	15	0	7		0	0	0	28.87	09	2.4	7.3	25	ENE/	12.7	100	0	0	5
6	90	55	73	9	23	0	8		0	0	0	28.86	12	6.2	7.5	25	SE/	12.7	100	0	0	6
7	89	61	75	10	20	0	10		0	0	0	28.78	24	3.3	9.5	25	W/	9.5	74	4	2	7
8	85	50	68	3	22	0	3		0	0	0	28.77	07	3.5	5.9	15	WNW/	12.8	100	0	0	8
9	88	51	70	5	24	0	5		0	0	0	28.83	10	1.2	5.3	15	WNW/	12.8	100	0	0	9
10	90	51	71	5	27	0	6		0	0	0	28.80	29	1.8	6.8	14	W/	12.8	100	0	0	10
11	91	53	72	6	26	0	7		0	0	0	28.76	12	3.3	7.1	15	W/	12.9	100	2	1	11
12	91	57	74	8	25	0	9		0	0	0	28.75	14	1.5	6.3	15	W/	12.9	100	0	0	12
13	94*	54	74	7	27	0	9		0	0	0	28.73	11	3.1	5.9	13	WSW/	12.9	100	0	0	13
14	87	62	75*	8	30	0	10		0	0	0	28.57	14	6.3	12.5	29	ESE/	0.0	0	10	10	14
15	65	51	58	-9	46	7	0		0	.13	0	28.64	09	3.3	7.3	20	WSW/	1.6	12	9	9	15
16	78	49	64	-4	45	1	0		0	0	0	28.68	06	2.0	4.6	14	WNW/	13.0	100	0	0	16
17	82	55	69	1	39	0	4		0	0	0	28.53	23	6.4	11.1	39	WSW/	10.3	79	2	4	17
18	66	48	57	-11	26	8	0		0	T	0	28.57	25	9.5	11.7	31	SW/	9.0	69	4	6	18
19	67	44*	56*	-13	30	9	0		0	T	0	28.75	25	2.0	9.1	21	NW/	6.9	52	9	7	19
20	73	45	59	-10	29	6	0		0	0	0	28.71	11	4.9	6.9	18	SE/	12.9	98	6	3	20
21	72	52	62	-7	29	3	0		0	T	0	28.52	26	5.7	10.1	23	W/	12.1	92	5	6	21
22	72	46	59	-11	26	6	0		0	0	0	28.70	31	2.5	5.8	17	W/	12.3	93	0	1	22
23	80	49	65	-5	28	0	0		0	0	0	28.67	22	1.5	8.6	21	W/	12.9	97	5	4	23
24	83	52	68	-2	30	0	3		0	0	0	28.53	19	5.7	11.4	28	WSW/	13.3	100	0	0	24
25	70	57	64	-6	27	1	0		0	0	0	28.59	25	8.7	12.2	31	SW/	13.3	100	0	0	25
26	70	46	58	-13	27	7	0		0	0	0	28.74	27	2.2	7.8	21	WNW/	13.1	98	0	0	26
27	79	45	62	-9	23	3	0		0	0	0	28.68	28	.4	6.0	16	SW/	13.4	100	1	1	27
28	76	49	63	-8	31	2	0		0	0	0	28.68	22	2.0	6.5	20	WNW/	13.4	100	0	0	28
29	84	53	69	-3	31	0	4		0	0	0	28.76	22	2.0	6.0	14	SSW/	13.5	100	0	0	29
30	91	54	73	1	26	0	8		0	0	0	28.74	30	1.2	4.9	18	WSW/	13.5	100	5	4	30
	Sum 2443	Sum 1547				Total 53	Total 107			Total .13	Total 0	For the month: 28.72	22	1.0	7.7	39	WSW/	Total 346.8	% for month	Sum 62	Sum 58	
	Avg. 81.4	Avg. 51.6	Avg. 66.5	Dep. -0.7	Avg. 26	Dep. -22	Dep.			Dep. -0.19						Date: 17		Possible 390.5	89	Avg. 2.1	Avg. 1.9	

Number of days				Season to date	
Maximum Temp.		Minimum Temp.		Total	Total
≥ 90° ‡	≤ 32°	≤ 32°	≤ 0°	1327	192
6	0	0	0	Dep. -438	Dep.

Number of days Precipitation ≥ .01 inch	1
Snow, ice pellets ≥ 1.0 inch	0
Thunderstorms	0
Heavy fog X	0
Clear 21	Partly cloudy 6
Cloudy 3	

Greatest in 24 hours and dates		Greatest depth on ground of snow, ice pellets or ice and date
Precipitation	Snow, ice pellets	
.13	15	0

HOURLY PRECIPITATION (Water equivalent in inches)

Date	A. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	P. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	Date
1																									1
2																									2
3																									3
4																									4
5																									5
6																									6
7																									7
8																									8
9																									9
10																									10
11																									11
12																									12
13																									13
14																									14
15	T	.01	.02	.02	.04	.01	T	.02	.01	T	T														15
16																									16
17																									17
18		T	T																				T		18
19											T	T													19
20																									20
21							T																		21
22																									22
23																									23
24																									24
25																									25
26																									26
27																									27
28																									28
29																									29
30																									30

* Extreme temperatures for the month. May be the last of more than one occurrence.
– Below zero temperature or negative departure from normal.
‡ ≥ 70° at Alaskan stations.
+ Also on an earlier date, or dates.
X Heavy fog restricts visibility to ¼ mile or less.
T In the Hourly Precipitation table and in columns 9, 10, and 11 indicates an amount too small to measure.

The season for degree days begins with July for heating and with January for cooling.
Data in columns 6, 12, 13, 14, and 15 are based on 8 observations per day at 3-hour intervals.
Wind directions are those from which the wind blows. Resultant wind is the vector sum of wind directions and speeds divided by the number of observations. Figures for directions are tens of degrees from true North; i.e., 09 = East, 18 = South, 27 = West, 36 = North, and 00 = Calm. When directions are in tens of degrees in Col. 17, entries in Col. 16 are fastest observed 1-minute speeds. If the / appears in Col. 17, speeds are gusts.
Any errors detected will be corrected and changes in summary data will be annotated in the annual summary.

Subscription Price: Local Climatological Data $ 1.00 per year including annual summary if published. Single copy: 10 cents for monthly summary; 15 cents for annual summary. Checks or money orders should be made payable and remittances and correspondence should be sent to the Superintendent of Documents, U. S. Goverment Printing Office, Washington, D. C. 20402.

I certify that this is an official publication of the National Oceanic and Atmospheric Administration, and is compiled from records on file at the National Climatic Center, Asheville, North Carolina 28801.

William H. Haggard
Director, National Climatic Center

SUMMARY BY HOURS

Hour Local time	AVERAGES Sky cover Tenths	Station pressure In.	Temperature Air °F	Wet bulb °F	Dew Pt. °F	Relative humidity %	Wind speed m.p.h.	Resultant wind Direction	Speed m.p.h.
02	2	28.71	60	45	27	31	6.6	12	1.3
05	1	28.72	55	43	27	38	6.6	10	4.2
08	2	28.77	60	46	28	33	7.7	10	5.4
11	2	28.78	72	51	26	21	7.6	15	1.6
14	2	28.72	79	53	24	16	9.2	26	5.5
17	2	28.67	81	54	23	14	9.7	25	6.2
20	2	28.67	75	51	25	17	7.4	28	4.8
23	2	28.71	66	49	27	26	6.5	21	.6

USCOMM — NOAA — ASHEVILLE 325

OBSERVATIONS AT 3-HOUR INTERVALS

HOUR	SKY COVER Tenths	CEILING Hnds. of ft.	VISIBILITY Whole Miles	VISIBILITY 16ths Mile	WEATHER	TEMPERATURE AIR °F	TEMPERATURE WET BULB °F	TEMPERATURE DEW PT. °F	REL. HUM. %	WIND DIR.	WIND SPEED Knots
DAY 01											
02	0	UNL	15			63	42	02	08	23	5
05	0	UNL	15			56	39	10	16	36	3
08	0	UNL	35			59	41	12	15	28	5
11	0	UNL	30			73	47	03	06	33	3
14	0	UNL	35			79	50	10	07	36	4
17	0	UNL	30			82	51	05	05	27	7
20	0	UNL	15			74	49	14	10	25	5
23	0	UNL	15			66	46	19	16	29	4
DAY 02											
02	0	UNL	15			61	42	13	15	28	6
05	0	UNL	15			52	38	16	24	36	3
08	0	UNL	45			62	43	16	17	01	5
11	0	UNL	30			78	50	12	08	04	11
14	0	UNL	30			85	54	14	07	28	5
17	0	UNL	20			85	53	06	05	28	9
20	0	UNL	15			77	51	19	11	27	6
23	0	UNL	15			67	47	21	17	27	4
DAY 03											
02	0	UNL	15			64	44	13	14	23	3
05	0	UNL	15			50	38	18	28	09	10
08	0	UNL	30			53	40	19	26	13	5
11	0	UNL	20			73	48	13	10	05	4
14	0	UNL	25			83	53	15	08	27	8
17	0	UNL	30			87	54	09	05	25	10
20	0	UNL	15			77	50	14	09	34	6
23	0	UNL	15			77	49	09	07	05	10
DAY 04											
02	0	UNL	15			65	43	07	10	35	8
05	0	UNL	15			60	41	08	12	00	0
08	0	UNL	45			64	43	10	12	13	3
11	0	UNL	45			79	49	00	04	36	9
14	0	UNL	45			86	52	-04	03	07	6
17	0	UNL	35			87	53	-01	03	28	4
20	0	UNL	15			78	51	18	10	24	7
23	0	UNL	15			70	47	14	11	34	4
DAY 05											
02	0	UNL	15			62	44	19	19	29	3
05	0	UNL	15			64	43	07	10	20	6
08	0	UNL	25			71	46	02	06	05	11
11	0	UNL	12			79	51	13	08	06	8
14	0	UNL	15			84	54	17	08	16	6
17	0	UNL	15			87	55	17	07	18	5
20	0	UNL	15			79	52	20	11	33	5
23	0	UNL	15			66	46	21	18	08	7
DAY 06											
02	0	UNL	15			65	47	24	21	00	0
05	0	UNL	15			56	42	21	26	10	5
08	0	UNL	20			67	47	22	18	12	7
11	0	UNL	20			83	54	21	10	12	8
14	0	UNL	10			89	57	23	09	13	14
17	0	UNL	15			90	57	24	09	13	6
20	0	UNL	15			80	54	25	13	30	4
23	0	UNL	15			73	51	26	17	12	8
DAY 07											
02	0	UNL	15			64	48	31	29	10	8
05	3	UNL	15			66	48	28	24	09	9
08	10	170	15			66	49	31	27	00	0
11	3	UNL	20			78	51	19	11	14	4
14	0	UNL	20			85	54	17	08	22	13
17	0	UNL	20			86	54	16	07	28	15
20	0	UNL	15			78	50	11	08	26	13
23	0	UNL	15			74	48	07	07	31	4
DAY 08											
02	0	UNL	15			58	42	20	23	09	8
05	0	UNL	15			51	39	20	29	08	7
08	0	UNL	35			60	43	20	21	10	7
11	0	UNL	35			74	51	24	15	08	7
14	0	UNL	35			81	53	22	11	00	0
17	0	UNL	25			83	55	25	12	30	9
20	0	UNL	15			74	49	18	12	07	3
23	0	UNL	15			66	49	29	25	00	0
DAY 09											
02	0	UNL	15			57	44	27	32	14	5
05	0	UNL	15			53	41	25	34	08	8
08	0	UNL	30			60	46	28	30	12	7
11	0	UNL	30			75	52	26	16	00	0
14	0	UNL	30			86	55	21	09	20	5
17	0	UNL	30			88	55	13	06	30	3
20	0	UNL	15			81	54	24	12	31	5
23	0	UNL	15			72	51	27	19	35	4
DAY 10											
02	0	UNL	15			61	46	27	27	11	5
05	0	UNL	15			54	43	30	40	08	6
08	0	UNL	30			62	47	29	29	12	5
11	0	UNL	30			79	54	28	15	28	4
14	0	UNL	30			88	56	23	09	26	8
17	0	UNL	35			89	56	21	08	30	9
20	0	UNL	15			82	55	27	13	27	6
23	0	UNL	15			71	51	30	22	35	4
DAY 11											
02	0	UNL	15			62	47	29	29	11	9
05	0	UNL	15			56	43	25	30	10	8
08	0	UNL	40			65	47	24	21	10	10
11	0	UNL	40			81	54	26	13	10	5
14	5	UNL	40			89	58	26	10	24	10
17	0	UNL	40			90	59	30	12	27	4
20	0	UNL	15			82	54	21	10	05	3
23	0	UNL	15			70	50	28	21	00	0
DAY 12											
02	0	UNL	15			65	47	26	23	06	5
05	0	UNL	15			60	44	24	25	11	8
08	0	UNL	35			68	48	22	17	11	8
11	0	UNL	20			82	55	27	13	18	3
14	0	UNL	20			88	58	29	12	24	4
17	0	UNL	25			91	57	20	07	26	7
20	0	UNL	15			85	56	25	11	25	5
23	0	UNL	15			70	50	27	20	04	4
DAY 13											
02	0	UNL	15			61	45	24	24	11	5
05	0	UNL	15			57	44	28	33	10	7
08	0	UNL	40			66	48	28	24	11	8
11	0	UNL	20			81	55	29	15	11	7
14	0	UNL	20			91	57	22	08	28	4
17	0	UNL	20			93	60	28	10	24	5
20	0	UNL	15			85	56	28	13	04	5
23	4	UNL	15			75	53	31	20	00	0
DAY 14											
02	10	170	15			68	49	27	21	09	7
05	10	170	7			69	49	27	21	11	10
08	10	120	1		D	71	53	35	27	08	7
11	10	120	1		D	83	58	35	18	12	20
14	10	120	12			86	55	21	09	18	14
17	10	110	35			82	55	27	13	13	10
20	10	110	6		D	73	52	29	20	28	10
23	10	120	15			67	53	39	36	26	9
DAY 15											
02	10	55	15		RW	59	53	48	67	30	7
05	10	45	12		R	54	51	49	83	05	5
08	10	40	8		R	51	49	48	90	09	15
11	10	50	30			55	51	47	75	12	10
14	10	35	40			59	51	43	56	00	0
17	9	120	40			63	53	43	48	22	6
20	10	90	15			62	53	45	54	03	4
23	3	UNL	15			58	53	48	70	12	4
DAY 16											
02	0	UNL	15			55	51	48	77	08	4
05	0	UNL	15			52	49	47	83	00	0
08	0	UNL	10			55	52	50	83	11	6
11	0	UNL	20			66	54	43	43	04	4
14	0	UNL	15			73	57	43	34	29	9
17	0	UNL	30			77	58	43	30	11	2
20	0	UNL	15			74	56	41	31	08	4
23	0	UNL	15			66	56	47	51	06	3
DAY 17											
02	0	UNL	15			66	54	44	45	36	4
05	7	UNL	15			56	51	47	72	12	4
08	6	UNL	30			63	55	48	58	09	7
11	7	UNL	25			73	56	42	33	20	7
14	0	UNL	35			78	57	39	25	29	10
17	0	UNL	25			82	56	32	16	20	15
20	2	UNL	15			74	53	33	22	24	13
23	7	60	8			62	47	30	30	24	17
DAY 18											
02	10	65	7		RW	55	42	25	31	26	15
05	3	UNL	15			51	40	25	36	26	10
08	0	UNL	10			53	41	26	35	34	5
11	4	UNL	20			59	45	27	29	12	5
14	7	65	35			63	46	26	25	26	10
17	8	200	40			65	46	22	19	24	17
20	5	UNL	15			59	44	26	28	25	9
23	10	65	15			55	44	32	42	23	10
DAY 19											
02	9	85	15			55	43	28	36	23	9
05	0	UNL	15			46	40	31	56	09	8
08	9	250	40			49	41	31	50	08	8
11	10	70	20		RW	56	46	36	47	31	6
14	8	100	25			63	48	31	30	28	10
17	8	100	35			67	48	26	21	23	9
20	9	90	15			65	47	25	22	25	7
23	0	UNL	15			54	44	32	43	07	6
DAY 20											
02	0	UNL	15			50	42	33	52	06	6
05	0	UNL	15			45	39	32	60	12	5
08	1	UNL	45			54	45	34	47	11	8
11	6	UNL	45			65	47	26	23	14	8
14	10	UNL	45			70	49	25	18	13	6
17	9	UNL	45			72	50	24	16	07	5
20	0	UNL	15			69	49	27	21	05	6
23	1	UNL	15			61	46	27	27	23	4
DAY 21											
02	0	UNL	15			56	44	28	34	15	4
05	10	120	15			53	42	29	40	05	5
08	10	120	45			57	44	29	34	10	7
11	7	UNL	25			66	49	31	27	25	3
14	2	UNL	35			70	51	31	24	28	12
17	0	UNL	30			72	51	27	19	26	13
20	6	75	15			67	48	25	20	24	13
23	10	75	10			61	48	33	35	28	13
DAY 22											
02	7	85	10			57	45	30	36	28	6
05	0	UNL	7			52	41	25	35	08	3
08	0	UNL	8			55	43	27	34	03	3
11	0	UNL	8			63	46	23	22	26	4
14	0	UNL	10			69	48	23	18	31	9
17	1	UNL	15			72	50	24	16	31	4
20	1	UNL	15			69	49	27	21	25	5
23	0	UNL	15			60	45	26	27	09	6
DAY 23											
02	0	UNL	15			55	44	30	39	12	9
05	0	UNL	15			51	41	28	41	10	6
08	0	UNL	15			58	45	30	35	11	7
11	0	UNL	15			71	50	26	19	34	4
14	9	UNL	20			77	52	25	14	29	8
17	9	UNL	25			80	55	29	15	26	10
20	7	UNL	15			75	52	28	18	27	11
23	6	UNL	15			65	49	30	27	15	5
DAY 24											
02	2	UNL	15			58	46	32	37	07	5
05	0	UNL	15			53	43	32	45	09	7
08	1	UNL	35			62	47	31	31	12	10
11	0	UNL	40			74	52	29	19	23	10
14	0	UNL	35			81	56	31	16	29	10
17	0	UNL	25			83	56	31	15	21	15
20	0	UNL	15			77	54	30	18	24	6
23	0	UNL	15			71	49	21	15	18	16
DAY 25											
02	0	UNL	15			65	47	26	23	16	11
05	0	UNL	15			61	46	29	30	16	8
08	0	UNL	20			61	49	36	39	25	10
11	0	UNL	15			65	50	35	33	26	14
14	0	UNL	15			70	49	25	18	28	15
17	0	UNL	20			69	48	21	16	27	14
20	6	80	15			64	45	19	18	29	9
23	0	UNL	15			60	44	23	24	23	4
DAY 26											
02	0	UNL	15			53	41	23	31	25	6
05	0	UNL	15			53	42	27	37	26	7
08	0	UNL	30			53	43	31	43	11	6
11	0	UNL	35			62	46	27	26	19	7
14	0	UNL	45			68	49	26	21	29	11
17	0	UNL	45			69	49	25	19	34	8
20	0	UNL	15			66	48	26	22	03	5
23	0	UNL	15			59	45	27	29	13	4
DAY 27											
02	0	UNL	15			52	40	24	34	07	3
05	0	UNL	15			48	39	27	44	07	3
08	0	UNL	30			57	44	27	32	24	4
11	7	UNL	40			72	50	25	17	23	6
14	0	UNL	45			77	51	18	11	15	6
17	0	UNL	40			79	52	18	10	05	7
20	0	UNL	15			75	50	20	13	27	8
23	0	UNL	15			67	48	25	20	35	5
DAY 28											
02	0	UNL	15			58	44	27	31	08	4
05	0	UNL	15			54	43	29	38	14	4
08	0	UNL	45			61	47	32	34	14	4
11	0	UNL	45			69	51	32	25	24	8
14	0	UNL	40			75	53	31	20	28	9
17	0	UNL	35			76	54	31	19	27	9
20	0	UNL	15			73	52	29	20	00	0
23	0	UNL	15			63	49	34	34	11	7
DAY 29											
02	0	UNL	15			59	47	35	41	00	0
05	0	UNL	15			55	44	30	39	13	4
08	0	UNL	25			64	49	33	32	11	8
11	0	UNL	25			74	54	36	25	26	5
14	0	UNL	20			82	56	30	15	27	9
17	0	UNL	25			83	55	27	13	21	7
20	0	UNL	15			79	54	27	15	26	5
23	0	UNL	15			68	50	31	25	04	4
DAY 30											
02	0	UNL	15			62	48	32	32	12	2
05	0	UNL	15			57	45	31	37	02	4
08	0	UNL	20			64	49	34	33	09	5
11	6	UNL	25			80	55	29	15	17	4
14	4	UNL	30			88	56	21	08	28	5
17	9	UNL	25			91	57	18	07	27	8
20	10	UNL	15			84	54	19	09	33	6
23	3	UNL	15			73	50	23	15	00	0

NOTES

CEILING COLUMN—

UNL indicates an unlimited ceiling.

WEATHER COLUMN—

*	Tornado
T	Thunderstorm
Q	Squall
R	Rain
RW	Rain showers
ZR	Freezing rain
L	Drizzle
ZL	Freezing drizzle
S	Snow
SP	Snow pellets
IC	Ice crystals
SW	Snow showers
SG	Snow grains
IP	Ice pellets
A	Hail
F	Fog
IF	Ice fog
GF	Ground fog
BD	Blowing dust
BN	Blowing sand
BS	Blowing snow
BY	Blowing spray
K	Smoke
H	Haze
D	Dust

WIND COLUMNS--

Directions are those from which the wind blows, indicated in tens of degrees from true North; i. e., 09 for East, 18 for South, 27 for West. Entry of 00 in the direction column indicates calm.

Speed is expressed in knots; multiply by 1.15 to convert to miles per hour.

ADDITIONAL DATA

Other observational data contained in records on file can be furnished at cost via microfilm, microfiche, or paper copies of the original records. Inquiries as to availability and costs should be addressed to: Director, National Climatic Center, Federal Building, Asheville, North Carolina 28801.

STATION: PHOENIX ARIZONA YEAR & MONTH: 71 04

LOCAL CLIMATOLOGICAL DATA

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
ENVIRONMENTAL DATA SERVICE

A UNITED STATES DEPARTMENT OF COMMERCE PUBLICATION

PHOENIX, ARIZONA
SKY HARBOR AIRPORT
MAY 1971

Latitude 33° 26′ N Longitude 112° 01′ W Elevation (ground) 1117 ft. Standard time used: MOUNTAIN WBAN #23183

Date	Temperature °F Maximum	Minimum	Average	Departure from normal	Average dew point	Degree days Base 65° Heating	Cooling	Weather types on dates of occurrence (1 Fog, 2 Heavy fog x, 3 Thunderstorm, 4 Ice pellets, 5 Hail, 6 Glaze, 7 Duststorm, 8 Smoke, Haze, 9 Blowing snow)	Snow, ice pellets or ice on ground at 05AM In.	Precipitation Water equivalent In.	Snow, ice pellets In.	Avg. station pressure In. Elev. 1107 feet m.s.l.	Wind Resultant direction	Resultant speed m.p.h.	Average speed m.p.h.	Fastest mile Speed m.p.h.	Direction	Sunshine Hours and tenths	Percent of possible	Sky cover Tenths Sunrise to sunset	Midnight to midnight	Date
1	2	3	4	5	6	7A	7B	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	92	56	74	2	27	0	9		0	0	0	28.72	19	1.7	7.5	17	S/	13.5	100	0	0	1
2	95	55	75	3	24	0	10		0	0	0	28.73	13	2.5	8.3	25	SSE/	13.5	100	0	0	2
3	90	55	73	1	23	0	8		0	0	0	28.69	22	2.6	11.4	25	WNW/	13.6	100	0	0	3
4	77	58	68	-5	31	0	3		0	0	0	28.72	28	7.6	8.2	23	W/	13.6	100	0	0	4
5	80	51*	66	-7	34	0	1		0	0	0	28.57	34	1.9	8.3	18	N/	13.2	96	6	5	5
6	73	59	66	-7	44	0	1		0	T	0	28.61	16	3.4	11.4	23	NW/	12.7	93	9	7	6
7	76	53	65*	-8	40	0	0		0	T	0	28.75	10	1.8	6.6	23	W/	7.0	51	10	8	7
8	78	64	71	-2	39	0	6		0	0	0	28.76	25	6.6	7.8	22	WSW/	13.0	95	5	5	8
9	83	53	68	-6	34	0	3		0	0	0	28.77	21	2.0	4.9	17	W/	13.7	100	0	1	9
10	88	56	72	-2	34	0	7		0	0	0	28.71	30	1.9	7.8	21	W/	13.8	100	1	2	10
11	92	58	75	1	33	0	10		0	0	0	28.72	32	2.9	6.2	16	NW/	11.8	86	2	3	11
12	92	70	81	7	38	0	16	7	0	0	0	28.72	07	13.2	13.7	46	NE/	6.3	46	9	8	12
13	92	63	78	4	40	0	13		0	0	0	28.70	12	3.8	6.8	13	WSW/	11.5	83	10	8	13
14	96	67	82*	7	37	0	17		0	0	0	28.64	08	3.0	7.8	17	SW/	12.2	88	5	5	14
15	96	65	81	6	34	0	16		0	0	0	28.70	09	2.4	8.3	22	SE/	13.9	100	3	2	15
16	96	63	80	5	33	0	15		0	0	0	28.67	22	1.2	9.1	20	WSW/	13.4	96	1	2	16
17	89	65	77	2	16	0	12		0	0	0	28.61	28	9.4	12.5	32	WNW/	13.6	98	0	0	17
18	82	57	70	-5	12	0	5		0	0	0	28.78	30	6.1	8.6	21	N/	14.0	100	0	0	18
19	88	52	70	-6	18	0	5		0	0	0	28.73	10	1.6	5.8	20	SW/	14.0	100	0	1	19
20	93	56	75	-1	20	0	10		0	0	0	28.64	10	3.3	8.8	20	SW/	14.0	100	0	0	20
21	92	60	76	0	24	0	11		0	0	0	28.57	21	7.6	13.5	38	SW/	14.0	100	0	0	21
22	80	57	69	-7	27	0	4		0	0	0	28.63	25	6.8	8.1	22	WNW/	14.0	100	0	0	22
23	85	56	71	-6	29	0	6		0	0	0	28.67	24	.7	7.3	21	NW/	14.1	100	0	0	23
24	93	59	76	-1	28	0	11		0	0	0	28.68	11	2.1	6.9	16	ENE/	14.1	100	0	0	24
25	97	61	79	2	29	0	14		0	0	0	28.60	12	2.2	7.5	16	WSW/	14.1	100	4	3	25
26	97*	63	80	3	31	0	15		0	0	0	28.63	17	5.4	9.8	26	S/	14.1	100	0	0	26
27	91	66	79	1	34	0	14		0	0	0	28.69	24	8.2	13.1	30	WSW/	14.1	100	0	0	27
28	81	60	71	-7	31	0	6		0	T	0	28.74	27	10.4	11.8	32	WNW/	13.2	93	2	3	28
29	76	55	66	-12	38	0	1		0	0	0	28.70	27	5.9	9.2	21	W/	8.6	61	3	3	29
30	87	56	72	-7	35	0	7		0	0	0	28.65	25	3.0	10.2	29	WSW/	14.0	99	0	0	30
31	89	58	74	-5	35	0	9		0	0	0	28.73	18	5.3	10.5	22	S/	14.2	100	3	2	31
	Sum 2716	Sum 1827				Total 0	Total 265			Total T	Total 0	28.68	23	1.5	8.9	46	NE/	For the month: Total 400.8	% for month	Sum 73	Sum 68	
	Avg. 87.6	Avg. 58.9	Avg. 73.3	Dep. -1.7	Avg. 31	Dep. 0	Dep.			Dep. -0.13						Date: 12		Possible 430.6	93	Avg. 2.4	Avg. 2.2	

Number of days				Season to date Total	Total
Maximum Temp.		Minimum Temp.		1327	457
≧ 90° ‡	≦ 32°	≦ 32°	≦ 0°	Dep.	Dep.
15	0	0	0	-438	

Number of days	
Precipitation ≧ .01 inch	0
Snow, ice pellets ≧ 1.0 inch	0
Thunderstorms	0
Heavy fog X	0
Clear 23	Partly cloudy 4 Cloudy 4

Greatest in 24 hours and dates		Greatest depth on ground of snow, ice pellets or ice and date
Precipitation	Snow, ice pellets	
T	28+	0

HOURLY PRECIPITATION (Water equivalent in inches)

Date	A. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	P. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	Date
1																									1
2																									2
3																									3
4																									4
5																									5
6												T				T	T								6
7														T		T	T	T							7
8																									8
9																									9
10																									10
11																									11
12																									12
13																									13
14																									14
15																									15
16																									16
17																									17
18																									18
19																									19
20																									20
21																									21
22																									22
23																									23
24																									24
25																									25
26																									26
27																									27
28																					T	T	T		28
29																									29
30																									30
31																									31

* Extreme temperatures for the month. May be the last of more than one occurrence.
– Below zero temperature or negative departure from normal.
‡ ≧ 70° at Alaskan stations.
+ Also on an earlier date, or dates.
X Heavy fog restricts visibility to ¼ mile or less.
T In the Hourly Precipitation table and in columns 9, 10, and 11 indicates an amount too small to measure.

The season for degree days begins with July for heating and with January for cooling.
Data in columns 6, 12, 13, 14, and 15 are based on 8 observations per day at 3-hour intervals.
Wind directions are those from which the wind blows. Resultant wind is the vector sum of wind directions and speeds divided by the number of observations. Figures for directions are tens of degrees from true North; i.e., 09 = East, 18 = South, 27 = West, 36 = North, and 00 = Calm. When directions are in tens of degrees in Col. 17, entries in Col. 16 are fastest observed 1-minute speeds. If the / appears in Col. 17, speeds are gusts.
Any errors detected will be corrected and changes in summary data will be annotated in the annual summary.

Subscription Price: Local Climatological Data $ 1.00 per year including annual summary if published. Single copy: 10 cents for monthly summary; 15 cents for annual summary. Checks or money orders should be made payable and remittances and correspondence should be sent to the Superintendent of Documents, U. S. Goverment Printing Office, Washington, D. C. 20402.

I certify that this is an official publication of the National Oceanic and Atmospheric Administration, and is compiled from records on file at the National Climatic Center, Asheville, North Carolina 28801.

William H. Haggard
Director, National Climatic Center

SUMMARY BY HOURS

Hour Local time	AVERAGES Sky cover Tenths	Station pressure in.	Temperature Air °F	Wet bulb °F	Dew Pt. °F	Relative humidity %	Wind speed m.p.h.	Resultant wind Direction	Speed m.p.h.
02	2	28.68	66	50	33	31	6.8	13	2.6
05	2	28.69	61	48	32	35	8.1	10	5.3
08	2	28.74	69	51	32	27	8.8	11	5.5
11	2	28.73	80	55	30	18	8.4	17	3.3
14	3	28.68	85	57	29	14	10.1	24	5.2
17	2	28.63	86	57	29	14	12.2	28	8.7
20	3	28.64	81	56	30	18	9.3	28	6.9
23	2	28.68	74	53	31	22	7.8	26	3.3

OBSERVATIONS AT 3-HOUR INTERVALS

HOUR	SKY COVER Tenths	CEILING Hnds. of ft.	VISIBILITY WHOLE MILES	VISIBILITY 16ths MILE	WEATHER	TEMPERATURE AIR °F	TEMPERATURE WET BULB °F	TEMPERATURE DEW PT. °F	REL. HUM. %	WIND DIR.	WIND SPEED Knots
DAY 01											
02	0	UNL	15			65	48	27	24	19	5
05	0	UNL	15			57	43	25	29	07	7
08	0	UNL	25			67	48	26	21	09	9
11	0	UNL	25			81	56	32	17	11	6
14	0	UNL	20			90	58	25	09	22	5
17	0	UNL	20			92	59	29	10	24	8
20	0	UNL	15			86	56	25	11	28	6
23	0	UNL	15			78	54	28	16	27	6
DAY 02											
02	0	UNL	15			67	49	27	22	00	0
05	0	UNL	45			59	47	33	38	11	7
08	0	UNL	30			70	49	25	18	09	7
11	0	UNL	40			83	54	19	09	13	10
14	0	UNL	40			91	57	22	08	13	10
17	0	UNL	70			93	58	21	07	27	10
20	0	UNL	15			85	56	28	13	26	8
23	0	UNL	15			75	50	17	11	02	6
DAY 03											
02	0	UNL	15			61	45	25	25	09	9
05	0	UNL	45			60	43	19	20	09	9
08	0	UNL	35			68	47	20	16	10	8
11	0	UNL	45			82	53	16	08	14	9
14	0	UNL	45			89	56	17	07	24	9
17	0	UNL	30			88	57	27	11	27	15
20	3	UNL	15			79	55	31	17	27	12
23	0	UNL	15			75	52	30	19	26	8
DAY 04											
02	0	UNL	15			67	50	32	27	28	5
05	0	UNL	15			59	47	33	38	35	5
08	0	UNL	25			63	49	34	34	29	9
11	0	UNL	20			71	52	33	25	28	9
14	0	UNL	30			74	53	31	21	27	8
17	0	UNL	35			76	52	26	16	28	9
20	0	UNL	15			73	52	30	20	26	6
23	0	UNL	15			68	51	32	26	26	6
DAY 05											
02	0	UNL	15			60	47	33	36	11	4
05	0	UNL	15			53	44	33	47	09	9
08	0	UNL	30			62	49	34	35	12	8
11	0	UNL	30			73	53	34	24	32	4
14	10	300	30			77	54	32	19	36	7
17	10	250	40			79	55	33	19	29	8
20	9	250	15			76	55	35	23	32	8
23	3	UNL	15			69	53	39	34	26	10
DAY 06											
02	2	UNL	15			63	51	39	41	15	8
05	9	55	15			60	50	41	50	11	9
08	10	65	40			62	53	45	54	14	11
11	10	46	40			68	55	44	42	14	9
14	10	50	40			71	55	42	35	16	14
17	8	50	40			70	58	48	46	31	17
20	4	UNL	15			67	56	47	49	34	5
23	3	UNL	15			64	55	47	54	28	6
DAY 07											
02	9	100	15			60	53	47	62	29	4
05	7	UNL	15			54	49	44	69	07	5
08	9	100	45			61	51	41	48	10	6
11	10	150	45			70	54	40	34	15	5
14	10	120	45			73	55	38	28	06	6
17	10	120	40		RW	75	55	36	24	33	9
20	10	120	15			74	54	34	23	18	7
23	6	250	15			67	53	39	36	14	4
DAY 08											
02	9	110	15			66	53	41	40	30	3
05	10	75	15			65	52	39	39	26	7
08	8	65	50			66	53	40	39	15	3
11	4	UNL	40			71	55	41	34	23	9
14	4	UNL	40			75	56	40	28	24	12
17	2	UNL	40			77	56	38	25	25	10
20	0	UNL	15			74	54	36	25	30	7
23	0	UNL	15			69	53	37	31	28	3
DAY 09											
02	0	UNL	15			62	50	37	40	22	5
05	0	UNL	40			55	47	38	53	12	6
08	0	UNL	60			65	51	37	36	10	4
11	0	UNL	60			76	55	36	23	15	3
14	0	UNL	70			81	56	31	16	24	6
17	0	UNL	60			82	56	29	14	29	5
20	3	UNL	15			79	55	30	17	27	5
23	3	UNL	15			71	53	34	26	00	0
DAY 10											
02	2	UNL	15			63	49	34	34	11	5
05	0	UNL	30			57	45	32	39	10	6
08	0	UNL	40			68	51	33	27	09	7
11	0	UNL	35			80	56	34	19	31	5
14	0	UNL	45			87	60	37	17	24	10
17	0	UNL	45			87	60	37	17	28	9
20	6	UNL	15			83	58	35	18	31	7
23	3	UNL	15			77	55	33	20	33	5
DAY 11											
02	0	UNL	15			70	53	37	30	26	3
05	0	UNL	45			60	48	34	38	12	5
08	0	UNL	40			70	52	33	26	34	3
11	0	UNL	40			84	58	34	17	31	4
14	2	UNL	40			92	60	31	11	32	9
17	2	UNL	40			91	59	30	11	29	8
20	10	250	15			87	58	31	13	31	5
23	6	250	15			76	53	30	18	10	6
DAY 12											
02	10	120	15			72	52	32	23	09	6
05	10	120	15			75	55	35	23	08	11
08	10	180	30			80	57	37	21	07	17
11	10	120	20			86	60	38	18	09	10
14	8	UNL	25			90	61	37	15	08	6
17	8	70	0	8	BD	81	60	43	26	05	25
20	7	70	15			78	58	42	28	08	12
23	2	UNL	15			73	57	43	34	07	8
DAY 13											
02	0	UNL	15			67	55	44	44	11	6
05	6	UNL	45			65	53	42	43	09	4
08	10	UNL	35			72	56	43	35	11	8
11	10	UNL	25			83	60	41	23	14	6
14	10	UNL	25			89	61	37	16	05	5
17	10	UNL	20			90	61	36	15	24	7
20	10	UNL	30			88	60	35	15	31	3
23	8	UNL	15			76	57	40	27	12	8
DAY 14											
02	10	UNL	15			70	55	42	36	12	8
05	10	UNL	15			70	54	38	31	10	8
08	10	UNL	30			79	58	39	24	11	10
11	6	UNL	25			88	62	41	19	02	4
14	6	UNL	35			94	62	35	12	05	4
17	0	UNL	20			96	62	34	11	33	8
20	0	UNL	15			89	60	36	15	08	4
23	0	UNL	15			85	58	34	16	27	8
DAY 15											
02	0	UNL	15			71	54	39	31	11	7
05	0	UNL	45			66	51	37	34	09	10
08	0	UNL	40			76	55	36	23	10	7
11	7	UNL	45			89	60	35	15	14	6
14	4	UNL	45			96	62	33	11	12	7
17	1	UNL	35			95	61	31	10	31	11
20	0	UNL	15			90	59	32	13	31	5
23	0	UNL	15			82	56	31	16	30	5
DAY 16											
02	0	UNL	15			70	53	36	29	12	5
05	0	UNL	45			64	49	34	33	06	8
08	0	UNL	60			75	54	32	21	12	8
11	0	UNL	60			86	58	32	14	13	8
14	0	UNL	60			94	61	32	11	33	7
17	2	UNL	60			94	61	32	11	25	10
20	8	UNL	15			88	60	35	15	27	7
23	9	220	15			83	56	30	15	26	10
DAY 17											
02	4	UNL	15			72	52	32	23	06	6
05	0	UNL	45			67	49	27	22	12	4
08	0	UNL	25			74	53	30	20	24	8
11	0	UNL	25			83	54	22	10	28	10
14	0	UNL	30			88	54	07	03	27	16
17	0	UNL	25			86	53	07	03	27	13
20	0	UNL	25			77	48	00	03	28	16
23	0	UNL	15			71	46	02	06	30	14
DAY 18											
02	0	UNL	15			66	45	12	12	33	10
05	0	UNL	45			60	42	16	18	26	8
08	0	UNL	60			67	46	18	15	35	8
11	0	UNL	70			72	47	06	07	15	4
14	0	UNL	70			79	51	15	09	35	4
17	0	UNL	70			81	51	08	06	30	11
20	0	UNL	45			78	50	12	08	26	8
23	0	UNL	15			71	47	11	10	28	7
DAY 19											
02	0	UNL	15			56	43	26	32	09	4
05	0	UNL	45			54	41	21	28	12	5
08	0	UNL	50			65	46	20	18	12	7
11	0	UNL	60			79	51	13	08	08	5
14	0	UNL	70			85	53	08	05	24	4
17	0	UNL	70			87	54	11	06	31	4
20	1	UNL	45			83	54	20	10	26	6
23	3	UNL	15			69	49	24	18	05	5
DAY 20											
02	0	UNL	15			63	46	25	24	12	5
05	0	UNL	15			57	42	19	23	10	10
08	0	UNL	25			67	46	19	16	10	10
11	0	UNL	25			85	55	21	09	10	6
14	0	UNL	40			91	57	19	07	24	8
17	0	UNL	35			93	58	20	07	35	10
20	0	UNL	35			87	55	17	07	28	5
23	0	UNL	15			74	50	21	14	11	7
DAY 21											
02	0	UNL	15			67	47	20	17	09	7
05	0	UNL	45			61	45	23	23	09	10
08	0	UNL	35			75	52	26	16	16	12
11	0	UNL	35			84	55	25	11	20	16
14	0	UNL	35			90	57	21	08	23	11
17	0	UNL	20			90	58	28	11	24	21
20	0	UNL	20			79	53	24	13	28	11
23	0	UNL	15			75	52	26	16	22	6
DAY 22											
02	0	UNL	15			69	49	26	20	23	12
05	0	UNL	15			62	47	31	31	19	5
08	0	UNL	8			63	48	32	31	36	3
11	0	UNL	10			72	51	26	18	24	5
14	0	UNL	15			77	53	26	15	25	11
17	0	UNL	25			78	53	27	15	29	6
20	0	UNL	25			75	51	24	15	25	8
23	0	UNL	15			70	49	25	18	25	6
DAY 23											
02	0	UNL	15			65	48	27	24	26	3
05	0	UNL	45			58	44	25	28	07	5
08	0	UNL	30			66	48	27	23	09	7
11	0	UNL	35			75	53	29	18	10	5
14	0	UNL	35			82	56	31	16	27	12
17	0	UNL	40			83	56	30	15	27	6
20	0	UNL	40			81	55	30	16	24	7
23	0	UNL	15			70	52	33	26	08	6
DAY 24											
02	0	UNL	15			65	50	33	30	10	5
05	0	UNL	45			60	48	35	39	10	7
08	0	UNL	25			72	53	33	24	08	3
11	0	UNL	40			87	56	23	10	07	10
14	0	UNL	35			91	58	26	09	22	9
17	0	UNL	20			92	58	22	08	15	4
20	0	UNL	20			88	57	25	10	33	6
23	0	UNL	15			81	55	30	16	24	4
DAY 25											
02	0	UNL	15			68	50	29	23	13	5
05	0	UNL	45			63	47	29	28	10	8
08	0	UNL	20			74	52	28	18	12	9
11	7	UNL	15			87	57	27	11	22	4
14	5	UNL	30			95	60	27	09	11	6
17	6	UNL	20			96	60	23	07	34	6
20	7	UNL	20			91	60	31	12	02	4
23	3	UNL	15			84	58	34	17	25	10
DAY 26											
02	0	UNL	15			71	51	30	22	11	4
05	0	UNL	45			66	51	35	32	12	7
08	0	UNL	40			76	55	34	22	11	10
11	0	UNL	35			89	59	31	12	16	11
14	0	UNL	20			94	59	24	08	20	12
17	0	UNL	35			97	59	20	06	23	11
20	0	UNL	15			88	60	36	16	27	10
23	0	UNL	15			79	58	39	24	10	3
DAY 27											
02	0	UNL	15			71	54	37	29	08	7
05	0	UNL	25			68	52	36	31	14	7
08	0	UNL	30			76	55	35	23	15	9
11	1	UNL	20			86	58	32	14	24	12
14	1	UNL	12			90	60	35	14	24	17
17	0	UNL	15			86	59	37	18	26	17
20	0	UNL	20			77	55	34	21	27	12
23	2	UNL	15			73	52	29	20	26	10
DAY 28											
02	0	UNL	15			65	49	31	28	21	7
05	0	UNL	20			62	47	30	30	26	8
08	0	UNL	12			65	49	31	28	30	7
11	0	UNL	15			74	52	27	17	23	5
14	1	UNL	20			78	53	25	14	28	8
17	2	UNL	20			78	53	27	15	27	18
20	8	140	15			65	51	37	36	30	21
23	9	110	15			63	50	38	40	24	8
DAY 29											
02	1	UNL	15			58	49	39	49	25	10
05	7	UNL	35			56	48	40	55	31	5
08	0	UNL	40			60	50	40	48	29	4
11	7	100	45			68	52	36	31	24	9
14	5	UNL	40			74	55	37	26	27	12
17	4	UNL	45			75	55	36	24	25	11
20	0	UNL	45			72	54	36	27	35	6
23	0	UNL	15			68	52	37	32	10	7
DAY 30											
02	0	UNL	15			61	49	37	41	14	9
05	0	UNL	40			58	48	38	48	06	5
08	0	UNL	40			67	53	39	36	09	7
11	0	UNL	40			78	56	36	22	06	6
14	0	UNL	30			84	57	31	15	23	9
17	0	UNL	50			86	58	32	14	27	11
20	0	UNL	50			80	58	38	22	27	13
23	0	UNL	15			75	52	28	18	27	11
DAY 31											
02	0	UNL	15			64	49	33	32	08	7
05	0	UNL	45			59	47	33	38	09	8
08	0	UNL	45			69	53	39	34	12	8
11	2	UNL	45			78	58	41	27	17	11
14	8	UNL	45			86	58	33	15	19	8
17	2	UNL	45			88	60	36	16	21	12
20	0	UNL	50			84	58	34	17	26	11
23	0	UNL	15			79	54	28	15	25	8

NOTES

CEILING COLUMN—

UNL indicates an unlimited ceiling.

WEATHER COLUMN—

*	Tornado
T	Thunderstorm
Q	Squall
R	Rain
RW	Rain showers
ZR	Freezing rain
L	Drizzle
ZL	Freezing drizzle
S	Snow
SP	Snow pellets
IC	Ice crystals
SW	Snow showers
SG	Snow grains
IP	Ice pellets
A	Hail
F	Fog
IF	Ice fog
GF	Ground fog
BD	Blowing dust
BN	Blowing sand
BS	Blowing snow
BY	Blowing spray
K	Smoke
H	Haze
D	Dust

WIND COLUMNS—

Directions are those from which the wind blows, indicated in tens of degrees from true North; i. e., 09 for East, 18 for South, 27 for West. Entry of 00 in the direction column indicates calm.

Speed is expressed in knots; multiply by 1.15 to convert to miles per hour.

ADDITIONAL DATA

Other observational data contained in records on file can be furnished at cost via microfilm, microfiche, or paper copies of the original records. Inquiries as to availability and costs should be addressed to: Director, National Climatic Center, Federal Building, Asheville, North Carolina 28801.

STATION: PHOENIX ARIZONA YEAR & MONTH: 71 05

LOCAL CLIMATOLOGICAL DATA

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
ENVIRONMENTAL DATA SERVICE

PHOENIX, ARIZONA
SKY HARBOR AIRPORT
JUNE 1971

Latitude 33° 26′ N Longitude 112° 01′ W Elevation (ground) 1117 ft Standard time used: MOUNTAIN WBAN #23183

Date	Temperature °F Maximum	Minimum	Average	Departure from normal	Average dew point	Degree days Base 65° Heating	Cooling	Weather types on dates of occurrence (1 Fog, 2 Heavy fog x, 3 Thunderstorm, 4 Ice pellets, 5 Hail, 6 Glaze, 7 Duststorm, 8 Smoke, Haze, 9 Blowing snow)	Snow, ice pellets or ice on ground at 05AM In.	Precipitation Water equivalent In.	Snow, ice pellets In.	Avg. station pressure In. Elev. 1107 feet m.s.l.	Wind Resultant direction	Resultant speed m.p.h.	Average speed m.p.h.	Fastest mile Speed m.p.h.	Direction	Sunshine Hours and tenths	Percent of possible	Sky cover Tenths Sunrise to sunset	Midnight to midnight	Date
1	2	3	4	5	6	7A	7B	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	91	59	75	-4	29	0	10		0	0	0	28.70	23	1.0	8.5	21	S/	14.2	100	0	0	1
2	87	61	74	-6	23	0	9		0	0	0	28.66	15	5.3	10.5	36	W/	8.6	60	10	8	2
3	84	56*	70*	-10	29	0	5		0	0	0	28.76	30	3.7	5.9	21	WNW/	12.9	91	2	2	3
4	92	58	75	-5	30	0	10		0	0	0	28.81	14	2.2	7.8	16	S/	14.3	100	0	0	4
5	93	59	76	-5	27	0	11		0	0	0	28.76	30	2.2	8.2	20	WNW/	14.3	100	0	0	5
6	97	60	79	-2	21	0	14		0	0	0	28.71	17	2.7	7.8	17	W/	12.5	87	1	1	6
7	95	62	79	-2	23	0	14		0	0	0	28.66	19	1.4	8.9	20	WSW/	14.0	98	0	0	7
8	94	63	79	-2	34	0	14		0	0	0	28.66	11	1.2	7.6	15	NNW/	14.0	98	4	3	8
9	95	67	81	-1	36	0	16		0	0	0	28.61	34	3.0	6.5	17	WSW/	8.8	61	6	4	9
10	95	62	79	-3	35	0	14		0	0	0	28.61	21	5.5	10.6	25	S/	12.7	88	4	3	10
11	90	65	78	-4	38	0	13		0	0	0	28.70	30	.2	7.2	16	WNW/	9.3	65	8	5	11
12	97	65	81	-2	40	0	16		0	0	0	28.75	26	.8	6.3	16	W/	14.3	100	0	0	12
13	100	65	83	0	39	0	18		0	0	0	28.69	28	2.5	7.1	18	WNW/	14.3	100	0	0	13
14	104	70	87	3	40	0	22		0	0	0	28.63	28	5.2	8.1	20	W/	14.4	100	0	0	14
15	105	70	88	4	38	0	23		0	0	0	28.58	29	.7	7.5	21	NW/	14.4	100	0	0	15
16	109	71	90	6	36	0	25		0	0	0	28.56	25	2.9	8.1	20	W/	13.9	97	0	0	16
17	110	75	93	9	39	0	28		0	0	0	28.55	28	3.2	7.2	21	W/	13.4	93	8	7	17
18	109	80	95	10	40	0	30	3	0	0	0	28.59	28	5.4	9.4	22	WNW/	13.7	95	2	3	18
19	108	73	91	6	37	0	26		0	0	0	28.68	28	3.2	6.5	26	WSW/	14.4	100	0	0	19
20	108	72	90	5	37	0	25		0	0	0	28.68	11	2.2	5.9	17	SSE/	14.4	100	0	0	20
21	110	75	93	8	37	0	28		0	0	0	28.69	27	1.6	8.6	20	W/	14.4	100	0	0	21
22	111*	75	93	7	43	0	28		0	0	0	28.65	25	3.6	8.9	21	W/	14.4	100	0	0	22
23	109	79	94	8	49	0	29		0	0	0	28.61	26	7.1	9.8	23	W/	14.4	100	0	0	23
24	108	82	95*	9	50	0	30		0	0	0	28.64	27	5.5	9.8	30	W/	14.4	100	0	0	24
25	105	82	94	7	47	0	29		0	0	0	28.69	27	7.6	9.2	21	W/	13.9	97	4	4	25
26	107	76	92	5	48	0	27		0	0	0	28.62	28	4.7	8.5	23	W/	14.0	98	0	0	26
27	106	78	92	5	46	0	27		0	0	0	28.57	29	7.4	9.6	21	W/	14.4	100	0	0	27
28	104	78	91	3	43	0	26		0	0	0	28.63	27	5.7	9.9	23	W/	14.4	100	0	0	28
29	102	74	88	0	43	0	23		0	0	0	28.71	29	1.3	8.2	18	WNW/	14.4	100	0	0	29
30	105	72	89	1	38	0	24		0	0	0	28.66	28	2.5	5.9	14	NNE/	14.4	100	0	0	30
	Sum	Sum	—	—	—	Total	Total			Total	Total	For the month:						Total	% for month	Sum	Sum	
	3030	2084	—	—	—	0	614	Number of days		.00	0	28.66	26	2.4	8.1	36	W/	405.9		49	40	
	Avg.	Avg.	Avg.	Dep.	Avg.	Dep.	Dep.	Precipitation		Dep.	—	—	—	—	—	Date: 02		Possible		Avg.	Avg.	
	101.0	69.5	85.3	1.7	37	0		≥ .01 inch	0	-0.09	—	—	—	—	—	—		429.9	94	1.6	1.3	

Number of days				Season to date Total	Total				
Maximum Temp.		Minimum Temp.		1327	1071	Thunderstorms	1	Greatest in 24 hours and dates: Precipitation	Snow, ice pellets
≥ 90° ‡	≤ 32°	≤ 32°	≤ 0°	Dep.	Dep.	Heavy fog X	0	0	0
28	0	0	0	-438		Clear 23	Partly cloudy 4	Cloudy 3	

Snow, ice pellets ≥ 1.0 inch 0

Greatest depth on ground of snow, ice pellets or ice and date: 0

HOURLY PRECIPITATION (Water equivalent in inches)

Date	A. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	P. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	Date
1																									1
2																									2
3																									3
4																									4
5																									5
6																									6
7																									7
8																									8
9																									9
10																									10
11																									11
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19																									19
20																									20
21																									21
22																									22
23																									23
24																									24
25																									25
26																									26
27																									27
28																									28
29																									29
30																									30

* Extreme temperatures for the month. May be the last of more than one occurrence.
– Below zero temperature or negative departure from normal.
‡ ≥ 70° at Alaskan stations.
+ Also on an earlier date, or dates.
X Heavy fog restricts visibility to ¼ mile or less.
T In the Hourly Precipitation table and in columns 9, 10, and 11 indicates an amount too small to measure.

The season for degree days begins with July for heating and with January for cooling.
Data in columns 6, 12, 13, 14, and 15 are based on 8 observations per day at 3-hour intervals.
Wind directions are those from which the wind blows. Resultant wind is the vector sum of wind directions and speeds divided by the number of observations. Figures for directions are tens of degrees from true North; i.e., 09 = East, 18 = South, 27 = West, 36 = North, and 00 = Calm. When directions are in tens of degrees in Col. 17, entries in Col. 16 are fastest observed 1-minute speeds. If the / appears in Col. 17, speeds are gusts.
Any errors detected will be corrected and changes in summary data will be annotated in the annual summary.

Subscription Price: Local Climatological Data $1.00 per year including annual summary if published. Single copy: 10 cents for monthly summary; 15 cents for annual summary. Checks or money orders should be made payable and remittances and correspondence should be sent to the Superintendent of Documents, U.S. Goverment Printing Office, Washington, D.C. 20402.

I certify that this is an official publication of the National Oceanic and Atmospheric Administration, and is compiled from records on file at the National Climatic Center, Asheville, North Carolina 28801.

William H. Haggard
Director, National Climatic Center

SUMMARY BY HOURS

Hour Local time	Sky cover Tenths	Averages: Station pressure In.	Temperature Air °F	Wet bulb °F	Dew Pt. °F	Relative humidity %	Wind speed m.p.h.	Resultant wind Direction	Speed m.p.h.
02	1	28.65	78	57	39	25	5.6	06	1.5
05	2	28.68	71	55	39	31	6.1	09	5.0
08	2	28.72	81	58	38	23	7.2	10	5.9
11	2	28.72	92	62	37	15	7.7	22	3.0
14	2	28.67	98	64	35	11	10.5	26	7.0
17	1	28.61	100	64	35	11	12.6	28	11.0
20	1	28.60	95	62	36	13	8.9	27	8.1
23	1	28.64	86	60	38	18	6.4	28	3.8

OBSERVATIONS AT 3-HOUR INTERVALS

HOUR	SKY COVER Tenths	CEILING Hnds. of ft.	VISIBILITY WHOLE MILES	VISIBILITY 16ths MILE	WEATHER	TEMPERATURE AIR °F	TEMPERATURE WET BULB °F	TEMPERATURE DEW PT. °F	REL. HUM. %	WIND DIR.	WIND SPEED Knots
DAY 01											
02	0	UNL	15			65	50	33	30	10	3
05	0	UNL	40			60	48	34	38	10	6
08	0	UNL	35			71	52	33	25	10	6
11	0	UNL	35			83	56	31	15	11	11
14	0	UNL	40			88	57	25	10	25	9
17	0	UNL	40			91	58	25	09	29	10
20	0	UNL	40			85	56	26	12	30	8
23	0	UNL	15			79	54	27	15	25	6
DAY 02											
02	3	UNL	15			67	49	29	24	12	7
05	10	250	15			64	47	28	26	10	9
08	10	250	45			71	50	26	19	09	8
11	10	250	35			81	54	25	13	14	7
14	10	250	40			86	55	21	09	18	14
17	10	180	45			86	55	19	08	18	11
20	10	170	15			79	51	15	09	26	11
23	3	UNL	15			74	51	23	15	02	6
DAY 03											
02	0	UNL	15			63	46	25	24	00	0
05	6	UNL	45			58	45	28	32	09	3
08	8	UNL	45			65	48	28	25	06	4
11	0	UNL	45			76	53	30	18	28	4
14	0	UNL	45			81	56	31	16	33	8
17	0	UNL	45			83	57	32	16	30	10
20	0	UNL	45			80	56	32	17	26	6
23	0	UNL	15			77	53	28	16	27	6
DAY 04											
02	0	UNL	15			64	50	36	35	10	6
05	0	UNL	45			59	47	34	39	09	7
08	0	UNL	45			71	52	33	25	11	5
11	0	UNL	35			84	57	32	15	14	10
14	0	UNL	35			88	57	26	10	21	11
17	0	UNL	30			91	58	23	08	01	5
20	0	UNL	30			87	57	27	11	30	7
23	0	UNL	15			79	55	32	18	28	3
DAY 05											
02	0	UNL	15			72	52	32	23	32	5
05	0	UNL	45			62	49	34	35	11	9
08	0	UNL	45			74	52	28	18	07	6
11	0	UNL	45			85	55	23	10	22	7
14	0	UNL	45			92	58	22	08	29	8
17	0	UNL	40			92	58	23	08	29	13
20	0	UNL	35			88	57	25	10	31	5
23	0	UNL	15			74	53	31	21	09	4
DAY 06											
02	0	UNL	15			66	49	30	26	08	3
05	0	UNL	45			61	46	28	29	10	6
08	0	UNL	50			74	51	23	15	10	8
11	0	UNL	50			86	54	16	07	14	6
14	0	UNL	50			94	57	13	05	17	10
17	3	UNL	45			96	59	18	06	26	9
20	3	UNL	35			89	56	19	08	31	5
23	1	UNL	15			82	54	24	12	24	7
DAY 07											
02	0	UNL	15			69	49	26	20	07	8
05	0	UNL	45			63	46	24	23	09	3
08	0	UNL	50			75	51	24	15	10	8
11	0	UNL	50			85	55	23	10	19	11
14	0	UNL	50			93	57	17	06	18	11
17	0	UNL	45			94	59	22	07	31	9
20	0	UNL	35			89	56	21	08	30	8
23	0	UNL	15			80	54	28	15	29	4
DAY 08											
02	0	UNL	15			71	52	31	23	06	3
05	0	UNL	45			66	49	29	25	09	8
08	0	UNL	45			76	56	37	24	11	9
11	7	UNL	35			87	61	40	19	13	6
14	10	250	40			91	62	39	16	18	5
17	2	UNL	40			93	61	32	11	33	8
20	0	UNL	30			90	59	29	11	30	7
23	0	UNL	15			82	57	33	17	24	7
DAY 09											
02	2	UNL	15			72	54	37	28	05	4
05	7	250	45			67	53	39	36	06	4
08	9	250	45			74	55	37	26	12	7
11	9	150	40			83	58	37	19	36	6
14	8	250	40			89	60	35	15	30	5
17	1	UNL	45			95	62	33	11	32	7
20	0	UNL	40			90	59	31	12	29	8
23	0	UNL	15			83	58	35	18	30	4
DAY 10											
02	0	UNL	15			72	54	36	27	03	5
05	0	UNL	45			63	50	37	38	10	6
08	0	UNL	35			75	56	38	26	13	7
11	0	UNL	35			86	59	34	16	19	14
14	6	UNL	35			93	60	30	11	19	11
17	9	250	35			93	61	34	12	25	12
20	3	UNL	35			85	60	40	20	25	12
23	2	UNL	15			80	56	33	18	28	7
DAY 11											
02	0	UNL	15			69	53	39	34	08	4
05	6	UNL	30			67	51	36	32	10	5
08	6	UNL	35			78	55	34	20	08	6
11	10	250	40			81	57	34	18	16	7
14	9	220	40			86	59	35	16	25	9
17	9	UNL	45			88	61	39	18	30	11
20	2	UNL	45			86	61	42	21	32	5
23	1	UNL	15			76	58	43	31	09	3
DAY 12											
02	0	UNL	15			71	56	43	37	09	4
05	0	UNL	45			66	53	41	40	11	5
08	0	UNL	40			76	58	43	31	13	6
11	0	UNL	40			88	62	42	20	32	5
14	0	UNL	45			94	62	35	12	29	8
17	0	UNL	45			97	63	37	12	26	7
20	0	UNL	45			93	62	38	15	26	5
23	0	UNL	15			81	58	39	22	09	4
DAY 13											
02	0	UNL	15			72	55	40	31	09	2
05	0	UNL	45			69	54	40	35	07	4
08	0	UNL	35			77	56	37	24	11	5
11	0	UNL	35			91	61	37	15	19	8
14	0	UNL	45			98	65	40	13	28	7
17	0	UNL	45			100	65	37	11	30	11
20	0	UNL	45			94	64	41	16	27	8
23	0	UNL	15			85	61	42	22	33	4
DAY 14											
02	0	UNL	15			82	58	38	21	25	6
05	0	UNL	45			76	57	40	27	29	4
08	0	UNL	30			82	60	42	24	12	5
11	0	UNL	25			95	64	41	15	05	3
14	0	UNL	30			102	67	43	13	28	11
17	0	UNL	30			103	66	37	10	27	12
20	0	UNL	35			97	64	39	13	26	8
23	0	UNL	15			89	60	36	15	34	7
DAY 15											
02	0	UNL	15			77	57	40	27	09	7
05	0	UNL	45			72	55	41	33	09	5
08	0	UNL	25			81	59	42	25	14	5
11	0	UNL	20			95	63	38	14	23	8
14	0	UNL	30			104	66	38	10	30	7
17	0	UNL	30			105	66	34	08	31	11
20	0	UNL	35			101	64	32	09	25	4
23	0	UNL	15			87	59	35	16	07	5
DAY 16											
02	0	UNL	15			79	58	40	25	10	4
05	0	UNL	45			74	55	37	26	13	6
08	0	UNL	35			82	57	34	18	12	8
11	0	UNL	20			97	63	35	11	23	5
14	0	UNL	20			105	65	32	08	30	8
17	0	UNL	20			109	67	35	08	26	12
20	0	UNL	30			103	66	39	11	27	6
23	1	UNL	15			96	63	37	13	30	7
DAY 17											
02	1	UNL	15			85	59	36	17	00	0
05	2	UNL	30			76	58	44	32	10	5
08	9	150	25			88	61	38	17	10	6
11	10	UNL	20			101	66	40	12	31	7
14	7	UNL	30			109	66	32	07	26	12
17	8	250	25			107	67	37	09	27	11
20	10	130	20			102	67	41	12	29	6
23	9	150	15			94	64	43	17	02	3
DAY 18											
02	8	150	15			90	64	45	21	32	6
05	7	150	20			83	61	45	26	09	6
08	3	UNL	20			88	63	44	22	06	5
11	1	UNL	20			102	67	41	12	32	6
14	0	UNL	20			107	66	34	08	24	8
17	0	UNL	30			108	67	37	09	28	16
20	0	UNL	30			101	64	33	09	27	12
23	0	UNL	15			92	63	40	16	23	6
DAY 19											
02	0	UNL	15			84	58	35	17	00	0
05	0	UNL	30			73	54	37	27	09	5
08	0	UNL	25			86	59	35	16	07	6
11	0	UNL	20			101	65	38	11	27	4
14	0	UNL	20			106	67	36	09	29	11
17	0	UNL	25			107	66	33	08	25	10
20	0	UNL	25			101	65	36	10	28	9
23	0	UNL	15			88	62	42	20	00	0
DAY 20											
02	0	UNL	15			78	55	34	20	10	4
05	0	UNL	35			74	57	44	34	11	7
08	0	UNL	40			85	59	38	19	12	7
11	0	UNL	30			100	64	35	10	27	4
14	0	UNL	30			107	66	34	08	16	5
17	0	UNL	40			107	66	34	08	36	7
20	0	UNL	40			103	65	35	09	22	4
23	0	UNL	15			89	62	42	19	05	3
DAY 21											
02	0	UNL	15			78	57	38	24	08	7
05	0	UNL	35			77	55	33	20	07	6
08	0	UNL	30			87	60	38	18	10	8
11	0	UNL	25			99	66	42	14	21	4
14	0	UNL	20			107	67	35	08	27	11
17	0	UNL	30			109	67	34	07	26	11
20	0	UNL	30			103	66	38	11	26	8
23	0	UNL	15			92	62	39	16	36	5
DAY 22											
02	0	UNL	15			81	59	42	25	08	5
05	0	UNL	30			76	57	40	27	09	6
08	0	UNL	25			90	61	37	15	10	7
11	0	UNL	20			101	68	47	16	27	6
14	0	UNL	20			107	69	44	12	27	8
17	0	UNL	25			109	69	40	10	26	13
20	0	UNL	25			104	69	46	14	23	9
23	0	UNL	15			97	67	47	18	27	8
DAY 23											
02	0	UNL	15			87	64	48	26	18	5
05	0	UNL	30			82	62	48	31	12	3
08	0	UNL	25			90	66	51	26	05	5
11	0	UNL	20			100	69	49	18	26	10
14	0	UNL	20			105	70	49	15	27	12
17	0	UNL	20			108	70	45	12	26	14
20	0	UNL	20			103	69	47	15	26	11
23	0	UNL	15			95	68	52	23	26	8
DAY 24											
02	0	UNL	15			87	66	53	31	07	8
05	0	UNL	45			84	65	53	34	07	5
08	0	UNL	30			91	67	53	27	29	6
11	0	UNL	30			98	67	46	17	29	7
14	0	UNL	25			105	71	51	16	28	13
17	0	UNL	30			107	72	51	15	26	15
20	4	UNL	30			101	69	48	17	22	8
23	0	UNL	15			94	66	48	21	25	6
DAY 25											
02	9	150	15			88	64	48	25	31	6
05	7	150	45			83	63	48	30	25	6
08	10	150	40			86	63	47	26	34	5
11	3	UNL	35			93	66	48	21	17	5
14	0	UNL	20			102	68	46	15	26	9
17	0	UNL	25			105	70	48	15	27	13
20	0	UNL	30			100	67	44	15	27	12
23	0	UNL	15			92	66	48	22	27	8
DAY 26											
02	0	UNL	15			86	64	50	29	34	7
05	0	UNL	40			79	62	51	38	13	4
08	0	UNL	45			85	64	51	31	10	7
11	2	UNL	35			95	66	46	19	30	3
14	0	UNL	25			103	69	48	16	29	8
17	0	UNL	25			106	70	46	13	26	13
20	0	UNL	35			101	67	44	14	26	10
23	0	UNL	15			92	64	45	20	27	7
DAY 27											
02	0	UNL	15			88	63	46	23	30	8
05	0	UNL	45			81	62	48	32	02	3
08	0	UNL	45			86	64	50	29	08	5
11	0	UNL	35			95	66	46	19	31	8
14	0	UNL	35			104	68	43	13	28	12
17	0	UNL	30			104	69	45	14	28	13
20	0	UNL	30			100	67	45	15	26	7
23	0	UNL	15			92	64	45	20	26	11
DAY 28											
02	0	UNL	15			90	64	45	21	25	7
05	0	UNL	45			79	60	45	30	07	8
08	0	UNL	30			84	62	46	27	05	6
11	0	UNL	30			93	64	43	18	27	6
14	0	UNL	30			101	67	44	14	22	8
17	0	UNL	30			103	68	44	13	27	15
20	0	UNL	30			96	64	39	14	27	12
23	0	UNL	15			88	62	41	19	28	7
DAY 29											
02	0	UNL	15			88	63	45	22	22	8
05	0	UNL	45			76	59	45	33	09	5
08	0	UNL	25			83	62	47	28	12	7
11	0	UNL	25			92	64	43	18	09	6
14	1	UNL	30			100	67	45	15	36	8
17	0	UNL	30			100	66	41	13	29	12
20	0	UNL	30			97	63	37	12	30	7
23	0	UNL	15			88	61	38	17	23	4
DAY 30											
02	0	UNL	15			84	58	36	18	26	4
05	0	UNL	45			74	57	42	32	00	0
08	0	UNL	40			84	59	37	19	13	4
11	0	UNL	30			96	63	37	13	21	6
14	0	UNL	40			105	66	35	09	02	8
17	0	UNL	30			104	67	41	12	27	8
20	0	UNL	30			99	64	36	11	33	5
23	0	UNL	15			90	61	36	15	26	6

NOTES

CEILING COLUMN—

UNL indicates an unlimited ceiling.

WEATHER COLUMN—

*	Tornado
T	Thunderstorm
Q	Squall
R	Rain
RW	Rain showers
ZR	Freezing rain
L	Drizzle
ZL	Freezing drizzle
S	Snow
SP	Snow pellets
IC	Ice crystals
SW	Snow showers
SG	Snow grains
IP	Ice pellets
A	Hail
F	Fog
IF	Ice fog
GF	Ground fog
BD	Blowing dust
BN	Blowing sand
BS	Blowing snow
BY	Blowing spray
K	Smoke
H	Haze
D	Dust

WIND COLUMNS—

Directions are those from which the wind blows, indicated in tens of degrees from true North; i. e., 09 for East, 18 for South, 27 for West. Entry of 00 in the direction column indicates calm.

Speed is expressed in knots; multiply by 1.15 to convert to miles per hour.

ADDITIONAL DATA

Other observational data contained in records on file can be furnished at cost via microfilm, microfiche, or paper copies of the original records. Inquiries as to availability and costs should be addressed to: Director, National Climatic Center, Federal Building, Asheville, North Carolina 28801.

STATION: PHOENIX ARIZONA YEAR & MONTH: 71 06

LOCAL CLIMATOLOGICAL DATA

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
ENVIRONMENTAL DATA SERVICE

A UNITED STATES DEPARTMENT OF COMMERCE PUBLICATION

PHOENIX, ARIZONA
SKY HARBOR AIRPORT
JULY 1971

Latitude 33° 26′ N Longitude 112° 01′ W Elevation (ground) 1117 ft. Standard time used: MOUNTAIN WBAN #23183

Date	Temperature °F Maximum	Minimum	Average	Departure from normal	Average dew point	Degree days Base 65° Heating	Cooling	Weather types on dates of occurrence (1 Fog, 2 Heavy fog x, 3 Thunderstorm, 4 Ice pellets, 5 Hail, 6 Glaze, 7 Duststorm, 8 Smoke, Haze, 9 Blowing snow)	Snow, ice pellets or ice on ground at 05AM In.	Precipitation Water equivalent In.	Snow, ice pellets In.	Avg. station pressure In. Elev. 1107 feet m.s.l.	Wind Resultant direction	Resultant speed m.p.h.	Average speed m.p.h.	Fastest mile Speed m.p.h.	Direction	Sunshine Hours and tenths	Percent of possible	Sky cover Tenths Sunrise to sunset	Midnight to midnight	Date
1	2	3	4	5	6	7A	7B	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	108	72*	90*	1	35	0	25		0	0	0	28.62	14	1.1	8.1	18	WSW/	14.3	100	0	0	1
2	106	75	91	2	43	0	26		0	0	0	28.67	27	4.3	8.5	22	W/	14.3	100	0	0	2
3	105	80	93	4	54	0	28		0	0	0	28.73	30	6.0	7.6	21	W/	14.3	100	0	0	3
4	106	85	96	6	52	0	31		0	0	0	28.71	30	4.5	7.5	25	NW/	14.3	100	1	2	4
5	108	79	94	4	49	0	29		0	0	0	28.64	27	3.7	8.3	20	S/	14.0	98	7	7	5
6	97	85	91	1	56	0	26		0	T	0	28.67	11	7.5	9.1	18	ESE/	4.0	28	10	9	6
7	108	78	93	3	52	0	28		0	0	0	28.67	14	3.0	6.6	17	NW/	14.3	100	0	0	7
8	108	78	93	3	41	0	28		0	0	0	28.69	27	1.7	7.3	18	WSW/	14.3	100	0	0	8
9	111	80	96	6	47	0	31		0	0	0	28.69	27	3.4	7.5	22	WNW/	14.3	100	0	0	9
10	112	83	98	8	38	0	33		0	0	0	28.64	26	5.8	7.9	21	WNW/	12.7	89	1	1	10
11	114*	78	96	6	37	0	31		0	0	0	28.59	26	4.2	9.4	20	W/	13.9	98	0	1	11
12	111	83	97	7	48	0	32		0	T	0	28.62	26	4.8	9.8	22	W/	13.5	95	3	3	12
13	111	87	99	9	54	0	34		0	0	0	28.62	26	5.7	8.9	21	W/	12.5	88	4	5	13
14	108	86	97	7	56	0	32		0	0	0	28.61	29	3.9	10.5	20	WNW/	12.9	91	3	4	14
15	105	85	95	5	58	0	30	3	0	T	0	28.64	28	12.0	12.5	29	W/	13.3	94	4	5	15
16	106	83	95	5	60	0	30	3 7	0	.14	0	28.69	25	10.5	12.8	45	S/	12.5	88	5	6	16
17	104	78	91	0	63	0	26		0	0	0	28.74	25	4.0	9.6	21	WSW/	12.9	92	4	5	17
18	108	86	97	6	58	0	32		0	0	0	28.68	27	7.8	9.5	22	WSW/	13.3	94	5	5	18
19	109	78	94	3	58	0	29	3 7	0	.10	0	28.68	16	2.5	10.8	44	SSW/	12.9	91	2	4	19
20	105	78	92	2	61	0	27		0	T	0	28.69	28	5.9	9.9	22	WNW/	13.5	96	5	6	20
21	108	83	96	6	60	0	31		0	0	0	28.67	26	5.3	9.9	23	W/	12.2	87	9	7	21
22	106	84	95	5	62	0	30		0	0	0	28.72	35	2.0	10.5	20	ESE/	10.5	75	6	7	22
23	107	87	97	7	59	0	32		0	T	0	28.66	30	5.4	9.5	33	NNW/	10.6	76	3	4	23
24	108	84	96	6	57	0	31		0	0	0	28.64	24	4.5	9.4	24	WSW/	14.0	100	2	5	24
25	107	86	97	7	57	0	32		0	0	0	28.63	28	2.2	10.1	25	W/	12.1	87	2	5	25
26	110	86	98	8	54	0	33		0	0	0	28.60	25	1.5	6.6	16	WNW/	14.0	100	1	4	26
27	109	88	99*	9	54	0	34		0	T	0	28.61	10	2.0	11.2	44	NNE/	12.5	90	1	4	27
28	107	89	98	8	58	0	33		0	0	0	28.63	26	5.5	11.1	18	WSW/	13.4	97	0	2	28
29	106	87	97	7	62	0	32	3	0	0	0	28.70	29	9.5	10.5	28	N/	13.5	97	1	3	29
30	104	89	97	7	61	0	32		0	T	0	28.70	29	7.1	9.2	21	NNW/	5.4	39	8	9	30
31	104	77	91	2	60	0	26	7	0	T	0	28.69	22	1.1	11.5	51	SE/	10.7	78	7	8	31
	Sum 3326	Sum 2557				Total 0	Total 934			Total .24	Total 0	For the month: 28.66	27	3.6	9.4	51	SE/	Total 390.9	% for month 89	Sum 94	Sum 121	
	Avg. 107.3	Avg. 82.5	Avg. 94.9	Dep. 5.1	Avg. 54	Dep. 0	Dep.	Number of days		Dep. -0.53						Date: 31		Possible 437.8		Avg. 3.0	Avg. 3.9	

Number of days				Season to date	
Maximum Temp.		Minimum Temp.		Total	Total
≥ 90° ‡	≤ 32°	≤ 32°	≤ 0°	0	2005
31	0	0	0	Dep. 0	Dep.

Number of days	
Precipitation ≥ .01 inch	2
Snow, ice pellets ≥ 1.0 inch	0
Thunderstorms	4
Heavy fog X	0
Clear 19	Partly cloudy 9
Cloudy 3	

Greatest in 24 hours and dates				Greatest depth on ground of snow, ice pellets or ice and date
Precipitation		Snow, ice pellets		
.14	16	0		0

HOURLY PRECIPITATION (Water equivalent in inches)

Date	A. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	P. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	Date
1																									1
2																									2
3																									3
4																									4
5																									5
6					T	T			T	T			T	T											6
7																									7
8																									8
9																									9
10																									10
11																									11
12						T																			12
13																									13
14																									14
15			T	T																					15
16																			T	.14					16
17																									17
18																									18
19																							.08	.02	19
20	T																								20
21																									21
22																									22
23	T	T																							23
24																									24
25																									25
26																									26
27	T																								27
28																									28
29																									29
30										T	T														30
31																								T	31

* Extreme temperatures for the month. May be the last of more than one occurrence.
– Below zero temperature or negative departure from normal.
‡ ≥ 70° at Alaskan stations.
\+ Also on an earlier date, or dates.
X Heavy fog restricts visibility to ¼ mile or less.
T In the Hourly Precipitation table and in columns 9, 10, and 11 indicates an amount too small to measure.

The season for degree days begins with July for heating and with January for cooling.
Data in columns 6, 12, 13, 14, and 15 are based on 8 observations per day at 3-hour intervals.
Wind directions are those from which the wind blows. Resultant wind is the vector sum of wind directions and speeds divided by the number of observations. Figures for directions are tens of degrees from true North; i.e., 09 = East, 18 = South, 27 = West, 36 = North, and 00 = Calm. When directions are in tens of degrees in Col. 17, entries in Col. 16 are fastest observed 1-minute speeds. If the / appears in Col. 17, speeds are gusts.
Any errors detected will be corrected and changes in summary data will be annotated in the annual summary.

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I certify that this is an official publication of the National Oceanic and Atmospheric Administration, and is compiled from records on file at the National Climatic Center, Asheville, North Carolina 28801.

William H. Haggard
Director, National Climatic Center

SUMMARY BY HOURS

Hour Local time	Sky cover Tenths	Station pressure In.	AVERAGES Temperature Air °F	Wet bulb °F	Dew Pt. °F	Relative humidity %	Wind speed m.p.h.	Resultant wind Direction	Speed m.p.h.
02	5	28.66	89	68	55	34	8.4	09	.7
05	5	28.68	85	67	55	39	7.3	10	2.6
08	4	28.73	89	68	56	33	7.7	10	2.6
11	2	28.73	98	70	54	24	8.8	26	4.6
14	2	28.66	105	72	52	18	10.9	27	9.2
17	2	28.59	106	72	51	17	12.5	27	10.3
20	6	28.59	102	71	52	20	10.6	28	5.8
23	5	28.64	95	69	54	27	9.1	27	4.9

OBSERVATIONS AT 3-HOUR INTERVALS

HOUR	SKY COVER Tenths	CEILING Hnds. of ft.	VISIBILITY Whole Miles	VISIBILITY 16ths Mile	WEATHER	TEMPERATURE AIR °F	TEMPERATURE WET BULB °F	TEMPERATURE DEW PT. °F	REL. HUM. %	WIND DIR.	WIND SPEED Knots
DAY 01											
02	0	UNL	15			81	58	37	21	12	4
05	0	UNL	45			76	55	36	23	11	8
08	0	UNL	40			85	58	35	17	09	7
11	0	UNL	35			99	63	34	10	08	4
14	0	UNL	35			106	67	36	09	22	10
17	0	UNL	40			107	66	33	08	32	9
20	0	UNL	40			102	64	31	08	28	9
23	0	UNL	15			90	61	36	15	12	5
DAY 02											
02	0	UNL	15			80	58	38	22	09	8
05	0	UNL	40			77	57	40	27	09	6
08	0	UNL	25			88	60	37	16	31	3
11	0	UNL	30			98	65	40	12	27	9
14	0	UNL	30			104	66	36	09	27	5
17	0	UNL	40			105	69	45	13	27	10
20	0	UNL	30			100	70	52	20	26	11
23	0	UNL	15			94	69	54	26	27	7
DAY 03											
02	0	UNL	15			88	66	53	30	31	8
05	0	UNL	40			82	65	54	38	36	5
08	0	UNL	25			88	67	55	33	05	3
11	0	UNL	30			96	69	53	23	33	5
14	1	UNL	35			103	73	56	21	31	7
17	1	UNL	40			105	72	54	18	26	9
20	0	UNL	15			101	70	51	19	30	8
23	0	UNL	15			95	69	55	26	26	8
DAY 04											
02	0	UNL	15			89	68	55	32	32	9
05	2	UNL	45			87	67	55	34	36	5
08	0	UNL	35			90	68	55	31	18	2
11	0	UNL	40			98	69	53	22	16	7
14	0	UNL	40			104	72	54	19	33	9
17	0	UNL	40			105	70	49	15	28	7
20	8	UNL	45			102	68	45	14	29	8
23	1	UNL	15			94	67	49	22	27	5
DAY 05											
02	4	UNL	15			89	66	51	27	34	6
05	9	UNL	45			82	63	51	34	13	5
08	3	UNL	30			88	65	51	28	10	7
11	7	UNL	30			99	68	50	19	27	4
14	9	UNL	35			107	71	49	14	29	10
17	6	300	35			107	70	47	13	26	13
20	10	250	30			102	70	50	17	18	5
23	8	160	15			97	66	46	17	28	8
DAY 06											
02	10	150	15			92	66	49	23	03	5
05	10	100	15		RW	89	68	55	32	17	8
08	10	100	45			88	70	60	39	10	8
11	10	100	40			92	70	59	33	12	11
14	10	150	45			95	69	55	26	09	8
17	9	150	45			96	70	55	25	09	10
20	8	150	45			94	70	56	28	14	7
23	4	UNL	15			88	69	59	38	10	6
DAY 07											
02	0	UNL	15			82	67	59	46	06	4
05	0	UNL	45			80	66	58	47	14	3
08	0	UNL	35			90	69	58	34	14	6
11	0	UNL	35			98	71	56	25	13	9
14	0	UNL	50			105	71	52	17	19	6
17	0	UNL	50			106	70	48	14	16	8
20	0	UNL	45			102	68	46	15	36	5
23	0	UNL	15			94	64	41	16	32	5
DAY 08											
02	0	UNL	15			88	61	38	17	36	5
05	0	UNL	45			83	58	37	19	18	4
08	0	UNL	45			90	61	38	16	09	10
11	0	UNL	45			101	66	40	12	05	4
14	0	UNL	45			106	69	45	13	27	6
17	0	UNL	45			108	69	42	11	25	9
20	0	UNL	45			104	68	43	13	30	6
23	0	UNL	15			94	65	45	18	23	7
DAY 09											
02	0	UNL	15			87	64	48	26	10	3
05	0	UNL	45			80	61	47	31	09	4
08	0	UNL	45			90	64	47	23	05	4
11	0	UNL	45			104	69	47	15	19	6
14	0	UNL	45			109	70	46	12	30	8
17	0	UNL	45			111	71	46	11	29	11
20	0	UNL	45			105	70	47	14	25	9
23	0	UNL	15			97	66	44	16	26	7
DAY 10											
02	1	UNL	15			91	63	43	19	25	8
05	2	UNL	35			88	61	39	18	28	5
08	5	UNL	40			90	63	42	19	10	7
11	0	UNL	40			104	67	40	11	26	9
14	0	UNL	40			109	66	32	07	28	7
17	0	UNL	40			112	67	32	06	26	12
20	0	UNL	40			106	67	37	09	26	7
23	0	UNL	15			96	63	37	13	00	0
DAY 11											
02	0	UNL	15			88	60	37	16	32	4
05	0	UNL	30			78	58	42	28	09	8
08	0	UNL	30			90	61	38	16	10	9
11	0	UNL	40			104	66	38	10	24	5
14	0	UNL	30			111	66	27	05	28	8
17	0	UNL	40			112	68	36	07	26	10
20	0	UNL	40			107	67	36	09	26	12
23	2	UNL	15			101	67	42	13	26	9
DAY 12											
02	1	UNL	15			91	63	42	18	02	5
05	7	140	30			87	60	39	18	14	7
08	4	UNL	30			90	66	51	26	08	8
11	8	140	30			102	70	50	17	25	8
14	0	UNL	30			108	72	50	14	28	10
17	1	UNL	30			111	72	50	13	26	12
20	2	UNL	30			107	71	50	15	26	8
23	3	UNL	15			98	70	55	24	27	10
DAY 13											
02	4	UNL	15			91	70	58	33	15	3
05	9	150	35			87	68	58	37	09	6
08	10	UNL	30			92	70	59	33	31	6
11	4	UNL	30			101	72	55	22	27	10
14	2	UNL	30			107	72	51	15	29	9
17	0	UNL	25			110	73	52	15	23	12
20	4	UNL	25			108	73	53	16	22	5
23	3	UNL	15			101	69	49	17	26	11
DAY 14											
02	5	UNL	15			94	70	56	28	08	6
05	8	UNL	35			87	67	56	35	11	8
08	5	UNL	35			93	69	55	28	06	7
11	0	UNL	35			100	71	55	22	29	10
14	0	UNL	20			105	74	57	21	29	13
17	1	UNL	20			107	74	57	19	23	12
20	8	250	20			104	72	55	20	27	10
23	5	UNL	15			96	70	56	26	32	7
DAY 15											
02	10	140	15			93	70	58	31	30	13
05	9	250	15			86	68	58	39	29	8
08	0	UNL	35			90	71	62	39	27	9
11	0	UNL	35			96	71	57	27	29	8
14	0	UNL	30			103	74	58	23	25	11
17	3	UNL	35			105	73	56	20	29	12
20	8	UNL	30			101	73	57	23	27	13
23	3	UNL	15			95	71	58	29	26	13
DAY 16											
02	5	UNL	15			91	70	59	34	27	6
05	8	UNL	45			87	69	60	40	31	9
08	8	UNL	35			92	71	60	34	29	10
11	0	UNL	35			98	72	59	27	25	13
14	1	UNL	35			103	73	57	22	27	12
17	8	250	35			105	73	55	19	24	12
20	10	100	7		T	85	72	66	53	22	23
23	9	UNL	15			85	73	67	55	11	4
DAY 17											
02	8	140	15			79	72	69	72	10	8
05	10	UNL	45			80	71	67	65	07	7
08	8	UNL	30			86	71	64	48	16	5
11	2	UNL	30			95	73	62	34	21	7
14	0	UNL	25			102	73	58	23	26	10
17	3	UNL	30			103	75	61	25	29	13
20	6	250	30			99	73	61	29	27	9
23	5	UNL	15			94	72	60	32	26	8
DAY 18											
02	6	UNL	15			91	71	60	35	26	6
05	7	180	15			86	70	61	43	34	3
08	7	UNL	45			91	71	61	37	24	4
11	3	UNL	45			100	73	59	26	26	8
14	5	UNL	45			106	74	57	20	25	13
17	6	UNL	45			108	74	55	17	26	13
20	8	UNL	30			105	72	53	18	26	11
23	3	UNL	15			98	70	55	24	36	8
DAY 19											
02	2	UNL	7			89	69	57	34	13	10
05	6	140	30			84	68	59	43	10	9
08	1	UNL	35			90	69	57	33	10	7
11	0	UNL	35			100	72	57	24	25	9
14	0	UNL	35			106	73	55	19	28	10
17	3	UNL	35			108	74	55	17	28	11
20	8	250	35			103	72	54	20	07	8
23	10	50	3		TRW	81	72	68	65	16	11
DAY 20											
02	10	150	15			79	72	68	69	29	12
05	10	150	45			79	72	69	72	20	5
08	6	UNL	30			86	71	64	48	14	7
11	0	UNL	25			94	73	63	36	32	11
14	6	UNL	40			103	74	58	23	30	12
17	7	UNL	45			105	72	54	18	28	11
20	7	UNL	45			102	72	55	21	27	7
23	6	UNL	15			92	70	58	32	11	4
DAY 21											
02	4	UNL	15			89	71	62	41	12	3
05	6	UNL	15			84	71	64	51	09	5
08	9	UNL	40			90	71	61	38	11	7
11	8	UNL	35			99	73	60	28	31	7
14	9	UNL	40			107	74	57	19	28	12
17	7	UNL	45			107	74	56	19	26	12
20	7	UNL	45			103	73	56	21	24	12
23	6	UNL	15			97	73	62	31	27	11
DAY 22											
02	8	140	15			87	72	65	48	11	11
05	9	250	15			84	72	67	57	10	5
08	8	UNL	35			88	72	65	47	11	6
11	7	UNL	35			94	74	64	37	02	4
14	1	UNL	35			102	75	61	26	23	12
17	3	UNL	40			105	74	57	21	28	12
20	10	UNL	35			100	73	58	25	36	12
23	3	UNL	15			94	71	59	31	34	11
DAY 23											
02	5	UNL	15			90	72	63	41	03	5
05	3	UNL	15			88	71	62	42	22	7
08	0	UNL	45			90	72	63	41	32	6
11	0	UNL	45			98	73	61	29	23	9
14	0	UNL	40			105	75	60	23	28	8
17	8	250	15			100	71	55	22	33	20
20	10	150	45			96	69	54	24	06	4
23	10	150	15			93	70	57	30	25	7
DAY 24											
02	10	150	15			91	69	57	32	13	7
05	2	UNL	15			86	70	62	45	09	6
08	0	UNL	45			89	72	63	42	12	6
11	2	UNL	35			98	72	58	26	24	12
14	4	UNL	35			104	72	54	19	26	8
17	0	UNL	35			107	72	51	15	25	10
20	9	150	40			103	72	55	20	28	7
23	10	150	15			98	71	56	25	28	9
DAY 25											
02	9	150	15			90	72	63	41	10	9
05	9	150	15			88	71	62	42	07	5
08	7	150	45			88	70	61	40	06	5
11	2	UNL	45			96	69	54	24	24	8
14	0	UNL	45			104	73	56	20	28	11
17	0	UNL	45			106	73	54	18	25	13
20	9	100	40			103	71	53	19	03	10
23	6	150	15			97	70	55	24	25	9
DAY 26											
02	10	150	15			93	69	56	29	27	7
05	6	150	15			91	69	57	32	01	4
08	3	UNL	40			90	69	57	33	13	8
11	1	UNL	40			100	71	55	22	14	4
14	0	UNL	35			106	72	53	17	25	10
17	0	UNL	30			108	72	50	14	29	8
20	1	UNL	40			106	71	49	15	00	0
23	9	150	15			97	69	52	22	08	5
DAY 27											
02	10	150	15			92	69	57	31	13	8
05	9	150	15			90	69	57	33	14	10
08	2	UNL	40			93	71	59	32	14	8
11	0	UNL	40			101	71	54	21	29	5
14	0	UNL	35			106	73	54	18	30	8
17	0	UNL	35			108	72	52	16	25	9
20	8	150	1		BD	102	69	48	16	03	22
23	3	UNL	10			97	68	50	20	14	8
DAY 28											
02	9	150	12			93	68	53	26	13	11
05	2	UNL	15			90	69	57	33	33	9
08	0	UNL	25			91	70	59	34	30	5
11	0	UNL	25			98	74	62	31	16	10
14	0	UNL	30			104	74	58	22	29	11
17	0	UNL	30			106	74	58	21	27	10
20	6	UNL	20			103	73	57	22	26	9
23	3	UNL	15			97	73	62	31	25	12
DAY 29											
02	2	UNL	15			92	73	63	38	29	10
05	0	UNL	15			88	71	63	43	34	6
08	0	UNL	35			91	72	63	39	33	9
11	0	UNL	45			97	74	63	33	32	6
14	0	UNL	40			104	75	61	24	27	12
17	3	UNL	30			106	76	61	23	28	12
20	9	250	20			102	74	59	24	26	9
23	10	150	7		T	98	74	62	31	30	9
DAY 30											
02	10	170	15			93	73	63	37	33	4
05	10	160	15			91	71	60	35	20	5
08	9	150	45			91	72	63	39	28	12
11	10	140	45			94	73	62	35	31	7
14	6	140	40			102	74	60	25	24	10
17	7	250	40			103	75	61	25	28	9
20	10	250	20			99	73	60	28	34	12
23	10	140	15			92	70	59	33	27	5
DAY 31											
02	10	120	4		BD	82	70	64	55	16	19
05	6	120	7			79	70	65	62	08	12
08	10	150	45			83	70	63	51	09	6
11	10	150	45			92	70	59	33	29	7
14	9	UNL	45			101	73	59	25	24	7
17	1	UNL	40			103	72	55	20	24	6
20	9	250	20			103	73	56	21	22	8
23	10	150	7			96	73	61	31	35	15

NOTES

CEILING COLUMN—

UNL indicates an unlimited ceiling.

WEATHER COLUMN—

*	Tornado
T	Thunderstorm
Q	Squall
R	Rain
RW	Rain showers
ZR	Freezing rain
L	Drizzle
ZL	Freezing drizzle
S	Snow
SP	Snow pellets
IC	Ice crystals
SW	Snow showers
SG	Snow grains
IP	Ice pellets
A	Hail
F	Fog
IF	Ice fog
GF	Ground fog
BD	Blowing dust
BN	Blowing sand
BS	Blowing snow
BY	Blowing spray
K	Smoke
H	Haze
D	Dust

WIND COLUMNS—

Directions are those from which the wind blows, indicated in tens of degrees from true North; i. e., 09 for East, 18 for South, 27 for West. Entry of 00 in the direction column indicates calm.

Speed is expressed in knots; multiply by 1.15 to convert to miles per hour.

ADDITIONAL DATA

Other observational data contained in records on file can be furnished at cost via microfilm, microfiche, or paper copies of the original records. Inquiries as to availability and costs should be addressed to: Director, National Climatic Center, Federal Building, Asheville, North Carolina 28801.

STATION: PHOENIX ARIZONA YEAR & MONTH: 71 07

LOCAL CLIMATOLOGICAL DATA

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
ENVIRONMENTAL DATA SERVICE

A UNITED STATES DEPARTMENT OF COMMERCE PUBLICATION

PHOENIX, ARIZONA
SKY HARBOR AIRPORT
AUGUST 1971

Latitude 33° 26′ N Longitude 112° 01′ W Elevation (ground) 1117 ft. Standard time used: MOUNTAIN WBAN #23183

Date	Temperature °F Maximum	Minimum	Average	Departure from normal	Average dew point	Degree days Base 65° Heating	Cooling	Weather types on dates of occurrence (1 Fog, 2 Heavy fog x, 3 Thunderstorm, 4 Ice pellets, 5 Hail, 6 Glaze, 7 Duststorm, 8 Smoke, Haze, 9 Blowing snow)	Snow, ice pellets or ice on ground at 05AM In.	Precipitation Water equivalent In.	Snow, ice pellets In.	Avg. station pressure In. Elev. 1107 feet m.s.l.	Wind Resultant direction	Resultant speed m.p.h.	Average speed m.p.h.	Fastest mile Speed m.p.h.	Direction	Sunshine Hours and tenths	Percent of possible	Sky cover Tenths Sunrise to sunset	Midnight to midnight	Date
1	2	3	4	5	6	7A	7B	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	106	84	95	6	60	0	30		0	T	0	28.65	12	4.9	10.9	25	ESE/	10.7	77	5	6	1
2	106	81	94	5	57	0	29		0	0	0	28.68	13	1.5	10.4	28	SE/	10.8	78	2	4	2
3	105	76	91	2	62	0	26	3	0	.30	0	28.66	23	6.1	12.4	29	NE/	10.8	79	4	5	3
4	98	74	86	-3	64	0	21		0	T	0	28.74	01	1.0	7.6	24	SSE/	12.7	92	6	7	4
5	104	83	94	5	60	0	29	3	0	.07	0	28.71	18	1.9	6.8	28	NE/	11.9	87	5	7	5
6	100	73	87	-2	65	0	22	3	0	.13	0	28.71	09	5.3	9.4	30	E/	8.6	63	7	8	6
7	102	81	92	3	61	0	27		0	0	0	28.63	10	5.1	7.3	22	NE/	7.1	52	6	7	7
8	104	81	93	4	61	0	28		0	0	0	28.65	28	1.3	7.1	17	WSW/	12.3	90	4	5	8
9	104	81	93	5	62	0	28		0	T	0	28.70	18	2.8	11.8	30	SE/	11.8	87	4	6	9
10	100	74	87	-1	65	0	22	3 7	0	.11	0	28.73	13	2.9	9.1	45	NE/	8.0	59	6	7	10
11	96	74	85	-3	66	0	20		0	0	0	28.74	15	3.3	7.6	16	W/	10.5	78	4	6	11
12	99	72	86	-2	66	0	21	3 7	0	T	0	28.70	25	3.7	8.6	46	ESE/	9.1	67	6	5	12
13	96	72*	84	-4	63	0	19	3	0	T	0	28.73	27	4.6	8.2	28	S/	12.8	95	4	5	13
14	98	79	89	1	64	0	24	7	0	.07	0	28.71	27	6.4	7.8	45	NE/	12.3	92	1	2	14
15	97	74	86	-2	67	0	21	3	0	.13	0	28.73	26	3.4	5.8	37	NE/	8.9	66	4	5	15
16	103	80	92	4	65	0	27		0	0	0	28.70	26	2.3	5.5	16	W/	12.1	90	2	4	16
17	100	83	92	4	66	0	27		0	0	0	28.74	26	4.1	6.9	25	NW/	8.8	66	5	5	17
18	99	79	89	1	67	0	24	3	0	T	0	28.71	24	2.7	7.8	21	W/	12.0	90	2	5	18
19	97	78	88	0	68	0	23	3	0	.18	0	28.71	11	3.3	9.9	23	E/	6.7	51	7	8	19
20	89	75	82*	-5	70	0	17		0	T	0	28.77	12	6.5	7.2	17	SSE/	1.0	7	9	10	20
21	92	77	85	-2	70	0	20	3	0	0	0	28.77	26	2.8	9.1	20	W/	7.3	55	7	7	21
22	95	77	86	-1	67	0	21		0	0	0	28.72	28	2.1	5.9	15	W/	10.1	76	5	5	22
23	98	80	89	2	66	0	24		0	0	0	28.69	25	3.7	6.2	17	NW/	10.5	80	4	3	23
24	101	80	91	4	64	0	26		0	0	0	28.69	20	4.0	6.9	21	W/	9.3	71	4	4	24
25	102	83	93	6	63	0	28		0	0	0	28.69	13	3.6	8.3	26	NW/	8.1	62	5	5	25
26	101	77	89	2	65	0	24		0	T	0	28.71	20	2.2	6.5	29	SSE/	12.4	95	4	5	26
27	103	82	93	6	65	0	28	3	0	T	0	28.70	10	2.5	8.9	28	SE/	8.5	65	6	4	27
28	103	82	93	6	62	0	28		0	0	0	28.72	11	1.6	6.5	14	NW/	7.6	58	4	5	28
29	105	83	94	8	62	0	29		0	0	0	28.67	18	3.1	6.5	15	SW/	12.6	97	0	0	29
30	106	83	95	9	63	0	30	3 7	0	0	0	28.63	15	3.4	7.2	45	SE/	12.8	99	1	1	30
31	106*	83	95*	9	62	0	30		0	0	0	28.61	14	1.6	7.9	15	SW/	12.8	99	4	3	31
	Sum 3115	Sum 2441				Total 0	Total 773	Number of days		Total .99	Total 0	For the month: 28.70	19	1.4	8.0	46	ESE/	Total 310.9	% for month	Sum 137	Sum 159	
	Avg. 100.5	Avg. 78.7	Avg. 89.6	Dep. 2.1	Avg. 64	Dep. 0	Dep.	Precipitation ≥ .01 inch 7		Dep. -0.13						Date: 12		Possible 414.4		Avg. 4.4	Avg. 5.1	

Number of days				Season to date Total	Total
Maximum Temp.		Minimum Temp.		0	2778
≥ 90° ‡	≤ 32°	≤ 32°	≤ 0°	Dep.	Dep.
30	0	0	0	0	

Snow, ice pellets ≥ 1.0 inch 0
Thunderstorms 12
Heavy fog X 0
Clear 6 Partly cloudy 24 Cloudy 1

Greatest in 24 hours and dates — Precipitation .30 (3); Snow, ice pellets 0

Greatest depth on ground of snow, ice pellets or ice and date: 0

HOURLY PRECIPITATION (Water equivalent in inches)

Date	A. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	P. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	Date
1	T	T																							1
2																									2
3																				T	.09	.09	.07	.05	3
4	T																								4
5																								.07	5
6	.03	T	.08	T	.02	T																			6
7																									7
8																									8
9																								T	9
10	T	.01																		.09	.01	T	T		10
11																									11
12																								T	12
13	T																								13
14																								.07	14
15	.01	.01	.10	.01																					15
16																									16
17																									17
18																								T	18
19	.02	T						T	T												.13	.03			19
20															T										20
21																									21
22																									22
23																									23
24																									24
25																									25
26	T	T	T	T																					26
27																	T								27
28																									28
29																									29
30																									30
31																									31

* Extreme temperatures for the month. May be the last of more than one occurrence.
– Below zero temperature or negative departure from normal.
‡ ≥ 70° at Alaskan stations.
\+ Also on an earlier date, or dates.
X Heavy fog restricts visibility to ¼ mile or less.
T In the Hourly Precipitation table and in columns 9, 10, and 11 indicates an amount too small to measure.

The season for degree days begins with July for heating and with January for cooling.
Data in columns 6, 12, 13, 14, and 15 are based on 8 observations per day at 3-hour intervals.
Wind directions are those from which the wind blows. Resultant wind is the vector sum of wind directions and speeds divided by the number of observations. Figures for directions are tens of degrees from true North; i.e., 09 = East, 18 = South, 27 = West, 36 = North, and 00 = Calm. When directions are in tens of degrees in Col. 17, entries in Col. 16 are fastest observed 1-minute speeds. If the / appears in Col. 17, speeds are gusts.
Any errors detected will be corrected and changes in summary data will be annotated in the annual summary.

Subscription Price: Local Climatological Data $ 1.00 per year including annual summary if published. Single copy: 10 cents for monthly summary; 15 cents for annual summary. Checks or money orders should be made payable and remittances and correspondence should be sent to the Superintendent of Documents, U. S. Goverment Printing Office, Washington, D. C. 20402.

I certify that this is an official publication of the National Oceanic and Atmospheric Administration, and is compiled from records on file at the National Climatic Center, Asheville, North Carolina 28801.

William H. Haggard
Director, National Climatic Center

SUMMARY BY HOURS

Hour Local time	Averages: Sky cover Tenths	Station pressure In.	Temperature Air °F	Wet bulb °F	Dew Pt. °F	Relative humidity %	Wind speed m.p.h.	Resultant wind Direction	Speed m.p.h.
02	6	28.71	83	72	66	58	8.0	11	4.5
05	5	28.71	81	71	67	64	7.4	10	5.5
08	5	28.75	84	72	66	57	6.6	11	5.2
11	3	28.75	92	73	64	40	7.1	17	1.7
14	3	28.69	98	74	62	32	9.1	24	5.9
17	5	28.63	99	74	62	30	9.6	26	7.7
20	7	28.65	94	73	62	37	8.2	27	4.2
23	6	28.69	89	72	64	46	7.9	15	1.9

OBSERVATIONS AT 3-HOUR INTERVALS

HOUR	SKY COVER Tenths	CEILING Hnds. of ft.	VISI-BILITY WHOLE MILES	VISI-BILITY Hnds. MILE	WEATHER	TEMPERATURE AIR °F	TEMPERATURE WET BULB °F	TEMPERATURE DEW PT. °F	REL. HUM. %	WIND DIR.	WIND SPEED Knots
DAY 01											
02	10	140	15			86	70	62	45	02	7
05	8	250	5		BD	87	71	62	43	11	20
08	8	UNL	30			87	71	62	43	14	14
11	6	UNL	30			96	72	60	30	14	10
14	0	UNL	30			103	74	58	23	22	6
17	7	250	30			105	74	57	21	28	6
20	9	250	20			100	73	58	25	32	6
23	7	UNL	15			93	71	60	33	08	7
DAY 02											
02	5	UNL	2	8	BD	89	68	56	33	12	15
05	3	UNL	10			82	68	61	49	11	13
08	0	UNL	10			89	68	56	33	08	6
11	0	UNL	15			96	71	57	27	31	7
14	0	UNL	20			103	73	56	21	31	9
17	9	250	30			106	73	56	19	26	6
20	10	150	15			102	72	56	22	11	5
23	9	UNL	15			94	71	59	31	25	11
DAY 03											
02	3	UNL	15			88	69	59	38	23	8
05	5	UNL	5		BD	85	68	59	41	14	13
08	2	UNL	30			88	70	61	40	08	7
11	0	UNL	25			97	73	62	31	27	12
14	0	UNL	35			102	75	62	27	27	12
17	9	250	30			104	74	59	23	27	10
20	10	100	12		TRW	101	74	61	27	25	15
23	10	150	15		TRW	76	71	69	79	14	9
DAY 04											
02	10	140	15			75	70	68	79	10	5
05	10	250	15			74	70	68	82	08	7
08	10	UNL	30			80	72	69	69	06	5
11	4	UNL	25			89	71	61	39	13	4
14	1	UNL	30			96	74	63	34	28	9
17	7	250	40			97	72	60	29	27	8
20	6	250	15			93	71	59	32	26	7
23	10	250	15			90	71	62	39	04	8
DAY 05											
02	10	160	15			88	71	63	43	06	3
05	10	160	15			83	70	64	53	14	3
08	6	UNL	40			89	72	63	42	03	3
11	1	UNL	40			98	72	59	27	22	5
14	3	UNL	50			103	72	54	20	16	5
17	9	250	45			102	74	60	25	27	8
20	10	140	15			100	72	57	24	27	7
23	10	140	15			96	72	59	29	12	13
DAY 06											
02	10	100	15		RW	77	72	69	76	08	16
05	10	90	15		RW	78	72	70	77	08	5
08	8	120	45			81	72	68	65	07	9
11	7	250	45			90	73	65	44	08	9
14	5	UNL	30			97	72	60	29	13	6
17	10	250	25			99	73	60	28	25	8
20	10	200	15			95	74	64	36	34	6
23	5	UNL	15			90	74	67	47	14	6
DAY 07											
02	10	UNL	15			85	75	70	61	08	6
05	6	UNL	15			82	74	70	67	09	8
08	5	UNL	30			87	73	67	52	10	8
11	0	UNL	20			97	72	59	28	15	8
14	7	250	25			101	70	52	19	16	5
17	10	250	25			100	71	55	22	01	9
20	10	250	20			95	71	59	30	00	0
23	10	UNL	15			91	69	57	32	13	7
DAY 08											
02	6	250	15			85	72	66	53	10	11
05	3	UNL	15			82	71	66	58	00	0
08	7	100	20			87	71	63	45	00	0
11	7	UNL	20			96	72	59	29	07	8
14	1	UNL	20			101	73	59	25	24	8
17	1	UNL	30			103	74	58	23	30	11
20	8	UNL	15			99	72	59	27	26	7
23	10	UNL	15			96	71	57	27	27	4
DAY 09											
02	8	250	15			87	73	66	50	11	13
05	8	250	15			82	70	64	55	10	6
08	7	UNL	30			87	71	63	45	13	8
11	1	UNL	30			93	73	63	37	31	6
14	1	UNL	30			101	76	64	30	29	9
17	3	UNL	30			103	74	60	24	26	12
20	9	250	15			100	72	57	24	27	10
23	10	130	1		BD	92	72	62	37	14	18
DAY 10											
02	8	130	7			79	71	67	67	09	11
05	2	UNL	15			78	70	66	67	09	7
08	1	UNL	25			86	71	63	46	16	4
11	5	UNL	35			91	72	63	39	13	6
14	5	UNL	35			98	74	62	31	27	9
17	10	220	30			96	74	63	34	18	6
20	10	60	5		TRW	77	70	67	71	32	10
23	10	110	15			75	71	69	82	14	10
DAY 11											
02	10	140	15			78	72	70	77	11	4
05	7	UNL	15			75	72	71	87	07	7
08	4	UNL	25			78	72	70	77	08	5
11	0	UNL	20			85	73	68	57	17	5
14	0	UNL	30			93	72	62	36	26	10
17	6	UNL	35			95	72	61	32	24	6
20	10	140	15			92	73	64	40	14	10
23	6	UNL	15			88	72	65	47	14	6
DAY 12											
02	2	UNL	15			86	73	67	53	36	4
05	2	UNL	15			80	72	69	69	10	8
08	9	120	35			82	72	68	63	09	6
11	2	UNL	35			89	73	65	45	29	5
14	5	UNL	40			95	74	65	37	23	9
17	6	UNL	40			98	74	63	32	27	10
20	9	250	15			95	74	65	37	24	9
23	7	65	15			92	74	66	42	26	9
DAY 13											
02	10	60	15			81	69	62	53	22	3
05	9	200	15			77	69	64	64	33	8
08	5	UNL	45			79	69	63	58	13	7
11	1	UNL	40			86	71	63	46	25	9
14	3	UNL	40			93	73	63	37	28	11
17	4	UNL	40			95	73	62	34	26	9
20	3	UNL	15			92	72	62	37	22	4
23	3	UNL	15			88	71	63	43	35	6
DAY 14											
02	2	UNL	15			85	72	65	51	30	7
05	2	UNL	15			82	71	65	56	26	3
08	2	UNL	40			84	71	65	53	29	4
11	0	UNL	40			90	71	62	39	27	6
14	0	UNL	40			96	74	63	34	28	9
17	2	UNL	35			97	74	63	33	27	11
20	4	UNL	15			95	73	63	35	26	9
23	4	UNL	15			92	72	62	37	14	5
DAY 15											
02	10	70	7		RW	76	71	69	79	29	5
05	10	120	15			75	72	70	85	30	3
08	3	UNL	45			77	72	69	76	00	0
11	6	150	45			88	75	70	55	14	6
14	9	UNL	40			92	74	65	41	22	9
17	0	UNL	40			96	74	64	35	25	9
20	1	UNL	15			93	72	62	36	30	5
23	5	UNL	15			88	72	65	47	34	3
DAY 16											
02	5	UNL	15			84	73	68	59	16	4
05	6	UNL	15			82	73	69	65	06	5
08	7	160	20			84	74	70	63	12	4
11	0	UNL	30			96	74	63	34	25	4
14	0	UNL	30			101	75	63	29	27	6
17	0	UNL	30			103	75	61	25	28	10
20	8	140	15			99	73	60	28	26	5
23	7	250	15			94	75	66	40	00	0
DAY 17											
02	5	UNL	15			90	74	66	45	27	7
05	0	UNL	15			85	74	69	59	08	6
08	5	UNL	25			86	74	68	55	02	3
11	1	UNL	30			92	74	66	42	27	3
14	5	UNL	30			96	75	66	37	26	10
17	10	250	30			99	75	65	33	23	6
20	10	150	15			86	71	63	46	28	7
23	10	75	15			83	71	65	55	22	6
DAY 18											
02	10	150	15			83	71	65	55	17	4
05	5	UNL	15			80	73	70	72	17	6
08	2	UNL	15			82	74	70	67	12	7
11	1	UNL	15			89	74	67	48	03	4
14	2	UNL	20			96	75	65	36	34	8
17	1	UNL	30			98	75	65	34	24	12
20	9	150	15			94	75	66	40	27	8
23	10	150	15			90	74	67	47	26	5
DAY 19											
02	10	150	15		T	84	72	66	55	13	4
05	10	150	15			79	72	68	69	09	6
08	10	120	25		RW	81	73	69	67	15	5
11	9	140	25			86	74	68	55	12	7
14	6	UNL	25			94	75	67	41	26	10
17	2	UNL	30			96	76	68	40	28	11
20	10	120	7			88	71	63	43	07	16
23	10	140	15			78	73	71	79	10	10
DAY 20											
02	10	140	15			75	72	70	85	13	9
05	10	48	15			76	72	70	82	10	6
08	10	250	20			78	72	70	77	14	6
11	10	120	15			83	73	69	63	13	3
14	10	100	20			84	74	70	63	16	8
17	10	140	20			86	75	71	61	13	7
20	10	55	7			83	75	72	70	09	7
23	8	100	15			81	74	71	72	08	4
DAY 21											
02	8	90	15			78	74	72	82	10	7
05	8	90	15			77	73	71	82	09	8
08	10	42	20			80	73	70	72	15	6
11	6	120	15			85	75	71	63	28	8
14	3	UNL	20			90	74	67	47	23	7
17	7	250	20		T	91	75	68	47	28	9
20	6	UNL	15			82	74	71	69	27	12
23	7	UNL	15			81	73	70	69	33	6
DAY 22											
02	5	UNL	15			79	73	71	77	05	4
05	4	UNL	15			78	73	71	79	14	3
08	0	UNL	20			81	73	70	69	11	4
11	3	UNL	30			87	73	67	52	04	4
14	5	UNL	40			93	73	64	38	27	6
17	7	250	40			94	74	65	38	27	10
20	10	UNL	15			90	72	64	42	27	5
23	0	UNL	15			87	73	66	50	27	5
DAY 23											
02	0	UNL	15			83	73	68	61	26	5
05	0	UNL	15			81	72	68	65	33	3
08	2	UNL	20			82	73	69	65	14	3
11	1	UNL	20			90	74	67	47	09	4
14	5	UNL	20			95	74	65	37	21	7
17	7	250	20			97	74	63	33	27	7
20	6	250	15			92	73	64	40	25	8
23	0	UNL	15			90	72	64	42	28	6
DAY 24											
02	0	UNL	15			84	72	66	55	18	5
05	2	UNL	15			81	71	66	60	20	4
08	3	UNL	30			84	72	66	55	13	6
11	7	140	30			95	73	63	35	30	5
14	0	UNL	30			98	73	61	29	24	9
17	8	250	30			99	73	61	29	28	4
20	8	250	15			96	73	62	32	22	6
23	8	250	15			92	73	63	38	14	9
DAY 25											
02	10	130	15			87	73	66	50	11	8
05	3	UNL	15			84	72	66	55	10	6
08	8	130	30			86	72	65	50	10	9
11	10	160	30			96	73	62	32	07	7
14	2	UNL	25			99	73	61	29	16	10
17	1	UNL	25			101	73	59	25	35	3
20	2	UNL	15			91	72	63	39	27	5
23	4	UNL	15			86	71	63	46	23	10
DAY 26											
02	10	120	15		RW	79	72	69	72	12	14
05	6	UNL	15			77	72	69	76	06	4
08	6	UNL	25			81	72	68	65	18	4
11	5	UNL	30			92	74	65	41	26	5
14	3	UNL	40			98	73	61	29	21	6
17	0	UNL	35			99	74	62	30	28	6
20	8	250	15			96	73	62	32	26	6
23	4	UNL	15			93	73	64	38	00	0
DAY 27											
02	0	UNL	15			85	72	65	51	08	4
05	0	UNL	15			83	72	66	57	10	6
08	10	UNL	30			87	74	68	53	10	10
11	2	UNL	35			96	75	65	36	18	5
14	5	UNL	35			102	76	64	29	25	6
17	8	250	35			99	75	65	33	22	11
20	6	140	15			90	71	62	39	01	8
23	4	UNL	15			86	72	65	50	05	12
DAY 28											
02	7	140	15			84	71	64	51	05	3
05	5	UNL	15			83	69	61	48	07	8
08	5	UNL	45			83	70	63	51	21	4
11	5	UNL	35			94	72	61	33	15	6
14	2	UNL	35			101	73	59	25	08	7
17	7	UNL	30			102	74	59	24	18	7
20	8	UNL	15			96	73	61	31	33	5
23	3	UNL	15			92	73	64	40	30	5
DAY 29											
02	0	UNL	15			86	72	65	50	12	6
05	0	UNL	15			83	72	66	57	16	6
08	0	UNL	30			86	72	66	51	14	7
11	0	UNL	20			96	73	62	32	23	2
14	0	UNL	20			104	75	60	24	25	8
17	0	UNL	20			105	74	59	22	22	8
20	0	UNL	15			101	73	58	24	32	4
23	0	UNL	15			93	71	59	32	10	4
DAY 30											
02	0	UNL	15			88	72	64	45	13	7
05	0	UNL	15			84	71	64	51	09	6
08	1	UNL	20			89	72	64	44	11	7
11	0	UNL	20			100	76	64	31	14	8
14	1	UNL	12			104	75	61	24	18	5
17	2	UNL	25			106	75	60	22	27	9
20	8	UNL	15			94	72	61	33	14	3
23	0	UNL	15			95	73	62	34	26	5
DAY 31											
02	0	UNL	15			86	73	67	53	06	6
05	0	UNL	15			85	73	67	55	09	6
08	6	UNL	30			87	73	67	52	11	7
11	3	UNL	30			98	75	64	33	16	10
14	6	UNL	30			106	75	60	22	17	7
17	1	UNL	35			105	74	57	21	27	10
20	1	UNL	15			100	73	58	25	31	5
23	3	UNL	15			95	71	59	30	33	4

NOTES

CEILING COLUMN—

UNL indicates an unlimited ceiling.

WEATHER COLUMN—

*	Tornado
T	Thunderstorm
Q	Squall
R	Rain
RW	Rain showers
ZR	Freezing rain
L	Drizzle
ZL	Freezing drizzle
S	Snow
SP	Snow pellets
IC	Ice crystals
SW	Snow showers
SG	Snow grains
IP	Ice pellets
A	Hail
F	Fog
IF	Ice fog
GF	Ground fog
BD	Blowing dust
BN	Blowing sand
BS	Blowing snow
BY	Blowing spray
K	Smoke
H	Haze
D	Dust

WIND COLUMNS—

Directions are those from which the wind blows, indicated in tens of degrees from true North; i. e., 09 for East, 18 for South, 27 for West. Entry of 00 in the direction column indicates calm.

Speed is expressed in knots; multiply by 1.15 to convert to miles per hour.

ADDITIONAL DATA

Other observational data contained in records on file can be furnished at cost via microfilm, microfiche, or paper copies of the original records. Inquiries as to availability and costs should be addressed to: Director, National Climatic Center, Federal Building, Asheville, North Carolina 28801.

STATION: PHOENIX ARIZONA YEAR & MONTH: 71 08

U.S. DEPARTMENT OF COMMERCE
NATIONAL CLIMATIC CENTER
FEDERAL BUILDING
ASHEVILLE, N.C. 28801

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LOCAL CLIMATOLOGICAL DATA

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
ENVIRONMENTAL DATA SERVICE

PHOENIX, ARIZONA
SKY HARBOR AIRPORT
SEPTEMBER 1971

Latitude 33° 26′ N Longitude 112° 01′ W Elevation (ground) 1117 ft. Standard time used: MOUNTAIN WBAN #23183

Date	Temperature °F Maximum	Minimum	Average	Departure from normal	Average dew point	Degree days Base 65° Heating	Cooling	Weather types on dates of occurrence (1 Fog, 2 Heavy fog x, 3 Thunderstorm, 4 Ice pellets, 5 Hail, 6 Glaze, 7 Duststorm, 8 Smoke, Haze, 9 Blowing snow)	Snow, ice pellets or ice on ground at 05AM In.	Precipitation Water equivalent In.	Snow, ice pellets In.	Avg. station pressure In. Elev. 1107 feet m.s.l.	Wind Resultant direction	Resultant speed m.p.h.	Average speed m.p.h.	Fastest mile Speed m.p.h.	Direction	Sunshine Hours and tenths	Percent of possible	Sky cover Tenths Sunrise to sunset	Midnight to midnight	Date
1	2	3	4	5	6	7A	7B	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	105	73	89	3	64	0	24	3 7	0	.14	0	28.61	14	1.9	8.8	52	SE/	10.6	82	4	6	1
2	99	74	87	1	66	0	22		0	0	0	28.60	12	4.5	7.2	16	SE/	9.8	76	4	5	2
3	101	78	90	4	63	0	25		0	0	0	28.58	21	2.3	9.4	23	WSW/	12.2	95	2	1	3
4	99	73	86	0	52	0	21		0	0	0	28.68	06	2.0	5.6	13	S/	12.8	100	0	0	4
5	104	74	89	3	51	0	24		0	0	0	28.63	10	3.1	6.0	12	E/	12.8	100	0	0	5
6	106	76	91	5	54	0	26		0	0	0	28.60	14	5.5	7.8	20	ESE/	12.3	96	2	2	6
7	102	82	92	7	64	0	27		0	0	0	28.67	26	1.9	7.5	20	WNW/	11.3	89	4	5	7
8	106	85	96	11	62	0	31		0	0	0	28.67	26	4.6	8.3	30	E/	12.1	96	0	2	8
9	107	80	94	9	62	0	29		0	0	0	28.65	12	3.2	7.9	15	ESE/	12.6	100	1	1	9
10	110	81	96*	11	56	0	31		0	0	0	28.62	09	2.8	7.9	16	E/	12.6	100	0	0	10
11	110	79	95	10	51	0	30		0	0	0	28.63	13	3.6	7.3	15	ESE/	12.5	100	0	0	11
12	110*	78	94	10	49	0	29		0	0	0	28.65	13	6.4	6.9	17	ESE/	12.5	100	0	0	12
13	108	82	95	11	49	0	30		0	0	0	28.64	10	5.8	7.6	22	ESE/	12.2	98	1	1	13
14	109	78	94	10	48	0	29		0	T	0	28.50	18	2.6	7.1	46	N/	10.0	80	3	3	14
15	107	78	93	9	52	0	28		0	0	0	28.50	23	.8	7.9	16	SW/	12.0	96	1	1	15
16	105	75	90	7	55	0	25		0	0	0	28.58	25	2.5	7.2	16	SSW/	12.4	100	0	2	16
17	100	80	90	7	57	0	25		0	0	0	28.60	27	4.3	8.9	35	W/	11.3	91	2	2	17
18	94	72	83	0	32	0	18		0	0	0	28.71	30	4.7	9.5	20	NE/	10.9	88	5	4	18
19	91	69	80	-3	23	0	15		0	0	0	28.80	10	2.8	8.1	22	ENE/	12.3	100	0	0	19
20	93	59*	76	-6	31	0	11		0	0	0	28.72	15	4.9	8.9	18	W/	12.2	100	0	0	20
21	94	63	79	-3	39	0	14		0	0	0	28.67	11	.8	7.2	18	WNW/	12.2	100	0	0	21
22	93	65	79	-3	41	0	14		0	0	0	28.71	09	3.4	7.3	31	NNE/	10.7	88	1	1	22
23	92	63	78	-3	43	0	13		0	0	0	28.79	06	7.8	9.2	22	ENE/	12.1	100	0	0	23
24	93	70	82	1	46	0	17		0	0	0	28.76	10	4.5	7.6	22	ENE/	12.1	100	0	0	24
25	99	66	83	2	40	0	18		0	0	0	28.63	15	5.5	11.7	32	SE/	12.1	100	0	0	25
26	94	62	78	-2	40	0	13		0	0	0	28.65	16	2.1	9.2	25	SSE/	12.0	100	0	0	26
27	88	61	75	-5	44	0	10		0	0	0	28.67	07	1.4	6.5	16	NW/	12.0	100	1	1	27
28	92	62	77	-2	41	0	12		0	0	0	28.68	10	3.4	6.5	17	W/	11.5	96	3	5	28
29	81	63	72	-7	57	0	7	3	0	.69	0	28.65	03	2.5	11.7	31	WNW/	0.5	4	10	10	29
30	77	63	70*	-8	63	0	5	1	0	.09	0	28.61	13	4.2	7.6	16	W/	2.8	24	7	8	30
	Sum 2969	Sum 2164				Total 0	Total 623			Total .92	Total 0	For the month: 28.65	12	1.8	8.0	52	SE/	Total 335.4	% for month 90	Sum 51	Sum 60	
	Avg. 99.0	Avg. 72.1	Avg. 85.6	Dep. 2.8	Avg. 50	Dep. 0	Dep.			Dep. 0.19						Date: 01		Possible 371.4		Avg. 1.7	Avg. 2.0	

Number of days				Season to date Total	Total
Maximum Temp.		Minimum Temp.		0	3401
≥ 90° ‡	≤ 32°	≤ 32°	≤ 0°	Dep. 0	Dep.
27	0	0	0		

Number of days	
Precipitation ≥ .01 inch	3
Snow, ice pellets ≥ 1.0 inch	0
Thunderstorms	2
Heavy fog X	0
Clear 24	Partly cloudy 5
	Cloudy 1

Greatest in 24 hours and dates		
Precipitation	Snow, ice pellets	
.69	29	0

Greatest depth on ground of snow, ice pellets or ice and date: 0

HOURLY PRECIPITATION (Water equivalent in inches)

Date	A. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	P. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	Date
1																			T	.01	.13	T			1
2																									2
3																									3
4																									4
5																									5
6																									6
7																									7
8																									8
9																									9
10																									10
11																									11
12																									12
13																									13
14																		T	T						14
15																									15
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17																									17
18																									18
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20																									20
21																									21
22																									22
23																									23
24																									24
25																									25
26																									26
27																									27
28																									28
29	T	T	T	T	T			T	T	.09	.07	T	.30	.13	.01	T		T	.05	.04					29
30										T	T	T	T	T		.09	T								30

* Extreme temperatures for the month. May be the last of more than one occurrence.
– Below zero temperature or negative departure from normal.
‡ ≥ 70° at Alaskan stations.
\+ Also on an earlier date, or dates.
X Heavy fog restricts visibility to ¼ mile or less.
T In the Hourly Precipitation table and in columns 9, 10, and 11 indicates an amount too small to measure.

The season for degree days begins with July for heating and with January for cooling.
Data in columns 6, 12, 13, 14, and 15 are based on 8 observations per day at 3-hour intervals.
Wind directions are those from which the wind blows. Resultant wind is the vector sum of wind directions and speeds divided by the number of observations. Figures for directions are tens of degrees from true North; i.e., 09 = East, 18 = South, 27 = West, 36 = North, and 00 = Calm. When directions are in tens of degrees in Col. 17, entries in Col. 16 are fastest observed 1-minute speeds. If the / appears in Col. 17, speeds are gusts.
Any errors detected will be corrected and changes in summary data will be annotated in the annual summary.

Subscription Price: Local Climatological Data $1.00 per year including annual summary if published. Single copy: 10 cents for monthly summary; 15 cents for annual summary. Checks or money orders should be made payable and remittances and correspondence should be sent to the Superintendent of Documents, U.S. Goverment Printing Office, Washington, D.C. 20402.

I certify that this is an official publication of the National Oceanic and Atmospheric Administration, and is compiled from records on file at the National Climatic Center, Asheville, North Carolina 28801.

William H. Haggard
Director, National Climatic Center

SUMMARY BY HOURS

Hour Local time	Averages: Sky cover Tenths	Station pressure In.	Temperature Air °F	Wet bulb °F	Dew Pt. °F	Relative humidity %	Wind speed m.p.h.	Resultant wind Direction	Speed m.p.h.
02	2	28.64	79	62	51	39	7.0	10	4.7
05	2	28.66	75	62	52	47	6.9	10	5.2
08	2	28.70	79	63	51	40	8.0	09	5.9
11	2	28.70	90	66	51	29	8.8	12	5.5
14	1	28.64	96	68	48	23	8.9	24	3.0
17	2	28.59	97	67	47	21	10.1	28	5.6
20	2	28.61	90	66	49	28	7.6	22	3.1
23	3	28.64	84	64	50	34	6.9	09	2.1

OBSERVATIONS AT 3-HOUR INTERVALS

HOUR	SKY COVER Tenths	CEILING Hnds. of ft.	VISIBILITY Whole Miles	VISIBILITY 16ths Mile	WEATHER	TEMPERATURE AIR °F	TEMPERATURE WET BULB °F	TEMPERATURE DEW PT. °F	REL. HUM. %	WIND DIR.	WIND SPEED Knots
					DAY 01						
02	10	UNL	15			90	71	62	39	36	5
05	4	UNL	15			85	73	68	57	16	4
08	7	UNL	45			88	71	63	43	05	2
11	4	UNL	35			97	73	61	30	30	7
14	1	UNL	35			104	76	62	25	21	5
17	6	250	35			102	73	58	23	30	9
20	10	90	12		TRW	76	70	67	74	14	22
23	10	100	15			77	70	67	71	09	7
					DAY 04						
02	0	UNL	15			81	64	53	38	02	5
05	0	UNL	15			74	64	57	55	00	0
08	0	UNL	45			81	66	56	42	09	5
11	0	UNL	45			91	66	51	26	11	5
14	0	UNL	45			97	67	47	18	34	6
17	0	UNL	45			98	67	47	18	36	5
20	0	UNL	15			93	67	50	23	22	6
23	1	UNL	15			85	67	57	39	11	7
					DAY 07						
02	5	UNL	15			87	73	67	52	06	5
05	6	140	15			84	72	66	55	09	6
08	1	UNL	30			87	73	66	50	10	6
11	2	UNL	30			96	74	63	34	26	6
14	6	UNL	40			100	74	60	27	27	10
17	5	UNL	35			102	75	61	26	24	7
20	3	UNL	15			97	73	62	31	21	5
23	2	UNL	15			91	74	66	44	32	7
					DAY 10						
02	0	UNL	15			89	70	60	38	08	5
05	0	UNL	15			85	70	62	46	10	5
08	0	UNL	25			87	71	62	43	11	10
11	0	UNL	20			99	73	60	28	12	7
14	0	UNL	25			107	73	54	17	21	6
17	0	UNL	45			109	70	45	12	32	10
20	0	UNL	15			102	70	50	17	29	4
23	0	UNL	15			90	67	54	29	07	8
					DAY 13						
02	0	UNL	15			89	66	51	27	10	10
05	3	UNL	15			83	65	54	37	10	7
08	2	UNL	40			90	64	46	22	08	10
11	3	UNL	40			102	69	49	17	12	11
14	0	UNL	30			107	70	46	13	13	4
17	0	UNL	30			108	70	45	12	28	5
20	3	UNL	15			101	70	51	19	00	0
23	1	UNL	15			92	67	51	25	07	6
					DAY 16						
02	0	UNL	15			83	66	55	38	14	4
05	0	UNL	15			79	65	56	45	12	7
08	0	UNL	30			81	67	59	47	09	4
11	0	UNL	30			95	70	57	28	28	7
14	0	UNL	20			103	71	52	18	27	10
17	0	UNL	25			104	71	51	17	29	7
20	6	150	15			98	69	52	21	22	7
23	8	140	15			94	71	59	31	34	4
					DAY 19						
02	0	UNL	15			75	51	24	15	10	8
05	0	UNL	15			72	50	23	16	24	4
08	0	UNL	60			76	51	19	12	06	9
11	0	UNL	60			85	53	12	06	11	12
14	0	UNL	60			89	57	24	09	33	8
17	0	UNL	60			90	57	21	08	25	6
20	0	UNL	15			82	56	30	15	17	3
23	0	UNL	15			73	53	33	23	13	6
					DAY 22						
02	0	UNL	15			73	58	47	40	14	4
05	1	UNL	15			68	56	47	47	06	7
08	1	UNL	25			69	55	42	38	11	5
11	0	UNL	20			83	58	37	19	21	4
14	1	UNL	30			92	60	31	11	25	8
17	3	UNL	30			89	61	38	17	04	9
20	0	UNL	15			80	58	40	24	08	7
23	0	UNL	15			75	57	43	32	08	7
					DAY 25						
02	0	UNL	15			72	58	47	41	11	9
05	0	UNL	15			67	56	46	47	09	10
08	0	UNL	30			71	58	47	43	08	9
11	0	UNL	30			87	64	48	26	13	8
14	0	UNL	30			97	62	33	10	14	16
17	0	UNL	30			97	62	32	10	27	10
20	0	UNL	15			88	60	35	15	24	11
23	0	UNL	15			82	56	30	15	20	8
					DAY 28						
02	0	UNL	15			68	56	47	47	09	8
05	2	UNL	15			64	55	48	56	12	5
08	5	UNL	30			68	56	46	45	10	9
11	2	UNL	35			80	59	42	26	12	5
14	0	UNL	40			89	59	32	13	16	5
17	8	UNL	45			92	61	35	13	32	7
20	10	UNL	15			83	59	40	22	32	3
23	10	120	15			80	59	41	25	08	3

HOUR	SKY COVER Tenths	CEILING Hnds. of ft.	VISIBILITY Whole Miles	VISIBILITY 16ths Mile	WEATHER	TEMPERATURE AIR °F	TEMPERATURE WET BULB °F	TEMPERATURE DEW PT. °F	REL. HUM. %	WIND DIR.	WIND SPEED Knots
					DAY 02						
02	10	160	15			79	70	65	62	28	6
05	9	UNL	15			76	71	69	79	08	6
08	9	250	15			78	71	68	71	11	6
11	8	250	25			88	71	63	43	13	5
14	1	UNL	25			95	73	63	35	10	6
17	0	UNL	30			97	74	63	33	17	8
20	1	UNL	15			92	75	67	44	12	8
23	0	UNL	15			88	74	68	52	06	5
					DAY 05						
02	0	UNL	15			78	64	55	45	10	6
05	0	UNL	15			75	62	54	48	12	5
08	0	UNL	45			81	65	54	39	13	7
11	0	UNL	45			92	69	55	29	14	5
14	0	UNL	45			101	70	50	18	04	5
17	0	UNL	45			102	66	40	12	01	4
20	0	UNL	15			97	66	46	17	26	6
23	0	UNL	15			86	67	56	36	08	4
					DAY 08						
02	6	150	15			89	73	66	47	21	7
05	0	UNL	25			87	72	65	48	27	5
08	0	UNL	30			89	73	66	47	28	4
11	0	UNL	35			99	74	63	31	32	6
14	0	UNL	35			104	74	59	23	29	9
17	0	UNL	35			105	73	56	20	29	10
20	0	UNL	15			100	74	60	27	24	7
23	2	UNL	15			89	71	61	39	12	10
					DAY 11						
02	0	UNL	15			85	66	55	36	12	6
05	0	UNL	15			82	64	53	37	12	8
08	0	UNL	45			86	66	53	32	10	10
11	0	UNL	35			100	70	51	19	13	7
14	0	UNL	30			108	69	43	11	15	7
17	0	UNL	40			109	69	43	11	31	7
20	0	UNL	15			101	70	51	19	26	6
23	0	UNL	15			92	69	55	29	00	0
					DAY 14						
02	0	UNL	15			85	66	55	36	12	4
05	0	UNL	15			83	63	50	32	13	7
08	0	UNL	25			83	64	52	34	10	8
11	3	UNL	25			98	67	48	18	13	5
14	2	UNL	30			106	69	44	12	22	9
17	6	150	30			108	69	44	12	27	8
20	5	UNL	15			102	68	46	15	27	8
23	8	160	15			94	66	48	21	00	0
					DAY 17						
02	7	140	15			87	69	60	40	07	3
05	6	140	15			84	70	62	48	09	3
08	2	UNL	20			84	71	64	51	05	6
11	1	UNL	25			94	73	63	36	05	5
14	3	UNL	20			99	74	63	31	26	12
17	3	UNL	25			100	73	59	26	26	15
20	0	UNL	15			90	66	50	25	26	8
23	0	UNL	15			86	59	34	16	26	10
					DAY 20						
02	0	UNL	15			68	51	33	27	12	9
05	0	UNL	15			60	48	35	39	10	7
08	0	UNL	45			67	50	33	28	12	6
11	0	UNL	40			84	59	39	20	14	7
14	0	UNL	40			92	60	31	11	23	7
17	0	UNL	40			93	58	22	07	26	12
20	0	UNL	15			80	53	22	12	16	7
23	0	UNL	15			72	51	29	20	11	7
					DAY 23						
02	0	UNL	15			71	57	46	41	27	3
05	0	UNL	15			64	54	46	52	07	6
08	0	UNL	45			75	57	43	32	01	5
11	0	UNL	45			85	61	42	22	05	8
14	0	UNL	35			90	63	42	19	04	8
17	2	UNL	25			92	63	41	17	07	17
20	0	UNL	15			82	60	42	24	10	6
23	0	UNL	15			77	58	43	30	06	11
					DAY 26						
02	0	UNL	15			68	53	39	35	08	7
05	0	UNL	15			64	51	37	37	09	6
08	0	UNL	45			71	54	38	30	07	8
11	0	UNL	45			86	62	44	23	16	11
14	0	UNL	45			92	63	41	17	21	9
17	0	UNL	45			93	62	38	15	30	10
20	0	UNL	15			84	60	42	23	26	9
23	0	UNL	15			78	58	41	27	13	4
					DAY 29						
02	10	120	15		RW	80	60	44	28	09	8
05	8	120	15			74	64	57	55	01	8
08	9	90	20		RW	75	66	60	60	29	7
11	10	70	15		RW	69	66	64	84	08	12
14	10	20	20		RW	65	62	60	84	31	11
17	10	60	30			68	61	57	68	28	15
20	10	120	15			63	60	58	84	10	12
23	9	55	15			64	60	58	81	13	8

HOUR	SKY COVER Tenths	CEILING Hnds. of ft.	VISIBILITY Whole Miles	VISIBILITY 16ths Mile	WEATHER	TEMPERATURE AIR °F	TEMPERATURE WET BULB °F	TEMPERATURE DEW PT. °F	REL. HUM. %	WIND DIR.	WIND SPEED Knots
					DAY 03						
02	0	UNL	15			84	74	70	63	09	8
05	0	UNL	15			81	71	66	60	08	7
08	0	UNL	30			84	72	66	55	13	7
11	0	UNL	30			91	74	67	45	15	9
14	5	UNL	30			98	75	64	33	27	7
17	1	UNL	35			99	73	60	28	28	9
20	0	UNL	15			94	70	56	28	27	9
23	0	UNL	15			88	66	52	29	24	9
					DAY 06						
02	0	UNL	15			80	62	52	38	09	5
05	1	UNL	15			77	63	54	45	10	5
08	4	UNL	30			85	65	52	32	14	6
11	0	UNL	25			96	69	54	24	16	5
14	1	UNL	25			104	72	53	18	16	13
17	0	UNL	30			105	73	55	19	14	8
20	3	UNL	15			100	71	55	22	28	6
23	8	UNL	15			92	69	57	31	11	6
					DAY 09						
02	0	UNL	15			85	71	64	49	12	10
05	0	UNL	15			81	70	65	58	10	8
08	0	UNL	20			85	71	64	49	09	5
11	0	UNL	20			96	73	62	32	10	7
14	0	UNL	25			104	74	59	23	30	4
17	4	UNL	30			106	74	57	20	27	8
20	0	UNL	15			101	73	59	25	22	6
23	0	UNL	15			92	72	62	37	09	7
					DAY 12						
02	0	UNL	15			86	64	50	29	16	5
05	0	UNL	15			80	63	52	38	10	11
08	0	UNL	40			86	64	50	29	12	6
11	0	UNL	45			104	70	48	15	12	12
14	0	UNL	25			108	72	50	14	14	7
17	0	UNL	40			109	70	45	12	16	7
20	0	UNL	15			100	69	49	18	00	0
23	0	UNL	15			93	67	51	24	00	0
					DAY 15						
02	0	UNL	15			84	64	50	31	07	3
05	0	UNL	15			79	63	53	41	07	4
08	6	140	25			85	64	50	30	09	9
11	2	UNL	30			97	70	54	24	13	7
14	0	UNL	20			105	70	49	15	28	9
17	0	UNL	30			107	71	50	15	24	10
20	0	UNL	15			99	69	51	20	24	7
23	0	UNL	15			93	69	55	28	34	6
					DAY 18						
02	0	UNL	15			80	55	30	16	24	5
05	0	UNL	15			73	54	35	25	25	5
08	3	UNL	35			76	55	35	23	27	6
11	7	140	40			88	60	35	15	04	13
14	7	140	40			92	62	37	14	07	7
17	1	UNL	35			93	60	31	11	29	12
20	8	140	15			87	57	26	11	27	8
23	8	140	15			81	55	29	15	29	10
					DAY 21						
02	0	UNL	15			68	49	26	21	07	6
05	0	UNL	15			64	47	27	25	10	10
08	0	UNL	45			69	51	32	25	10	7
11	0	UNL	45			86	59	37	18	17	7
14	0	UNL	35			92	64	44	19	27	7
17	0	UNL	35			93	65	46	20	29	9
20	0	UNL	15			86	64	49	28	32	4
23	3	UNL	15			81	61	47	30	00	0
					DAY 24						
02	0	UNL	15			74	57	44	34	14	6
05	0	UNL	15			72	58	47	41	12	4
08	0	UNL	45			77	60	48	36	06	13
11	0	UNL	45			85	62	46	26	10	11
14	0	UNL	45			90	64	45	21	24	4
17	0	UNL	40			91	63	42	18	18	5
20	0	UNL	15			85	63	47	27	32	3
23	0	UNL	15			75	58	45	34	08	7
					DAY 27						
02	0	UNL	15			68	54	42	39	09	7
05	0	UNL	15			64	52	41	43	09	5
08	0	UNL	45			68	54	42	39	13	7
11	0	UNL	35			86	62	43	22	13	7
14	0	UNL	40			88	63	46	23	31	6
17	0	UNL	40			87	63	47	25	31	10
20	0	UNL	15			82	62	47	29	33	3
23	1	UNL	15			76	60	47	36	00	0
					DAY 30						
02	10	55	15			64	61	59	84	08	5
05	10	50	15			64	62	60	87	10	4
08	9	50	30			65	62	60	84	11	6
11	10	23	4		RWF	67	64	63	87	12	8
14	4	UNL	25			73	68	65	76	14	8
17	8	40	30			75	70	67	76	09	4
20	9	42	15			73	70	68	84	12	6
23	4	UNL	15			73	65	60	64	26	12

NOTES

CEILING COLUMN—

UNL indicates an unlimited ceiling.

WEATHER COLUMN—

*	Tornado
T	Thunderstorm
Q	Squall
R	Rain
RW	Rain showers
ZR	Freezing rain
L	Drizzle
ZL	Freezing drizzle
S	Snow
SP	Snow pellets
IC	Ice crystals
SW	Snow showers
SG	Snow grains
IP	Ice pellets
A	Hail
F	Fog
IF	Ice fog
GF	Ground fog
BD	Blowing dust
BN	Blowing sand
BS	Blowing snow
BY	Blowing spray
K	Smoke
H	Haze
D	Dust

WIND COLUMNS—

Directions are those from which the wind blows, indicated in tens of degrees from true North; i. e., 09 for East, 18 for South, 27 for West. Entry of 00 in the direction column indicates calm.

Speed is expressed in knots; multiply by 1.15 to convert to miles per hour.

ADDITIONAL DATA

Other observational data contained in records on file can be furnished at cost via microfilm, microfiche, or paper copies of the original records. Inquiries as to availability and costs should be addressed to: Director, National Climatic Center, Federal Building, Asheville, North Carolina 28801.

STATION: PHOENIX ARIZONA YEAR & MONTH: 71 09

U.S. DEPARTMENT OF COMMERCE
NATIONAL CLIMATIC CENTER
FEDERAL BUILDING
ASHEVILLE, N.C. 28801

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LOCAL CLIMATOLOGICAL DATA

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
ENVIRONMENTAL DATA SERVICE

A UNITED STATES DEPARTMENT OF COMMERCE PUBLICATION

PHOENIX, ARIZONA
SKY HARBOR AIRPORT
OCTOBER 1971

Latitude 33° 26′ N Longitude 112° 01′ W Elevation (ground) 1117 ft. Standard time used: MOUNTAIN WBAN #23183

Date	Temperature °F Maximum	Minimum	Average	Departure from normal	Average dew point	Degree days Base 65° Heating	Cooling	Weather types on dates of occurrence (1 Fog, 2 Heavy fog x, 3 Thunderstorm, 4 Ice pellets, 5 Hail, 6 Glaze, 7 Duststorm, 8 Smoke, Haze, 9 Blowing snow)	Snow, ice pellets or ice on ground at 05AM In.	Precipitation Water equivalent In.	Snow, ice pellets In.	Avg. station pressure In. Elev. 1107 feet m.s.l.	Wind Resultant direction	Resultant speed m.p.h.	Average speed m.p.h.	Fastest mile Speed m.p.h.	Direction	Sunshine Hours and tenths	Percent of possible	Sky cover Tenths Sunrise to sunset	Midnight to midnight	Date
1	2	3	4	5	6	7A	7B	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	79	60	70	-8	36	0	5		0	0	0	28.75	28	4.5	6.0	13	W/	10.0	84	1	2	1
2	80	53	67	-10	40	0	2		0	0	0	28.81	22	1.7	4.3	12	SSE/	11.8	100	0	0	2
3	85	55	70	-7	41	0	5		0	0	0	28.76	23	2.2	4.6	13	W/	11.8	100	0	0	3
4	92	59	76	0	46	0	11	3	0	T	0	28.74	08	2.6	6.3	21	ENE/	10.7	91	2	3	4
5	91	71	81	5	49	0	16		0	0	0	28.83	08	8.9	10.9	35	ENE/	10.5	90	4	3	5
6	91	75	83*	7	46	0	18		0	0	0	28.82	08	11.6	13.4	30	SE/	9.4	80	5	5	6
7	91	72	82	7	48	0	17		0	0	0	28.74	09	5.0	8.8	26	SSE/	11.0	94	6	7	7
8	91	66	79	4	49	0	14		0	0	0	28.76	14	3.0	5.9	16	SE/	10.7	92	1	2	8
9	94	69	82	8	48	0	17		0	0	0	28.82	11	4.7	6.3	17	SE/	11.6	100	0	0	9
10	94	70	82	8	45	0	17		0	0	0	28.82	10	8.8	10.9	29	E/	9.6	83	4	4	10
11	92	66	79	6	47	0	14		0	0	0	28.74	12	4.9	6.0	16	SSE/	9.2	80	7	6	11
12	93	65	79	6	49	0	14		0	0	0	28.71	12	3.0	6.9	13	W/	11.5	100	1	1	12
13	95*	64	80	8	49	0	15		0	0	0	28.73	11	6.4	7.9	15	ESE/	11.4	100	0	0	13
14	94	64	79	7	48	0	14		0	0	0	28.63	12	2.9	7.2	13	ESE/	11.4	100	0	0	14
15	92	65	79	8	45	0	14		0	0	0	28.54	19	7.7	12.4	33	WSW/	10.1	88	2	1	15
16	77	57	67	-4	50	0	2		0	.07	0	28.56	23	6.3	13.2	33	SSE/	0.9	8	10	9	16
17	65	53	59	-11	46	6	0		0	.14	0	28.65	14	1.9	8.3	18	S/	3.1	27	9	9	17
18	65	47	56	-14	43	9	0		0	T	0	28.84	02	1.1	8.1	22	SW/	4.5	40	8	6	18
19	73	44	59	-10	38	6	0		0	0	0	28.97	01	.9	2.7	13	N/	11.2	100	0	0	19
20	82	53	68	-1	38	0	3		0	0	0	28.84	08	3.4	3.9	21	E/	10.5	93	1	1	20
21	85	55	70	1	42	0	5		0	0	0	28.89	18	1.7	5.8	13	ESE/	10.7	96	4	3	21
22	86	55	71	3	41	0	6		0	0	0	28.88	11	2.5	5.5	15	ENE/	11.2	100	0	0	22
23	83	55	69	1	43	0	4		0	0	0	28.65	13	2.0	5.3	14	ESE/	1.7	15	9	7	23
24	81	59	70	3	45	0	5		0	T	0	28.54	16	10.4	12.5	39	S/	1.5	14	8	8	24
25	68	54	61	-6	44	4	0		0	.06	0	28.68	19	2.9	9.1	18	S/	7.5	67	4	6	25
26	67	48	58	-8	40	7	0		0	0	0	28.84	11	5.5	6.6	12	SE/	8.5	77	3	2	26
27	74	45	60	-6	40	5	0		0	0	0	28.73	11	11.2	11.8	20	ESE/	11.0	100	0	0	27
28	81	52	67	2	38	0	2		0	0	0	28.56	21	4.7	18.0	32	SW/	9.0	82	2	3	28
29	57	40	49*	-16	21	16	0		0	T	0	28.87	26	15.5	16.4	35	W/	10.7	98	0	2	29
30	65	34*	50	-15	19	15	0		0	0	0	28.96	08	2.4	11.1	18	NNE/	10.9	100	0	0	30
31	69	38	54	-10	23	11	0		0	0	0	28.81	07	3.2	11.8	20	W/	10.9	100	0	0	31
	Sum 2532	Sum 1763				Total 79	Total 220			Total .27	Total 0	For the month: 28.76	13	2.5	8.6	39	S/	Total 284.5	% for month	Sum 91	Sum 90	
	Avg. 81.7	Avg. 56.9	Avg. 69.3	Dep. -1.4	Avg. 42	Dep. 57	Dep.			Dep. -0.19						Date: 24		Possible 351.8	81	Avg. 2.9	Avg. 2.9	

Number of days				Season to date	
Maximum Temp.		Minimum Temp.		Total	Total
≥ 90° ‡	≤ 32°	≤ 32°	≤ 0°	79	3621
12	0	0	0	Dep. 57	Dep.

Number of days Precipitation ≥ .01 inch	3
Snow, ice pellets ≥ 1.0 inch	0
Thunderstorms	1
Heavy fog X	0
Clear 19 Partly cloudy 7 Cloudy 5	

Greatest in 24 hours and dates		
Precipitation		Snow, ice pellets
.21	16-17	0

Greatest depth on ground of snow, ice pellets or ice and date
0

HOURLY PRECIPITATION (Water equivalent in inches)

Date	A. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	P. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	Date
1																									1
2																									2
3																									3
4																				T					4
5																									5
6																									6
7																									7
8																									8
9																									9
10																									10
11																									11
12																									12
13																									13
14																									14
15																									15
16											T		T		.03	T	T	T	T	T		T	.01	.03	16
17	.03	.06	.04	.01			T					T	T	T						T	T		T	T	17
18		T																T							18
19																									19
20																									20
21																									21
22																									22
23																									23
24											T							T							24
25		.01	T	.02	.01	.02	T	T																	25
26																									26
27																									27
28																									28
29	T	T																							29
30																									30
31																									31

* Extreme temperatures for the month. May be the last of more than one occurrence.
– Below zero temperature or negative departure from normal.
‡ ≥ 70° at Alaskan stations.
\+ Also on an earlier date, or dates.
X Heavy fog restricts visibility to ¼ mile or less.
T In the Hourly Precipitation table and in columns 9, 10, and 11 indicates an amount too small to measure.

The season for degree days begins with July for heating and with January for cooling.
Data in columns 6, 12, 13, 14, and 15 are based on 8 observations per day at 3-hour intervals.
Wind directions are those from which the wind blows. Resultant wind is the vector sum of wind directions and speeds divided by the number of observations. Figures for directions are tens of degrees from true North; i.e., 09 = East, 18 = South, 27 = West, 36 = North, and 00 = Calm. When directions are in tens of degrees in Col. 17, entries in Col. 16 are fastest observed 1-minute speeds. If the / appears in Col. 17, speeds are gusts.
Any errors detected will be corrected and changes in summary data will be annotated in the annual summary.

Subscription Price: Local Climatological Data $1.00 per year including annual summary if published. Single copy: 10 cents for monthly summary; 15 cents for annual summary. Checks or money orders should be made payable and remittances and correspondence should be sent to the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

I certify that this is an official publication of the National Oceanic and Atmospheric Administration, and is compiled from records on file at the National Climatic Center, Asheville, North Carolina 28801.

William H. Haggard
Director, National Climatic Center

SUMMARY BY HOURS

Hour Local time	Averages: Sky cover Tenths	Station pressure In.	Temperature Air °F	Wet bulb °F	Dew Pt. °F	Relative humidity %	Wind speed m.p.h.	Resultant wind Direction	Speed m.p.h.
02	3	28.76	62	53	45	56	7.1	11	3.8
05	3	28.76	60	52	45	59	8.5	11	5.0
08	4	28.80	63	53	45	54	8.5	11	4.9
11	3	28.80	74	56	41	33	10.4	10	4.1
14	3	28.74	80	57	38	24	10.3	19	3.7
17	3	28.71	79	57	37	25	10.4	24	3.4
20	3	28.74	72	55	41	34	6.7	14	1.0
23	3	28.76	66	54	43	44	7.3	14	2.3

OBSERVATIONS AT 3-HOUR INTERVALS

HOUR	SKY COVER Tenths	CEILING Hnds. of ft.	VISIBILITY WHOLE MILES	VISIBILITY 16ths MILE	WEATHER	TEMPERATURE AIR °F	TEMPERATURE WET BULB °F	TEMPERATURE DEW PT. °F	REL. HUM. %	WIND DIR.	WIND SPEED Knots
DAY 01											
02	4	UNL	15			66	54	43	43	20	2
05	9	85	15			64	52	41	43	32	4
08	3	UNL	15			62	51	41	46	29	8
11	0	UNL	12			70	55	42	36	21	6
14	0	UNL	12			76	55	34	22	28	7
17	0	UNL	25			78	51	18	10	35	6
20	0	UNL	15			73	54	35	25	26	5
23	0	UNL	15			67	51	35	31	27	4
DAY 02											
02	0	UNL	15			60	51	43	54	06	2
05	0	UNL	15			56	51	46	69	14	4
08	0	UNL	25			57	51	46	67	09	2
11	0	UNL	15			71	55	42	35	24	6
14	0	UNL	30			78	54	30	17	24	4
17	0	UNL	30			79	55	31	17	26	5
20	0	UNL	15			72	55	40	31	20	4
23	0	UNL	15			68	54	42	39	02	3
DAY 03											
02	0	UNL	15			60	53	47	62	12	4
05	0	UNL	15			58	53	48	70	19	3
08	0	UNL	60			62	53	44	52	00	0
11	0	UNL	45			76	55	36	23	35	4
14	0	UNL	60			84	58	34	17	27	5
17	0	UNL	60			84	58	35	17	23	8
20	0	UNL	15			77	57	39	26	28	4
23	0	UNL	15			71	56	44	38	17	4
DAY 04											
02	0	UNL	15			65	56	48	54	22	5
05	0	UNL	15			65	53	43	45	23	4
08	0	UNL	40			66	56	48	52	00	0
11	0	UNL	45			86	60	39	19	06	12
14	1	UNL	45			91	63	41	17	13	6
17	9	UNL	40			91	64	45	20	10	8
20	10	120	12		T	80	62	49	34	36	5
23	10	UNL	15			76	62	53	45	02	4
DAY 05											
02	0	UNL	15			72	61	53	51	00	0
05	0	UNL	15			74	59	48	40	07	10
08	0	UNL	40			78	61	48	35	06	17
11	0	UNL	40			86	64	48	27	05	14
14	1	UNL	40			90	64	47	23	15	11
17	7	250	40			88	64	48	25	13	11
20	6	UNL	15			82	62	47	29	08	6
23	7	UNL	15			79	62	49	35	07	7
DAY 06											
02	6	UNL	15			81	61	46	29	06	15
05	1	UNL	15			79	61	48	34	06	12
08	7	UNL	30			79	61	47	32	05	12
11	7	250	30			86	63	46	25	06	12
14	4	UNL	30			90	64	45	21	13	16
17	3	UNL	35			90	64	45	21	11	11
20	6	250	15			82	61	45	27	08	8
23	9	UNL	15			77	60	47	35	11	7
DAY 07											
02	7	250	15			73	59	48	41	08	7
05	5	UNL	15			77	60	48	36	07	12
08	7	UNL	40			77	61	49	37	08	10
11	8	250	40			84	63	48	29	07	9
14	6	250	40			89	64	47	23	10	4
17	3	UNL	40			90	64	47	23	31	5
20	6	250	15			85	64	50	30	27	4
23	10	250	15			77	61	49	37	17	10
DAY 08											
02	7	UNL	15			71	59	51	49	08	5
05	3	UNL	15			69	59	51	53	21	6
08	6	250	40			73	60	50	44	05	6
11	0	UNL	40			83	63	48	30	09	5
14	0	UNL	40			89	64	46	23	14	4
17	0	UNL	35			90	64	46	22	22	7
20	0	UNL	15			83	63	48	30	16	4
23	0	UNL	15			76	62	52	43	14	4
DAY 09											
02	0	UNL	15			73	60	51	46	10	5
05	0	UNL	15			70	59	51	51	12	6
08	0	UNL	40			74	61	51	45	11	7
11	0	UNL	45			88	63	46	23	10	7
14	0	UNL	45			93	64	44	18	13	7
17	0	UNL	45			93	64	42	17	19	5
20	0	UNL	15			84	64	50	31	36	5
23	0	UNL	15			78	62	50	38	10	2
DAY 10											
02	0	UNL	15			72	59	50	46	09	3
05	0	UNL	15			70	57	46	42	11	5
08	0	UNL	40			81	62	48	32	07	14
11	1	UNL	45			90	64	46	22	06	17
14	8	250	45			93	64	42	17	12	16
17	9	250	45			91	61	37	15	17	10
20	9	250	15			85	61	43	23	12	6
23	2	UNL	15			75	59	46	36	06	5
DAY 11											
02	8	150	15			70	57	47	44	08	3
05	4	UNL	15			70	58	49	47	00	0
08	8	UNL	45			70	57	47	44	09	7
11	8	UNL	30			87	64	49	27	15	7
14	7	140	35			89	64	46	23	15	8
17	5	UNL	35			90	63	44	20	14	5
20	4	UNL	15			82	61	46	28	16	5
23	4	UNL	15			74	60	50	43	07	7
DAY 12											
02	0	UNL	15			69	59	52	55	12	9
05	0	UNL	15			66	57	51	59	11	7
08	1	UNL	30			70	59	51	51	11	7
11	0	UNL	25			83	63	50	32	14	6
14	0	UNL	20			90	64	47	23	29	5
17	0	UNL	25			92	64	44	19	28	8
20	6	UNL	15			83	63	48	30	00	0
23	4	UNL	15			75	61	52	45	09	6
DAY 13											
02	0	UNL	15			71	60	52	51	11	8
05	0	UNL	15			66	57	51	59	11	9
08	0	UNL	25			68	58	51	55	11	8
11	0	UNL	10			81	63	51	35	12	9
14	0	UNL	10			91	65	47	22	11	4
17	0	UNL	15			94	64	43	17	27	5
20	0	UNL	15			84	64	50	31	09	5
23	0	UNL	15			74	59	48	40	10	7
DAY 14											
02	0	UNL	15			68	58	50	53	09	6
05	0	UNL	15			65	56	49	56	10	7
08	0	UNL	15			68	58	50	53	12	8
11	0	UNL	12			82	63	49	32	11	8
14	0	UNL	20			92	64	43	18	23	6
17	0	UNL	25			93	65	45	19	28	8
20	0	UNL	15			84	63	48	29	20	3
23	0	UNL	15			76	61	50	40	05	4
DAY 15											
02	0	UNL	15			69	57	48	47	09	7
05	0	UNL	15			65	56	48	54	09	7
08	0	UNL	40			72	59	50	46	15	10
11	0	UNL	20			85	64	51	31	17	8
14	0	UNL	35			91	62	39	16	25	13
17	0	UNL	20			91	62	38	15	23	18
20	0	UNL	15			81	59	41	24	17	12
23	2	UNL	15			77	58	42	29	22	11
DAY 16											
02	4	UNL	15			74	61	52	46	19	10
05	9	80	15			71	61	54	55	18	18
08	10	50	25			71	60	53	53	17	14
11	10	40	15			68	57	48	49	27	13
14	10	47	15			65	54	45	49	32	18
17	10	55	30		RW	57	53	49	75	30	9
20	10	50	15			57	52	47	69	10	3
23	10	45	15		RW	57	52	48	72	21	7
DAY 17											
02	10	60	7		RW	54	52	51	90	34	7
05	10	39	15			53	49	46	77	32	5
08	10	90	50			53	49	46	77	18	4
11	10	75	50			59	52	45	60	16	11
14	10	43	45			62	53	44	52	15	8
17	5	UNL	50			62	53	45	54	04	7
20	6	80	15			57	53	50	78	12	10
23	7	80	15		RW	56	48	41	57	28	6
DAY 18											
02	7	65	15			51	49	48	90	11	8
05	8	110	15			51	49	47	86	13	6
08	10	250	50			53	50	47	80	10	2
11	8	50	30			61	52	44	54	14	6
14	9	50	35			65	50	35	33	27	10
17	9	80	35			59	49	39	48	01	13
20	1	UNL	15			53	47	41	64	33	6
23	0	UNL	15			50	47	44	80	28	5
DAY 19											
02	0	UNL	15			49	46	44	83	00	0
05	0	UNL	15			47	45	43	86	00	0
08	0	UNL	45			50	46	43	77	00	0
11	0	UNL	45			62	49	36	38	06	4
14	0	UNL	45			70	51	31	24	36	3
17	0	UNL	45			72	52	32	23	32	5
20	0	UNL	15			65	50	34	32	26	3
23	0	UNL	15			56	48	40	55	12	4
DAY 20											
02	0	UNL	15			58	49	39	49	00	0
05	0	UNL	15			55	48	40	57	00	0
08	0	UNL	25			59	49	40	50	18	2
11	0	UNL	35			75	55	35	23	06	11
14	0	UNL	40			80	56	34	19	10	5
17	2	UNL	45			81	57	34	18	09	6
20	5	UNL	15			71	55	40	33	09	3
23	0	UNL	15			66	53	42	42	00	0
DAY 21											
02	2	UNL	15			59	51	43	56	14	4
05	2	UNL	15			58	50	43	58	13	8
08	10	UNL	20			62	53	45	54	12	5
11	7	UNL	30			77	57	40	27	28	3
14	0	UNL	20			83	59	38	20	28	5
17	0	UNL	25			83	58	37	19	26	7
20	0	UNL	15			73	57	43	34	23	3
23	0	UNL	15			63	54	46	54	08	5
DAY 22											
02	0	UNL	15			60	53	46	60	17	4
05	0	UNL	15			55	51	47	75	13	5
08	0	UNL	25			60	53	48	65	13	4
11	0	UNL	45			79	56	35	20	08	10
14	0	UNL	50			85	58	34	16	01	5
17	0	UNL	60			85	58	32	15	29	5
20	0	UNL	15			74	56	40	29	00	0
23	0	UNL	15			64	53	43	47	14	5
DAY 23											
02	0	UNL	15			59	51	44	58	07	3
05	2	UNL	15			59	51	44	58	11	8
08	8	150	25			62	53	44	52	00	0
11	10	UNL	25			78	58	42	28	14	6
14	10	120	25			81	58	39	22	22	7
17	10	120	20			80	59	41	25	02	3
20	10	160	15			73	58	45	37	13	5
23	10	130	15			73	58	45	37	30	5
DAY 24											
02	10	180	15			72	57	45	38	14	5
05	10	110	15			67	55	45	45	12	5
08	10	110	30			70	57	46	42	15	10
11	10	100	20			75	58	45	34	17	16
14	8	65	15			78	60	47	34	17	18
17	5	UNL	12			72	58	48	43	17	18
20	2	UNL	15			67	52	37	33	27	6
23	4	UNL	15			60	52	45	58	10	9
DAY 25											
02	10	65	15			60	55	52	75	24	7
05	10	48	10		RW	59	56	53	81	10	10
08	9	8	20			59	56	54	84	13	10
11	4	UNL	20			61	53	47	60	32	6
14	2	UNL	30			67	51	36	32	24	11
17	5	UNL	45			65	49	30	27	26	10
20	8	75	15			61	49	37	41	13	4
23	0	UNL	15			57	50	43	60	12	5
DAY 26											
02	0	UNL	15			53	49	45	74	14	3
05	6	100	15			50	46	43	77	13	10
08	8	75	45			50	46	42	74	12	8
11	0	UNL	40			58	49	39	49	07	4
14	1	UNL	30			65	51	36	34	33	3
17	0	UNL	35			66	51	35	32	12	7
20	0	UNL	15			59	49	38	46	09	5
23	0	UNL	15			54	48	41	62	12	6
DAY 27											
02	0	UNL	15			50	46	41	71	12	7
05	0	UNL	15			48	45	41	77	14	6
08	0	UNL	35			52	47	42	69	08	7
11	0	UNL	25			66	52	39	37	08	8
14	0	UNL	25			72	54	38	29	13	16
17	0	UNL	35			73	54	36	26	12	12
20	0	UNL	15			64	52	40	42	10	12
23	0	UNL	15			59	50	42	54	12	14
DAY 28											
02	0	UNL	15			54	48	41	62	08	15
05	0	UNL	15			52	47	41	66	08	14
08	0	UNL	45			56	48	40	55	10	13
11	1	UNL	45			72	53	34	25	17	16
14	4	UNL	45			80	58	40	24	23	17
17	2	UNL	20			72	56	43	35	27	20
20	6	65	15			64	49	33	32	27	13
23	10	50	12			59	45	29	32	26	17
DAY 29											
02	10	55	15			49	42	34	56	27	17
05	3	UNL	15			47	40	32	56	27	17
08	0	UNL	40			47	39	28	48	26	12
11	0	UNL	50			52	41	26	37	28	16
14	0	UNL	50			57	40	10	15	23	15
17	0	UNL	50			54	38	09	16	27	15
20	0	UNL	15			50	36	12	22	26	12
23	0	UNL	15			44	34	16	32	22	10
DAY 30											
02	0	UNL	15			39	32	18	43	13	10
05	0	UNL	15			34	29	21	59	09	10
08	0	UNL	45			40	34	24	53	28	10
11	0	UNL	50			55	40	15	20	02	10
14	0	UNL	60			63	44	15	15	09	9
17	0	UNL	60			64	44	15	15	24	9
20	0	UNL	15			57	42	20	24	34	10
23	0	UNL	15			52	40	24	34	13	9
DAY 31											
02	0	UNL	15			42	35	25	51	10	11
05	0	UNL	15			39	35	28	65	08	12
08	0	UNL	35			40	35	28	62	10	11
11	0	UNL	30			58	43	23	26	07	9
14	0	UNL	25			66	47	22	19	28	11
17	0	UNL	35			68	47	18	15	27	14
20	0	UNL	15			56	41	20	25	08	9
23	0	UNL	15			57	42	21	25	29	5

NOTES

CEILING COLUMN—

UNL indicates an unlimited ceiling.

WEATHER COLUMN—

*	Tornado
T	Thunderstorm
Q	Squall
R	Rain
RW	Rain showers
ZR	Freezing rain
L	Drizzle
ZL	Freezing drizzle
S	Snow
SP	Snow pellets
IC	Ice crystals
SW	Snow showers
SG	Snow grains
IP	Ice pellets
A	Hail
F	Fog
IF	Ice fog
GF	Ground fog
BD	Blowing dust
BN	Blowing sand
BS	Blowing snow
BY	Blowing spray
K	Smoke
H	Haze
D	Dust

WIND COLUMNS—

Directions are those from which the wind blows, indicated in tens of degrees from true North; i. e., 09 for East, 18 for South, 27 for West. Entry of 00 in the direction column indicates calm.

Speed is expressed in knots; multiply by 1.15 to convert to miles per hour.

ADDITIONAL DATA

Other observational data contained in records on file can be furnished at cost via microfilm, microfiche, or paper copies of the original records. Inquiries as to availability and costs should be addressed to: Director, National Climatic Center, Federal Building, Asheville, North Carolina 28801.

STATION: PHOENIX ARIZONA YEAR & MONTH: 71 10

U.S. DEPARTMENT OF COMMERCE
NATIONAL CLIMATIC CENTER
FEDERAL BUILDING
ASHEVILLE, N.C. 28801

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LOCAL CLIMATOLOGICAL DATA

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
ENVIRONMENTAL DATA SERVICE

A UNITED STATES DEPARTMENT OF COMMERCE PUBLICATION

PHOENIX, ARIZONA
SKY HARBOR AIRPORT
NOVEMBER 1971

Latitude 33° 26′ N Longitude 112° 01′ W Elevation (ground) 1117 ft. Standard time used: MOUNTAIN WBAN #23183

Date	Temperature °F Maximum	Minimum	Average	Departure from normal	Average dew point	Degree days Base 65° Heating	Cooling	Weather types on dates of occurrence (1 Fog, 2 Heavy fog x, 3 Thunderstorm, 4 Ice pellets, 5 Hail, 6 Glaze, 7 Duststorm, 8 Smoke, Haze, 9 Blowing snow)	Snow, ice pellets or ice on ground at 05AM In.	Precipitation Water equivalent In.	Snow, ice pellets In.	Avg. station pressure In. Elev. 1107 feet m.s.l.	Wind Resultant direction	Resultant speed m.p.h.	Average speed m.p.h.	Fastest mile Speed m.p.h.	Direction	Sunshine Hours and tenths	Percent of possible	Sky cover Tenths Sunrise to sunset	Midnight to midnight	Date
1	2	3	4	5	6	7A	7B	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	72	37	55	-9	23	10	0		0	0	0	28.93	20	.6	3.5	12	W/	10.9	100	0	0	1
2	77	40	59	-4	28	6	0		0	0	0	28.96	05	.8	5.0	10	WNW/	10.8	100	0	0	2
3	84	44	64	2	29	1	0		0	0	0	28.96	09	2.6	5.2	16	E/	10.8	100	0	0	3
4	87	49	68	6	33	0	3		0	0	0	28.84	12	.7	3.3	12	NE/	9.5	88	7	5	4
5	80	53	67	5	40	0	2		0	0	0	28.75	13	3.9	4.8	13	ESE/	2.4	23	10	9	5
6	86	57	72*	11	39	0	7		0	0	0	28.81	08	2.3	3.5	13	SE/	9.1	85	4	4	6
7	82	52	67	6	39	0	2		0	0	0	28.83	12	3.0	5.2	13	E/	10.7	100	0	0	7
8	80	48	64	3	38	1	0		0	0	0	28.88	12	4.7	5.5	12	E/	10.0	94	5	4	8
9	85	51	68	8	35	0	3		0	0	0	28.94	10	4.4	5.9	13	E/	9.8	92	2	2	9
10	87	52	70	10	34	0	5		0	0	0	28.93	10	2.6	3.9	17	NE/	10.2	96	8	5	10
11	88*	53	71	12	38	0	6		0	0	0	28.86	12	4.6	5.9	13	SE/	7.9	74	9	7	11
12	78	56	67	8	42	0	2		0	0	0	28.78	19	.7	6.8	17	W/	0.8	8	10	7	12
13	73	49	61	2	35	4	0		0	0	0	28.79	35	.9	4.8	15	W/	10.5	100	0	0	13
14	72	44	58	0	33	7	0		0	T	0	28.67	08	2.2	7.6	14	N/	8.9	85	2	4	14
15	66	50	58	0	30	7	0		0	0	0	28.63	18	2.9	8.6	23	SE/	2.4	23	7	7	15
16	62	47	55	-3	37	10	0		0	T	0	28.76	11	4.6	7.3	14	ESE/	2.9	28	9	7	16
17	61	39	50	-8	35	15	0		0	0	0	28.86	15	3.0	8.5	16	WSW/	10.2	98	1	0	17
18	56	37*	47*	-10	26	18	0		0	0	0	28.91	15	2.7	5.2	12	S/	1.5	14	10	7	18
19	73	43	58	1	27	7	0		0	0	0	28.93	07	6.9	9.5	25	ENE/	10.4	100	0	2	19
20	74	48	61	4	32	4	0		0	T	0	28.91	18	1.2	8.8	21	ENE/	7.2	70	3	4	20
21	65	45	55	-1	39	10	0		0	0	0	28.97	24	1.0	4.5	13	WNW/	9.2	90	2	4	21
22	66	41	54	-2	33	11	0		0	0	0	28.90	10	1.9	5.2	12	NW/	9.1	88	3	2	22
23	70	40	55	-1	35	10	0		0	0	0	28.90	12	3.4	5.3	10	E/	10.3	100	0	0	23
24	73	39	56	0	35	9	0		0	0	0	28.88	11	2.5	4.5	10	ESE/	10.3	100	0	0	24
25	72	42	57	2	33	8	0		0	0	0	28.92	12	3.4	5.3	12	SE/	10.2	100	0	0	25
26	71	40	56	1	34	9	0		0	0	0	28.97	11	3.6	5.0	12	ESE/	10.2	100	0	1	26
27	72	42	57	3	32	8	0		0	0	0	28.79	09	2.0	7.3	15	E/	8.4	82	3	2	27
28	67	39	53	-1	33	12	0		0	0	0	28.75	12	4.8	5.0	15	SE/	7.9	78	10	7	28
29	65	49	57	3	37	8	0		0	T	0	28.64	09	6.4	6.8	15	E/	0.5	5	10	8	29
30	65	44	55	1	39	10	0		0	0	0	28.69	18	1.4	5.0	9	ESE/	2.7	27	10	8	30
	Sum 2209	Sum 1370				Total 185	Total 30			Total T	Total 0	For the month: 28.84	11	2.4	5.7	25	ENE/	Total 235.7	% for month	Sum 125	Sum 106	
	Avg. 73.6	Avg. 45.7	Avg. 59.7	Dep. 1.6	Avg. 34	Dep. -49	Dep.			Dep. -0.49						Date: 19		Possible 313.5	75	Avg. 4.2	Avg. 3.5	

Number of days				Season to date	
Maximum Temp.		Minimum Temp.		Total 264	Total 3651
≥ 90° ‡	≤ 32°	≤ 32°	≤ 0°	Dep.	Dep.
0	0	0	0	8	

Number of days	
Precipitation ≥ .01 inch	0
Snow, ice pellets ≥ 1.0 inch	0
Thunderstorms	0
Heavy fog X	0
Clear 17	Partly cloudy 4
Cloudy 9	

Greatest in 24 hours and dates		Greatest depth on ground of snow, ice pellets or ice and date
Precipitation	Snow, ice pellets	
T	0	0
29+		

HOURLY PRECIPITATION (Water equivalent in inches)

Date	A. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	P. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	Date
1																									1
2																									2
3																									3
4																									4
5																									5
6																									6
7																									7
8																									8
9																									9
10																									10
11																									11
12																									12
13																									13
14																				T	T				14
15																									15
16																			T	T					16
17																									17
18																									18
19																									19
20																		T	T			T	T		20
21																									21
22																									22
23																									23
24																									24
25																									25
26																									26
27																									27
28																									28
29								T																	29
30																									30

* Extreme temperatures for the month. May be the last of more than one occurrence.
– Below zero temperature or negative departure from normal.
‡ ≥ 70° at Alaskan stations.
+ Also on an earlier date, or dates.
X Heavy fog restricts visibility to ¼ mile or less.
T In the Hourly Precipitation table and in columns 9, 10, and 11 indicates an amount too small to measure.

The season for degree days begins with July for heating and with January for cooling.
Data in columns 6, 12, 13, 14, and 15 are based on 8 observations per day at 3-hour intervals.
Wind directions are those from which the wind blows. Resultant wind is the vector sum of wind directions and speeds divided by the number of observations. Figures for directions are tens of degrees from true North; i.e., 09 = East, 18 = South, 27 = West, 36 = North, and 00 = Calm. When directions are in tens of degrees in Col. 17, entries in Col. 16 are fastest observed 1-minute speeds. If the / appears in Col. 17, speeds are gusts.
Any errors detected will be corrected and changes in summary data will be annotated in the annual summary.

Subscription Price: Local Climatological Data $1.00 per year including annual summary if published. Single copy: 10 cents for monthly summary; 15 cents for annual summary. Checks or money orders should be made payable and remittances and correspondence should be sent to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

I certify that this is an official publication of the National Oceanic and Atmospheric Administration, and is compiled from records on file at the National Climatic Center, Asheville, North Carolina 28801.

William H. Haggard
Director, National Climatic Center

SUMMARY BY HOURS

Hour Local time	Averages: Sky cover Tenths	Station pressure In.	Temperature Air °F	Wet bulb °F	Dew Pt. °F	Relative humidity %	Wind speed m.p.h.	Resultant wind Direction	Speed m.p.h.
02	3	28.85	52	44	35	53	6.0	10	4.9
05	3	28.85	49	43	35	59	5.6	11	4.7
08	4	28.88	49	43	35	61	5.9	09	4.7
11	4	28.89	64	50	35	35	6.2	11	4.0
14	4	28.82	72	52	32	25	6.2	17	1.7
17	5	28.80	72	52	31	23	5.8	28	2.3
20	5	28.82	63	49	35	35	4.0	23	1.4
23	2	28.84	57	46	35	45	6.1	12	3.2

USCOMM — NOAA — ASHEVILLE 325

OBSERVATIONS AT 3-HOUR INTERVALS

HOUR	SKY COVER Tenths	CEILING Hnds. of ft.	VISIBILITY Whole Miles	VISIBILITY 16ths Mile	WEATHER	TEMPERATURE AIR °F	TEMPERATURE WET BULB °F	TEMPERATURE DEW PT. °F	REL. HUM. %	WIND DIR	WIND SPEED Knots
DAY 01											
02	0	UNL	15			45	36	21	39	14	2
05	0	UNL	15			41	34	24	51	09	3
08	0	UNL	45			42	36	28	58	08	3
11	0	UNL	45			61	45	26	26	27	3
14	0	UNL	50			67	47	20	17	27	3
17	0	UNL	40			69	47	19	15	29	3
20	0	UNL	15			60	44	23	24	20	5
23	0	UNL	15			51	40	24	35	07	2
DAY 02											
02	0	UNL	15			45	38	28	51	12	4
05	0	UNL	15			42	36	27	55	08	6
08	0	UNL	45			44	38	29	56	12	5
11	0	UNL	35			62	47	28	28	00	0
14	0	UNL	30			74	51	26	17	29	7
17	0	UNL	35			76	53	28	17	28	5
20	0	UNL	15			65	49	30	27	30	3
23	0	UNL	15			57	45	31	37	06	5
DAY 03											
02	0	UNL	15			52	43	33	49	00	0
05	0	UNL	15			48	42	34	59	36	3
08	0	UNL	45			52	43	32	47	12	4
11	0	UNL	30			74	52	29	19	28	3
14	0	UNL	50			84	54	18	08	07	10
17	0	UNL	50			84	55	23	11	06	6
20	3	UNL	15			68	50	29	23	12	6
23	0	UNL	15			63	48	31	30	21	4
DAY 04											
02	0	UNL	15			60	47	31	34	21	4
05	2	UNL	15			54	44	32	43	00	0
08	9	UNL	45			52	43	33	49	00	0
11	4	UNL	25			76	55	34	22	35	4
14	10	UNL	35			85	57	30	14	04	4
17	8	UNL	30			83	56	28	13	21	4
20	9	UNL	15			71	54	37	29	00	0
23	2	UNL	15			62	50	37	40	11	7
DAY 05											
02	8	UNL	15			58	49	40	51	12	9
05	10	UNL	15			57	48	39	51	13	6
08	10	UNL	35			58	49	39	49	13	6
11	10	UNL	25			71	55	41	34	13	6
14	10	250	25			77	56	38	25	00	0
17	7	UNL	15			78	55	34	20	31	3
20	8	150	15			68	56	45	44	00	0
23	7	UNL	15			61	50	40	46	13	3
DAY 06											
02	10	250	15			59	49	40	50	07	4
05	10	200	15			58	50	42	55	09	5
08	8	250	35			58	50	42	55	36	4
11	6	250	35			75	55	37	25	00	0
14	2	UNL	35			85	58	33	15	04	4
17	3	UNL	20			83	58	35	18	14	7
20	0	UNL	15			70	55	43	38	00	0
23	0	UNL	15			63	51	39	41	00	0
DAY 07											
02	0	UNL	15			56	48	39	53	09	5
05	0	UNL	15			56	48	40	55	00	0
08	0	UNL	30			57	48	39	51	08	5
11	0	UNL	30			72	54	38	29	13	6
14	0	UNL	20			79	57	38	23	14	7
17	0	UNL	15			79	56	36	21	26	4
20	0	UNL	15			69	55	42	38	31	3
23	0	UNL	15			60	50	40	48	12	6
DAY 08											
02	0	UNL	15			54	48	41	62	10	6
05	0	UNL	15			50	45	39	66	12	7
08	1	UNL	35			53	47	40	62	09	8
11	3	UNL	30			70	55	42	36	13	7
14	10	UNL	20			79	57	37	22	18	4
17	8	UNL	15			78	55	32	19	18	3
20	9	UNL	15			66	52	38	36	00	0
23	2	UNL	15			59	48	37	44	14	3
DAY 09											
02	2	UNL	15			54	46	37	53	14	4
05	6	UNL	15			53	46	38	57	10	7
08	3	UNL	25			52	46	39	61	06	4
11	1	UNL	15			72	54	38	29	04	4
14	1	UNL	20			84	57	32	15	09	9
17	0	UNL	30			83	56	30	15	08	5
20	0	UNL	15			70	52	34	27	12	3
23	0	UNL	15			63	49	34	34	20	5
DAY 10											
02	2	UNL	15			57	46	34	42	00	0
05	0	UNL	15			53	45	35	51	07	3
08	10	UNL	35			58	48	38	48	28	3
11	10	UNL	30			80	56	32	17	08	10
14	8	UNL	30			86	57	28	12	14	8
17	1	UNL	30			84	57	30	14	08	3
20	3	UNL	15			74	54	36	25	00	0
23	0	UNL	15			66	51	36	33	00	0
DAY 11											
02	2	UNL	15			57	47	37	47	11	4
05	8	UNL	15			60	49	37	43	12	9
08	4	UNL	25			60	49	37	43	11	7
11	8	UNL	20			76	55	36	23	13	5
14	10	UNL	20			87	60	36	16	14	7
17	10	250	20			86	59	36	17	00	0
20	10	250	15			76	57	41	29	28	4
23	7	UNL	15			64	52	40	42	09	5
DAY 12											
02	8	250	15			61	50	40	46	14	5
05	9	250	15			60	50	40	48	09	5
08	9	250	20			57	49	40	53	09	5
11	10	150	12			68	54	41	38	11	7
14	10	150	10			75	57	41	30	30	3
17	10	200	12			75	57	41	30	33	4
20	2	UNL	15			71	56	44	38	25	6
23	0	UNL	15			67	56	48	51	26	12
DAY 13											
02	0	UNL	15			60	51	42	52	02	7
05	0	UNL	15			53	47	42	66	15	2
08	0	UNL	12			51	46	41	69	00	0
11	0	UNL	12			64	50	36	35	32	4
14	0	UNL	15			72	53	34	25	30	6
17	0	UNL	25			72	51	26	18	26	5
20	0	UNL	15			61	47	31	32	12	3
23	0	UNL	15			53	43	31	43	11	6
DAY 14											
02	0	UNL	15			50	43	35	57	08	9
05	0	UNL	15			47	40	30	52	11	8
08	0	UNL	20			46	41	35	66	10	8
11	0	UNL	20			63	50	36	37	11	6
14	3	UNL	20			72	52	31	22	16	3
17	9	140	25			71	52	31	23	32	8
20	9	140	15			67	49	30	25	29	7
23	8	90	15			63	48	32	31	28	4
DAY 15											
02	10	65	15			57	46	34	42	10	6
05	10	60	15			58	47	34	41	09	8
08	5	UNL	25			52	47	42	69	11	8
11	6	80	15			62	47	29	29	25	2
14	8	80	20			65	46	21	19	26	10
17	10	85	25			64	46	22	20	26	11
20	8	90	15			60	44	23	24	21	6
23	2	UNL	15			53	45	35	51	14	9
DAY 16											
02	5	UNL	15			50	43	36	59	09	9
05	10	55	15			50	44	37	61	10	6
08	7	90	45			48	43	38	68	07	4
11	10	55	40			54	46	37	53	05	3
14	5	UNL	30			61	48	35	38	21	6
17	10	75	30			61	48	35	38	21	7
20	10	65	15			59	47	35	41	12	5
23	0	UNL	15			50	46	41	71	09	11
DAY 17											
02	0	UNL	15			48	45	43	83	10	8
05	0	UNL	15			44	42	39	83	13	7
08	0	UNL	35			41	39	37	86	08	6
11	1	UNL	35			52	44	34	50	23	5
14	1	UNL	30			56	47	37	49	24	11
17	3	UNL	35			61	47	32	34	25	9
20	0	UNL	15			52	42	30	43	09	6
23	0	UNL	15			45	39	30	56	10	7
DAY 18											
02	0	UNL	15			42	37	31	65	09	4
05	0	UNL	15			40	37	32	73	00	0
08	10	UNL	50			40	35	28	62	09	7
11	10	220	45			49	38	23	36	13	8
14	10	220	45			55	41	21	27	19	9
17	10	200	40			55	41	20	25	00	0
20	10	160	15			54	42	26	34	25	5
23	10	180	15			52	41	27	38	25	3
DAY 19											
02	6	UNL	15			48	40	28	46	00	0
05	4	UNL	15			45	38	28	51	28	3
08	1	UNL	45			47	39	28	48	24	6
11	0	UNL	45			66	48	26	22	06	19
14	0	UNL	60			71	50	25	18	07	10
17	0	UNL	60			72	50	25	17	07	10
20	0	UNL	15			58	45	29	33	08	6
23	0	UNL	15			64	47	26	24	07	12
DAY 20											
02	0	UNL	15			61	45	25	25	06	12
05	0	UNL	15			50	39	24	36	24	3
08	0	UNL	60			49	40	27	43	09	3
11	2	UNL	50			67	49	27	22	12	9
14	4	UNL	40			72	53	34	25	17	8
17	10	65	45			70	52	35	28	27	8
20	10	80	15			61	50	40	46	24	12
23	10	49	15			58	49	40	51	34	6
DAY 21											
02	5	UNL	15			53	47	42	66	10	5
05	1	UNL	15			51	47	44	77	12	4
08	2	UNL	25			49	46	43	80	00	0
11	1	UNL	25			60	52	45	58	13	2
14	4	UNL	25			64	50	35	34	25	6
17	4	UNL	30			64	49	33	32	29	8
20	10	140	15			61	48	34	36	33	3
23	0	UNL	15			58	47	34	41	21	3
DAY 22											
02	0	UNL	15			51	43	33	50	34	4
05	0	UNL	15			43	39	34	71	09	4
08	0	UNL	25			43	39	35	73	10	7
11	0	UNL	20			58	48	38	48	13	4
14	2	UNL	25			65	50	34	32	18	3
17	10	250	25			66	49	30	26	26	3
20	4	UNL	15			60	47	32	35	28	4
23	1	UNL	15			53	43	31	43	09	7
DAY 23											
02	0	UNL	15			47	41	34	61	12	7
05	0	UNL	15			41	39	37	86	11	7
08	0	UNL	35			42	38	33	71	08	7
11	0	UNL	25			58	47	36	44	13	5
14	0	UNL	20			65	50	35	33	00	0
17	0	UNL	15			69	51	33	26	28	5
20	0	UNL	15			60	48	35	39	20	2
23	0	UNL	15			50	43	34	54	11	4
DAY 24											
02	0	UNL	15			48	42	35	61	12	3
05	0	UNL	15			42	39	34	73	06	4
08	0	UNL	25			43	39	34	71	06	3
11	0	UNL	20			65	51	36	34	10	8
14	0	UNL	25			73	53	34	24	09	3
17	0	UNL	25			73	53	32	22	23	7
20	0	UNL	15			64	51	37	37	00	0
23	0	UNL	15			53	45	35	51	13	3
DAY 25											
02	0	UNL	15			45	40	33	63	08	5
05	0	UNL	15			44	40	34	68	12	7
08	0	UNL	20			44	39	33	65	09	7
11	0	UNL	12			59	47	35	41	14	5
14	0	UNL	15			69	52	34	28	22	3
17	0	UNL	15			71	52	32	24	27	4
20	0	UNL	15			59	46	32	36	00	0
23	0	UNL	15			52	43	33	49	12	6
DAY 26											
02	0	UNL	15			46	41	35	66	12	7
05	0	UNL	15			43	38	32	65	13	5
08	0	UNL	25			43	39	33	68	09	6
11	0	UNL	15			59	48	36	42	13	8
14	1	UNL	12			68	52	35	30	02	3
17	0	UNL	12			70	51	32	25	30	3
20	0	UNL	15			57	47	35	44	00	0
23	6	UNL	12			50	42	32	50	11	3
DAY 27											
02	0	UNL	15			48	41	32	54	07	5
05	5	UNL	15			44	39	32	63	08	6
08	10	250	20			46	40	32	58	09	9
11	0	UNL	20			59	47	34	39	09	7
14	1	UNL	12			69	52	34	28	20	5
17	0	UNL	15			70	51	30	23	31	10
20	0	UNL	15			64	49	32	30	24	6
23	0	UNL	15			53	43	31	43	15	3
DAY 28											
02	0	UNL	15			44	38	31	60	09	5
05	1	UNL	15			44	39	32	63	12	6
08	10	UNL	25			42	37	31	65	12	8
11	10	UNL	25			56	46	35	45	12	5
14	10	250	15			64	49	34	33	16	3
17	10	150	15			66	50	32	28	00	0
20	10	230	15			58	47	35	42	00	0
23	9	UNL	15			51	44	35	54	12	8
DAY 29											
02	9	UNL	15			49	41	30	48	09	11
05	10	130	15			50	41	30	46	09	7
08	10	120	30			51	44	35	54	05	7
11	10	95	25			60	48	35	39	08	5
14	10	75	15			64	51	39	40	13	2
17	10	70	12			64	52	41	43	12	3
20	10	90	12			59	50	41	51	08	4
23	0	UNL	15			53	47	41	64	10	8
DAY 30											
02	8	85	15			50	45	40	69	16	3
05	0	UNL	15			48	44	40	74	14	6
08	10	250	20			48	44	39	71	16	4
11	10	160	12			57	49	40	53	23	2
14	10	150	25			65	51	38	37	06	5
17	10	140	30			64	50	35	34	03	4
20	10	75	15			59	49	40	50	25	6
23	9	80	15			58	49	39	49	26	5

NOTES

CEILING COLUMN—

UNL indicates an unlimited ceiling.

WEATHER COLUMN—

*	Tornado
T	Thunderstorm
Q	Squall
R	Rain
RW	Rain showers
ZR	Freezing rain
L	Drizzle
ZL	Freezing drizzle
S	Snow
SP	Snow pellets
IC	Ice crystals
SW	Snow showers
SG	Snow grains
IP	Ice pellets
A	Hail
F	Fog
IF	Ice fog
GF	Ground fog
BD	Blowing dust
BN	Blowing sand
BS	Blowing snow
BY	Blowing spray
K	Smoke
H	Haze
D	Dust

WIND COLUMNS—

Directions are those from which the wind blows, indicated in tens of degrees from true North; i. e., 09 for East, 18 for South, 27 for West. Entry of 00 in the direction column indicates calm.

Speed is expressed in knots; multiply by 1.15 to convert to miles per hour.

ADDITIONAL DATA

Other observational data contained in records on file can be furnished at cost via microfilm, microfiche, or paper copies of the original records. Inquiries as to availability and costs should be addressed to: Director, National Climatic Center, Federal Building, Asheville, North Carolina 28801.

STATION: PHOENIX ARIZONA YEAR & MONTH: 71 11

U.S. DEPARTMENT OF COMMERCE
NATIONAL CLIMATIC CENTER
FEDERAL BUILDING
ASHEVILLE, N.C. 28801

U.S. MAIL
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U.S. DEPARTMENT OF COMMERCE

LOCAL CLIMATOLOGICAL DATA

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
ENVIRONMENTAL DATA SERVICE

PHOENIX, ARIZONA
SKY HARBOR AIRPORT
DECEMBER 1971

Latitude 33° 26′ N Longitude 112° 01′ W Elevation (ground) 1117 ft. Standard time used: MOUNTAIN WBAN #23183

Date	Temperature °F Maximum	Minimum	Average	Departure from normal	Average dew point	Degree days Base 65° Heating	Cooling	Weather types on dates of occurrence (1 Fog, 2 Heavy fog x, 3 Thunderstorm, 4 Ice pellets, 5 Hail, 6 Glaze, 7 Duststorm, 8 Smoke, Haze, 9 Blowing snow)	Snow, ice pellets or ice on ground at 05AM In.	Precipitation Water equivalent In.	Snow, ice pellets In.	Avg. station pressure In. Elev. 1107 feet m.s.l.	Wind Resultant direction	Resultant speed m.p.h.	Average speed m.p.h.	Fastest mile Speed m.p.h.	Direction	Sunshine Hours and tenths	Percent of possible	Sky cover Tenths Sunrise to sunset	Midnight to midnight	Date
1	2	3	4	5	6	7A	7B	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	64	48	56	2	38	9	0		0	T	0	28.78	27	4.0	5.9	17	NW/	3.6	36	7	6	1
2	65	39	52	-2	38	13	0		0	0	0	28.93	12	4.5	5.0	14	SE/	8.8	87	3	4	2
3	61	43	52	-1	33	13	0		0	0	0	28.75	15	3.3	8.5	17	SW/	7.4	73	4	7	3
4	55	45	50	-3	39	15	0		0	.05	0	28.61	08	1.6	6.6	14	WSW/	1.5	14	10	7	4
5	63	34	49	-4	26	16	0		0	0	0	28.87	30	2.2	5.2	12	W/	10.1	100	1	0	5
6	62	34	48	-5	32	17	0		0	0	0	28.75	11	6.0	6.5	14	SE/	9.3	93	5	4	6
7	50	41	46	-7	39	19	0	1	0	.24	0	28.55	10	4.0	7.6	25	SW/	0.5	5	10	9	7
8	50	35	43	-10	31	22	0		0	0	0	28.79	24	4.1	7.1	16	WSW/	6.1	61	7	7	8
9	50	32	41	-12	27	24	0		0	0	0	28.91	12	1.8	5.6	12	W/	10.0	100	1	0	9
10	57	30	44	-8	29	21	0		0	0	0	28.87	12	4.2	6.3	13	ESE/	10.0	100	2	1	10
11	57	31	44	-8	27	21	0		0	0	0	28.93	17	1.9	8.1	24	W/	9.6	96	1	1	11
12	58	28*	43	-9	24	22	0		0	0	0	28.97	13	2.4	4.6	12	ESE/	10.0	100	0	0	12
13	44	35	40*	-12	35	25	0	1 8	0	.06	0	28.66	15	2.6	7.9	15	W/	0.0	0	10	10	13
14	51	33	42	-10	35	23	0		0	0	0	28.77	12	2.9	5.6	13	W/	9.1	91	1	2	14
15	57	32	45	-7	31	20	0		0	0	0	28.84	14	2.0	5.5	12	E/	10.0	100	1	0	15
16	59	29	44	-8	24	21	0		0	0	0	29.10	22	1.6	5.3	16	NE/	10.0	100	0	0	16
17	62	35	49	-3	18	16	0		0	0	0	29.12	07	11.3	11.4	28	ENE/	9.3	93	6	5	17
18	64	42	53	1	29	12	0		0	0	0	28.90	13	5.8	6.8	17	SSE/	2.7	27	10	8	18
19	61	43	52	1	35	13	0		0	0	0	28.92	10	3.6	5.2	12	E/	8.0	80	4	5	19
20	65	35	50	-1	32	15	0		0	0	0	28.94	11	3.8	4.8	9	ESE/	9.9	100	0	0	20
21	67	41	54	3	33	11	0		0	0	0	28.98	10	7.8	8.3	16	ESE/	5.2	52	10	8	21
22	68	55	62	11	47	3	0		0	.02	0	29.02	08	4.0	5.9	20	E/	0.1	1	10	10	22
23	74	52	63	12	50	2	0		0	0	0	28.99	10	.3	2.0	12	SE/	7.1	71	10	9	23
24	76	51	64	13	48	1	0		0	0	0	28.89	10	6.1	6.3	14	ESE/	7.4	74	10	7	24
25	76*	52	64*	13	48	1	0		0	T	0	28.84	10	6.0	6.2	14	ESE/	4.8	48	9	9	25
26	66	52	59	8	47	6	0		0	T	0	28.72	22	1.4	7.2	21	W/	0.4	4	8	8	26
27	66	38	52	1	38	13	0		0	0	0	28.83	11	5.8	6.6	17	SE/	8.6	86	2	2	27
28	62	38	50	-1	38	15	0		0	.01	0	28.85	12	4.6	6.9	12	ESE/	6.9	69	8	7	28
29	59	43	51	0	40	14	0		0	.09	0	28.93	26	3.9	5.3	12	W/	9.9	99	0	3	29
30	60	34	47	-4	35	18	0		0	0	0	28.93	27	2.0	3.9	12	W/	10.0	100	0	0	30
31	65	37	51	0	31	14	0		0	0	0	28.83	28	1.3	5.5	17	NE/	2.8	28	9	7	31
	Sum 1894	Sum 1217	—	—	—	Total 455	Total 0			Total .47	Total 0	For the month: 28.86	12	2.4	6.2	28	ENE/	Total 209.1	% for month	Sum 159	Sum 146	
	Avg. 61.1	Avg. 39.3	Avg. 50.2	Dep. -1.4	Avg. 35	Dep. 40	Dep.	Number of days Precipitation ≥ .01 inch 6		Dep. -0.38						Date: 17		Possible 309.4	68	Avg. 5.1	Avg. 4.7	

Number of days				Season to date	
Maximum Temp.		Minimum Temp.		Total	Total
≥ 90° ‡	≤ 32°	≤ 32°	≤ 0°	719	3651
0	0	6	0	Dep. 48	Dep.

Snow, ice pellets ≥ 1.0 inch 0
Thunderstorms 0
Heavy fog X 0
Clear 13 Partly cloudy 6 Cloudy 12

Greatest in 24 hours and dates			Greatest depth on ground of snow, ice pellets or ice and date
Precipitation		Snow, ice pellets	
.24	7	0	0

HOURLY PRECIPITATION (Water equivalent in inches)

Date	A. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	P. M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	Date
1								T	T							T	T								1
2																									2
3																									3
4		T	T		T	.02	.01	.01	.01	T															4
5																									5
6																									6
7						.02	.21	.01						T	T	T									7
8																									8
9																									9
10																									10
11																									11
12																									12
13									T	T	.01	.01	T	T	T	.02	.01	.01	T	T					13
14																									14
15																									15
16																									16
17																									17
18																									18
19																									19
20																									20
21																									21
22		T	T	T		.01	T	T	T		T	T							T	T	.01	T	T		22
23																									23
24																									24
25						T	T																		25
26	T	T	T	T	T	T									T			T							26
27																									27
28																				T	T	.01	T	T	28
29	.02	.04	.03		T																				29
30																									30
31																									31

* Extreme temperatures for the month. May be the last of more than one occurrence.
– Below zero temperature or negative departure from normal.
‡ ≥ 70° at Alaskan stations.
\+ Also on an earlier date, or dates.
X Heavy fog restricts visibility to ¼ mile or less.
T In the Hourly Precipitation table and in columns 9, 10, and 11 indicates an amount too small to measure.

The season for degree days begins with July for heating and with January for cooling.
Data in columns 6, 12, 13, 14, and 15 are based on 8 observations per day at 3-hour intervals.
Wind directions are those from which the wind blows. Resultant wind is the vector sum of wind directions and speeds divided by the number of observations. Figures for directions are tens of degrees from true North; i.e., 09 = East, 18 = South, 27 = West, 36 = North, and 00 = Calm. When directions are in tens of degrees in Col. 17, entries in Col. 16 are fastest observed 1-minute speeds. If the / appears in Col. 17, speeds are gusts.
Any errors detected will be corrected and changes in summary data will be annotated in the annual summary.

Subscription Price: Local Climatological Data $1.00 per year including annual summary if published. Single copy: 10 cents for monthly summary; 15 cents for annual summary. Checks or money orders should be made payable and remittances and correspondence should be sent to the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

I certify that this is an official publication of the National Oceanic and Atmospheric Administration, and is compiled from records on file at the National Climatic Center, Asheville, North Carolina 28801.

William H. Haggard
Director, National Climatic Center

SUMMARY BY HOURS

Hour Local time	Averages: Sky cover Tenths	Station pressure In.	Temperature Air °F	Wet bulb °F	Dew Pt. °F	Relative humidity %	Wind speed m.p.h.	Resultant wind Direction	Speed m.p.h.
02	4	28.86	45	40	34	68	6.6	10	3.2
05	4	28.85	43	39	35	73	6.1	10	4.2
08	5	28.88	41	39	35	78	5.8	10	4.3
11	5	28.91	52	45	37	58	6.4	11	3.4
14	5	28.84	59	47	34	42	7.6	17	2.3
17	5	28.83	60	47	33	38	6.6	24	1.9
20	4	28.85	53	45	35	53	4.7	05	.5
23	4	28.87	48	42	35	62	6.1	12	3.5

USCOMM—NOAA—ASHEVILLE 325

OBSERVATIONS AT 3-HOUR INTERVALS

HOUR	SKY COVER Tenths	CEILING Hnds. of ft.	VISIBILITY WHOLE MILES	VISIBILITY Hths MILE	WEATHER	TEMPERATURE AIR °F	TEMPERATURE WET BULB °F	TEMPERATURE DEW PT. °F	REL. HUM. %	WIND DIR.	WIND SPEED Knots
DAY 01											
02	9	70	15			53	46	39	59	25	6
05	8	65	15			49	43	36	61	14	4
08	8	65	35			50	44	37	61	00	0
11	7	55	10			57	48	38	49	28	6
14	6	130	25			64	52	41	43	00	0
17	8	60	30			62	51	40	45	32	11
20	8	90	15			57	48	38	49	28	8
23	0	UNL	15			50	44	38	64	22	6
DAY 02											
02	0	UNL	15			45	42	38	77	07	4
05	0	UNL	15			42	40	37	83	15	4
08	9	120	30			42	40	38	86	13	3
11	5	UNL	25			55	48	41	59	10	6
14	2	UNL	20			64	52	40	42	14	11
17	0	UNL	20			63	49	35	35	09	3
20	10	180	15			57	47	36	46	00	0
23	10	180	15			50	43	36	59	11	4
DAY 03											
02	10	95	15			49	43	35	59	09	8
05	2	UNL	15			47	42	36	66	12	11
08	4	UNL	20			43	40	36	76	12	5
11	3	UNL	15			54	45	36	51	14	4
14	0	UNL	25			61	47	32	34	24	11
17	0	UNL	30			60	46	29	31	28	7
20	9	220	30			55	44	30	39	23	6
23	10	220	15			49	41	31	50	10	7
DAY 04											
02	10	100	15		RW	48	41	31	52	10	7
05	10	50	15		RW	48	42	36	63	10	7
08	10	48	20		RW	47	45	43	86	04	3
11	10	60	15			48	45	43	83	14	7
14	9	42	35			51	46	40	66	05	4
17	9	70	35			54	46	38	55	25	8
20	0	UNL	15			50	45	40	69	34	5
23	0	UNL	15			47	43	38	71	32	5
DAY 05											
02	0	UNL	15			47	39	28	48	28	5
05	0	UNL	15			44	37	26	49	28	3
08	6	UNL	45			37	34	29	73	12	3
11	0	UNL	50			54	43	28	37	30	5
14	0	UNL	45			61	44	22	22	31	7
17	0	UNL	60			61	45	23	23	27	6
20	0	UNL	15			50	40	26	39	00	0
23	0	UNL	15			43	37	29	58	09	7
DAY 06											
02	0	UNL	15			40	35	26	57	11	6
05	0	UNL	15			40	37	33	76	08	7
08	0	UNL	45			37	34	30	76	10	8
11	5	UNL	35			51	44	36	57	13	7
14	8	250	30			60	48	34	38	15	4
17	5	UNL	30			61	48	33	35	08	5
20	0	UNL	15			50	42	33	52	11	4
23	8	150	15			48	41	32	54	13	4
DAY 07											
02	0	UNL	15			44	39	32	63	07	6
05	10	55	15			45	41	36	71	07	8
08	8	70	8			44	43	43	96	07	7
11	10	16	4		F	47	46	45	93	13	3
14	10	32	15		RW	48	45	41	77	23	13
17	10	60	20			47	42	37	68	11	6
20	10	UNL	15			45	41	37	74	07	5
23	10	80	15			41	40	39	93	09	5
DAY 08											
02	9	UNL	15			40	39	37	89	13	4
05	10	UNL	15			40	37	33	76	08	6
08	10	75	40			36	35	33	89	18	3
11	5	UNL	30			40	38	36	86	24	3
14	4	UNL	30			48	41	32	54	27	8
17	8	75	30			50	40	27	41	25	12
20	0	UNL	15			47	38	25	42	26	7
23	0	UNL	15			40	35	28	62	25	6
DAY 09											
02	0	UNL	15			38	33	26	62	28	5
05	0	UNL	15			34	30	23	64	30	5
08	0	UNL	45			32	30	25	75	11	4
11	5	UNL	45			43	37	28	56	12	7
14	0	UNL	25			50	40	27	41	27	3
17	0	UNL	20			50	40	26	39	12	5
20	0	UNL	15			44	38	31	60	07	4
23	0	UNL	15			38	35	31	76	12	6
DAY 10											
02	0	UNL	15			36	33	29	76	13	5
05	0	UNL	15			33	32	29	85	04	3
08	0	UNL	40			32	31	28	85	11	8
11	3	UNL	40			44	39	32	63	10	6
14	0	UNL	30			53	43	31	43	14	8
17	0	UNL	25			56	42	23	28	20	6
20	0	UNL	15			46	40	31	56	35	4
23	0	UNL	15			40	36	30	68	12	4
DAY 11											
02	0	UNL	15			37	35	31	79	13	4
05	0	UNL	15			33	32	29	85	12	7
08	3	UNL	30			32	31	28	85	12	6
11	0	UNL	20			42	38	33	71	11	7
14	0	UNL	20			55	42	24	30	26	9
17	0	UNL	30			55	40	18	23	27	11
20	0	UNL	15			49	38	23	36	27	5
23	0	UNL	15			37	33	26	65	09	7
DAY 12											
02	0	UNL	15			34	31	25	70	16	4
05	0	UNL	15			31	29	24	75	12	5
08	0	UNL	45			31	29	24	75	36	6
11	0	UNL	45			47	38	24	41	00	0
14	0	UNL	45			57	42	20	24	18	6
17	0	UNL	40			58	42	20	23	18	3
20	0	UNL	15			47	39	27	46	09	3
23	0	UNL	15			40	35	27	60	10	5
DAY 13											
02	9	UNL	15			36	32	26	67	09	5
05	10	100	15			38	34	28	67	08	8
08	10	60	30			40	36	30	68	09	7
11	10	42	6		RWKH	43	40	36	76	21	5
14	10	30	10			44	42	40	86	13	9
17	10	31	4		RWF	44	43	42	93	19	5
20	10	85	6		F	43	42	41	93	27	8
23	10	70	15			42	40	38	86	25	8
DAY 14											
02	10	70	15			41	39	36	82	26	7
05	0	UNL	15			36	36	35	96	06	3
08	0	UNL	20			35	35	35	100	09	5
11	0	UNL	25			45	41	36	71	00	0
14	1	UNL	30			49	42	33	54	13	7
17	2	UNL	35			50	42	32	50	12	7
20	0	UNL	15			42	40	37	83	07	6
23	0	UNL	15			39	37	35	86	18	4
DAY 15											
02	0	UNL	15			36	35	34	92	08	7
05	0	UNL	15			35	34	32	89	12	7
08	2	UNL	30			33	33	32	96	09	6
11	0	UNL	30			47	42	35	63	14	4
14	0	UNL	30			54	43	29	38	00	0
17	0	UNL	45			56	42	24	29	24	4
20	0	UNL	15			48	40	29	48	27	4
23	0	UNL	15			46	39	30	54	24	6
DAY 16											
02	0	UNL	15			39	35	28	65	24	5
05	0	UNL	15			35	32	27	73	25	5
08	0	UNL	45			31	30	27	85	11	4
11	0	UNL	40			46	38	28	50	27	3
14	0	UNL	60			53	41	23	31	19	3
17	0	UNL	70			57	43	23	27	28	6
20	0	UNL	15			51	38	17	26	05	5
23	0	UNL	15			47	36	19	33	14	6
DAY 17											
02	0	UNL	15			41	33	20	43	07	12
05	0	UNL	15			40	32	19	43	00	0
08	0	UNL	60			38	31	18	44	07	9
11	4	UNL	70			54	40	17	23	06	17
14	10	UNL	70			61	42	14	16	07	14
17	7	250	50			60	43	17	19	07	11
20	9	250	15			54	40	19	25	07	11
23	10	180	15			51	38	19	28	09	5
DAY 18											
02	9	180	15			50	38	20	31	10	7
05	10	180	15			46	37	22	39	00	0
08	10	130	45			48	39	25	41	15	4
11	10	120	45			59	45	28	31	18	5
14	10	140	45			64	48	30	28	15	12
17	10	100	40			62	49	35	37	12	7
20	2	UNL	15			54	45	36	51	12	5
23	5	UNL	15			48	43	37	66	08	7
DAY 19											
02	9	120	15			45	41	37	74	09	8
05	10	120	15			46	42	38	74	11	7
08	10	120	25			44	41	37	76	08	4
11	8	95	30			52	45	38	59	08	7
14	1	UNL	30			59	47	34	39	20	5
17	1	UNL	30			60	46	29	31	29	2
20	0	UNL	15			53	44	34	49	00	0
23	0	UNL	15			48	42	34	59	12	3
DAY 20											
02	0	UNL	15			40	37	32	73	09	4
05	0	UNL	15			38	36	32	79	10	5
08	0	UNL	25			36	35	33	89	11	8
11	0	UNL	15			53	45	36	53	11	6
14	0	UNL	20			64	49	33	32	01	3
17	0	UNL	20			64	47	28	26	16	3
20	0	UNL	15			55	45	33	43	00	0
23	1	UNL	15			48	41	31	52	16	4
DAY 21											
02	1	UNL	15			43	39	33	68	08	6
05	0	UNL	15			43	39	33	68	11	4
08	9	UNL	30			43	39	33	68	10	7
11	10	250	40			59	47	33	38	11	11
14	10	250	30			65	50	34	32	12	8
17	10	180	25			65	50	33	30	07	6
20	10	120	15			62	49	34	35	07	8
23	10	110	15			60	48	34	38	12	8
DAY 22											
02	10	90	15			58	48	38	48	11	5
05	10	55	15		RW	56	51	46	69	07	6
08	10	55	25		R	58	51	44	60	12	3
11	10	60	35		R	61	53	46	58	08	9
14	10	55	40			65	55	47	52	01	5
17	10	60	40			67	56	47	49	32	3
20	10	55	15		R	61	56	53	75	18	3
23	10	140	15			60	55	52	75	10	7
DAY 23											
02	7	UNL	15			57	54	52	83	18	3
05	9	UNL	15			53	52	51	93	12	4
08	10	250	35			53	51	49	86	00	0
11	10	UNL	30			65	57	50	59	02	4
14	10	250	15			71	59	49	46	29	3
17	10	250	15			73	59	49	43	00	0
20	10	250	15			64	57	51	63	00	0
23	8	UNL	15			59	54	50	72	00	0
DAY 24											
02	8	UNL	15			54	51	48	80	07	5
05	8	250	12			55	51	48	77	11	10
08	10	170	12			51	48	46	83	10	8
11	10	UNL	15			65	56	48	54	11	10
14	10	UNL	12			71	59	49	46	12	3
17	8	UNL	10			76	60	48	37	00	0
20	3	UNL	15			63	56	50	63	08	4
23	0	UNL	15			57	52	47	69	13	4
DAY 25											
02	8	UNL	15			55	50	46	72	09	8
05	9	120	15			54	50	46	75	10	6
08	10	100	12			54	50	46	75	11	10
11	10	95	12			61	54	49	65	12	6
14	8	UNL	15			71	58	48	44	11	6
17	10	UNL	30			75	60	49	40	00	0
20	10	250	15			65	56	49	56	00	0
23	10	90	15			64	55	48	56	08	7
DAY 26											
02	10	90	15			62	57	54	75	10	6
05	10	80	15		RW	61	57	54	78	11	9
08	10	55	25			60	56	53	78	11	5
11	10	39	25			64	58	54	70	36	3
14	8	65	35			65	53	43	45	27	10
17	6	65	40			64	52	41	43	26	11
20	2	UNL	15			59	49	38	46	26	3
23	7	70	15			54	46	37	53	22	3
DAY 27											
02	9	60	15			49	42	34	56	03	2
05	0	UNL	15			43	39	34	71	13	4
08	1	UNL	45			39	37	35	86	09	3
11	0	UNL	50			57	50	43	60	09	6
14	1	UNL	50			63	52	41	45	14	10
17	7	250	50			64	51	39	40	16	5
20	4	UNL	15			54	46	37	53	10	7
23	0	UNL	15			47	42	37	68	10	9
DAY 28											
02	1	UNL	15			46	41	36	68	06	7
05	1	UNL	15			40	38	36	86	09	6
08	3	UNL	35			40	38	35	82	12	6
11	7	UNL	40			52	45	38	59	10	5
14	10	180	40			59	47	33	38	12	7
17	10	180	50			60	48	36	41	21	6
20	10	55	12		RW	57	50	43	60	21	5
23	10	60	15			54	50	46	75	10	6
DAY 29											
02	10	23	6		RW	50	48	47	89	22	7
05	10	33	15			50	48	46	86	33	4
08	0	UNL	30			45	42	38	77	28	8
11	0	UNL	30			51	45	39	64	26	7
14	0	UNL	30			58	48	37	46	28	3
17	0	UNL	30			58	47	35	42	26	5
20	0	UNL	15			52	44	36	55	00	0
23	0	UNL	15			46	42	38	74	12	3
DAY 30											
02	0	UNL	15			40	39	37	89	09	3
05	0	UNL	15			38	37	35	89	12	2
08	0	UNL	45			36	35	34	92	00	0
11	0	UNL	45			47	42	37	68	00	0
14	1	UNL	25			59	47	35	41	28	7
17	0	UNL	40			60	47	33	36	25	8
20	0	UNL	15			51	44	36	57	34	4
23	0	UNL	15			46	41	35	66	24	3
DAY 31											
02	0	UNL	15			42	37	31	65	26	6
05	0	UNL	15			39	35	30	70	28	4
08	4	UNL	30			39	35	30	70	28	4
11	10	UNL	35			54	44	32	43	28	3
14	10	250	45			65	48	27	24	05	7
17	10	150	45			63	47	29	28	01	5
20	10	UNL	15			56	46	35	45	20	3
23	10	250	15			53	43	32	45	15	6

NOTES

CEILING COLUMN—

UNL indicates an unlimited ceiling.

WEATHER COLUMN—

*	Tornado
T	Thunderstorm
Q	Squall
R	Rain
RW	Rain showers
ZR	Freezing rain
L	Drizzle
ZL	Freezing drizzle
S	Snow
SP	Snow pellets
IC	Ice crystals
SW	Snow showers
SG	Snow grains
IP	Ice pellets
A	Hail
F	Fog
IF	Ice fog
GF	Ground fog
BD	Blowing dust
BN	Blowing sand
BS	Blowing snow
BY	Blowing spray
K	Smoke
H	Haze
D	Dust

WIND COLUMNS—

Directions are those from which the wind blows, indicated in tens of degrees from true North; i. e., 09 for East, 18 for South, 27 for West. Entry of 00 in the direction column indicates calm.

Speed is expressed in knots; multiply by 1.15 to convert to miles per hour.

ADDITIONAL DATA

Other observational data contained in records on file can be furnished at cost via microfilm, microfiche, or paper copies of the original records. Inquiries as to availability and costs should be addressed to: Director, National Climatic Center, Federal Building, Asheville, North Carolina 28801.

STATION: PHOENIX ARIZONA YEAR & MONTH: 71 12

U.S. DEPARTMENT OF COMMERCE
NATIONAL CLIMATIC CENTER
FEDERAL BUILDING
ASHEVILLE, N.C. 28801

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SUPPLEMENTAL MATERIAL RELATING TO ARCHAEOLOGY

Following is Policy and Procedure Memorandum 20-7, Procedures for Archaeological and Paleontological Salvage, issued on August 24, 1959 by the Bureau of Public Roads (since then renamed the Federal Highway Administration).

PROGRAM AND PROJECT PROCEDURES

Subject: ARCHEOLOGICAL AND PALEONTOLOGICAL SALVAGE

Supersedes: Policy and Procedure Memorandum 20-7, dated October 19, 1956

1. PURPOSE

The purpose of this memorandum is to set forth the procedures for implementing the provisions of section 305 of title 23 USC covering the use of Federal highway funds in archeological and paleontological salvage in Federal and Federal-aid highway construction.

2. POLICY

It is the national policy to have preserved for public use historical and prehistorical sites, buildings, and objects of national significance for the inspiration and benefit of the people of the United States. Indian ruins come within this policy. It is a Federal crime to injure or destroy any historical or prehistorical ruin or any object of antiquity, on Government lands without permission of the head of the department having jurisdiction over such lands (16 USC 433). Several of the States have somewhat similar statutes.

3. DEFINITIONS OF TERMS USED

a. The term "historical objects" as used in this memorandum means archeological and paleontological objects, including all ruins, sites, buildings, artifacts, fossils, or other objects of antiquity that have national significance from a historical or scientific standpoint for the inspiration and benefit of the people of the United States.

b. The term "salvage" as used in this memorandum shall mean the salvage of historical objects.

c. The term "appropriate authority" as used in this memorandum shall mean the Federal or State authorities concerned with the preservation and study of historical objects.

4. NOTIFICATION OF APPROPRIATE AUTHORITY

a. Historical objects should not be needlessly destroyed or if such destruction cannot be avoided, reasonable action should be taken to obtain all desired information concerning such objects prior to destruction. When a road location or improvement is in an area where it is anticipated that historical objects may be encountered, the appropriate authority should be advised as early as possible of the proposed location of the road to enable such authority to determine the likelihood of the highway destroying historical objects. If it should appear that the proposed road construction will result in the destruction of the historical objects and it is determined by the appropriate authority that such objects cannot reasonably be removed or otherwise preserved, consideration should be given to possible alternate locations of the highway.

b. If, during the course of construction, historical objects are encountered, the appropriate authority should be notified immediately and steps taken to excavate and preserve the objects if practicable, or if preservation is impracticable, to permit the appropriate authority to obtain and record data relative thereto.

5. ELIGIBILITY FOR FEDERAL-AID PARTICIPATION

a. Federal-aid funds may participate in archeological and paleontological salvage as provided in section 305 of title 23 USC to the extent that State laws are applicable and to the extent approved as necessary by the State highway department. The initiative for the application of this provision rests with the States.

b. Section 305 permits the use of Federal-aid highway funds for such salvage costs as are clearly attributable to highway projects, including survey costs incurred in advance of construction as the State may determine to be necessary to preserve historical objects which might otherwise be adversely affected by highway construction, or to avoid increased salvage costs as might otherwise occur during highway construction. Federal-aid highway funds are not available for use in connection with any salvage costs which would have been incurred had the highway project not been undertaken.

6. ARCHEOLOGICAL SURVEYS

Any archeological surveys deemed necessary will normally be handled as a part of preliminary engineering in determining the route location and will be eligible for Federal-aid reimbursement in the same manner as other preliminary engineering costs. The salaries, fees, and expenses incurred by the State in engaging services of archeologists for the purpose of such surveys are eligible for Federal reimbursement to the extent that such costs are attributable to and supported as part of the project cost. In addition, locating archeological sites on or along highway rights-of-way and identifying such sites on highway planning maps or in other appropriate ways may be eligible for Federal-aid participation when included in and performed as a part of any inventory phase of the State highway planning program financed from 1 1/2-percent funds. It is expected that the State will carefully evaluate the need for an archeological survey during the route selection states.

7. CONSTRUCTION

a. Costs of excavation of historical objects or recordation of data therefrom, whether performed prior to or during construction, are eligible for Federal-aid participation provided that such work is duly authorized by the State highway department with the concurrence of the division

engineer. Excavation costs may include costs of protecting and preserving during removal at the site but shall not include the expense of shipping or otherwise removing salvaged historical objects from the site.

b. In those instances where highway construction operations result in exposing, disturbing, or otherwise adversely affecting historical objects beyond the road prism, Federal-aid funds may participate in salvage work beyond the road prism for such limited distance within the highway right-of-way as deemed necessary to prevent archeological losses which otherwise may occur during the course of normal construction operations.

8. BORROW PITS

In isolated instances, the necessity for archeological salvage may arise as a result of obtaining materials from borrow pits. If the borrow pit and the historical objects are in public ownership, Federal funds may participate in salvage costs which are directly attributable to the utilization of the borrow pit, provided it would not be more economical to utilize a borrow pit at another location. In those instances where the borrow pit is commercially operated or otherwise is not in public ownership, Federal participation would be dependent upon an opinion by the State Attorney General indicating that the private owner has waived all claims to the historical objects and that such objects may be used for public purposes without possible private gain to any individual.

9. SALVAGE INCIDENTAL TO REMOVAL OR RELOCATION OF BUILDINGS FROM RIGHT-OF-WAY

If situations should arise where the removal or relocation of buildings or other structures located wholly or partly within the right-of-way will necessitate archeological salvage at either the existing or the relocation site, the cost of performing such salvage will be eligible for

Federal participation as part of the project costs. Participation in such costs at relocation sites should require a showing that it is necessary to relocate the buildings or structures at that particular site. There should also be a showing that the historical objects may be used for public purposes without possible private gain to any individual, subject to the conditions stated in the last sentence in paragraph 8.

10. MAINTENANCE

If the need for archeological salvage should arise after completion of construction of any Federal-aid project, the cost of such salvage would not qualify for participation from Federal-aid highway funds since Federal-aid funds are not eligible to participate in costs connected with maintenance operations.

11. FEDERAL DOMAIN PROJECTS

The principles set forth in the preceding paragraphs are applicable also to Federal domain projects under Bureau of Public Roads supervision. Agreements may be entered into with the appropriate authority to pay from Federal highway funds the reasonable costs of salvage work. Directives or change orders may be issued to the contractors in this connection, provided the specifications have not required the contractor to cover such work in his unit bid prices. They may also be issued in cases within the meaning of "subsurface or latent conditions" or "unknown physical conditions" where such terms are used in the standard contract forms. If a contractor's operations are delayed because of salvage work, such contractor would be entitled to an appropriate extension of the contract time. If practicable, the operations should be rescheduled to avoid the section until the removal of the historical objects or the gathering of historical data has been accomplished by the appropriate authority.

/s/ Ellis L. Armstrong

ELLIS L. ARMSTRONG
Commissioner of Public Roads

ARIZONA STATE LAW REGARDING ARCHAEOLOGICAL DISCOVERIES

Following is a reproduction of Article 4 of the Arizona Revised Statutes. This article specifies the limitations placed on archaeological exploration in the State of Arizona.

ARTICLE 4. ARCHAEOLOGICAL DISCOVERIES

§ 41-771. Archaeological discoveries; restrictions as to who may explore

No person, except when acting as a duly authorized agent of an institution or corporation referred to in § 41-772, shall excavate in or upon any historic or prehistoric ruin, burial ground, archaeological or vertebrate paleontological site, or site including fossilized footprints, inscriptions made by human agency, or any other archaeological, paleontological, or historical feature, situate on lands owned or controlled by the state of Arizona, or any agency thereof. As amended Laws 1960, Ch. 38, § 1.

1. Construction and application
Salvage of archaeological or paleontological artifacts is not appropriately connected with, and necessarily incidental to, legitimate highway purposes, and, therefore, specific legislative authorization would be required before funds appropriated for highway purposes could be expended for archaeological or paleontological salvage. Op.Atty.Gen.No. 62-18-L.

§ 41-772. Permits to explore

A. Only educational institutions, public museums or nonprofit corporations organized for scientific and research purposes may pursue any activity prescribed in § 41-771.
B. No such activity may be undertaken until a permit is first secured therefor from the director of the Arizona state museum.
C. Permits shall be granted by the director for such periods of time and under such regulations as he may from time to time determine to institutions or corporations which are qualified to conduct such

activities for the benefit of museums, universities, colleges or other recognized scientific or educational institutions, or for the purpose of propagating the knowledge to be gained, and which shall undertake to preserve permanently all objects, photographs and records in public repositories under their own supervision or control, or the supervision or control of other similar institutions or corporations. As amended Laws 1960, Ch. 38, § 2.

Reviser's Note:
In subsection A, the internal reference to "§ 41-771" is substituted for "§ 42-771" to correct a typographical error under the authority of § 41-1304.-02. There is no § 42-771 in the Arizona Revised Statutes.

§ 41-773. Prohibiting unnecessary defacing of site or object

No person, institution, or corporation shall deface or otherwise alter any site or object embraced within the terms of §§ 41-771 and 41-772, except in the course of activities pursued under the authority of a permit granted by the director of the Arizona state museum. Added Laws 1960, Ch. 38, § 3.

Arizona state museum, see § 15-705.

§ 41-774. Duty to report discoveries

A person in charge of any survey, excavation, or construction on any lands owned or controlled by this state, by any public agency or institution of the state, or by any county or municipal corporation within the state shall report promptly to the director of the Arizona state museum the existence of any archaeological, paleontological, or historical site or object discovered in the course of such survey, excavation, or construction, and shall take all reasonable steps to secure its preservation. Added Laws 1960, Ch. 38, § 3.

§ 41-775. Unlawful reproduction of original archaeological specimen

No person shall reproduce, retouch, rework, or forge any archaeological, paleontological, or historical object, deriving its principal value from its antiquity, or make any object, whether copied or not, or falsely label, describe, identify, or offer for sale or exchange any object, with intent to represent the same to be an original and genuine archaeological, paleontological, or historical specimen, nor shall any person offer for sale or exchange any object with knowledge that it has previously been collected or excavated in violation of any of the terms of this article. Added Laws 1960, Ch. 38, § 3.

§ 41-776. Violation; penalty

Any person, institution or corporation violating any provision of this article is guilty of a misdemeanor punishable by a fine not exceeding five hundred dollars or by imprisonment in the county jail for not to exceed six months, or both, and in addition, shall forfeit to the Arizona state museum all articles and material discovered, collected, excavated, or offered for sale or exchange, together with all photographs and records relating to such objects. Added Laws 1960, Ch. 38, § 3.

ARIZONA HIGHWAY DEPARTMENT SPECIFICATIONS

REGARDING ARCHAEOLOGICAL DISCOVERIES

Following is a reproduction of Section 107.06 of the Arizona Highway Department *Standard Specifications for Road and Bridge Construction,* edition of 1969. This section defines the responsibilities of highway contractors in encountering archaeological features during construction of a highway under the jurisdiction of the Arizona Highway Department.

> 107.06 Archaeological Features of Arizona:
>
> The attention of the contractor is directed to Sections 41-771 and 41-772, Arizona Revised Statutes, which make it a misdemeanor, punishable by a fine not exceeding $500.00 and imprisonment not exceeding six months, to investigate, explore or excavate, on either Federal or State land, in or on prehistoric ruins, ancient burial grounds, fossilized footprints, hieroglyphics and all other archaeological features of Arizona without permits from the Archaeological Branch of the University of Arizona and the Board of Supervisors of the county within which such excavation, exploration or investigation is to be undertaken.
>
> In view of the above, it is a provision of the contract that when archaeological features are turned up, encountered or unearthed in the excavation of material pits or of the roadway prism, the contractor shall immediately notify the Archaeological Branch, University of Arizona, by written notice.

SUPPLEMENTAL MATERIAL RELATING TO ALTERNATIVES

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The following is the text of the minority report of the PHOENIX FORWARD, Land Transportation Committee, including a Feasibility Study for A Mass Transit System.

January 20, 1970

The Rev. Culver H. Nelson,
General Chairman
Phoenix Forward Task Force
821 Municipal Building
251 West Washington
Phoenix, Arizona

Dear Mr. Chairman:

We are submitting herewith a "Statement by Members of the Land Transportation Committee of the Phoenix Forward Task Force." The members who signed this statement did not feel they were adequately represented in the goals submitted by co-chairmen Morton L. Monson, Jr., and J. R. McDonald.

As you know, procedural rules of Phoenix Forward called for a "clear and concise statement of goals." They also indicated that "if a sharp difference of opinion exists within a committee, and substantial numbers hold different points of view, the recorder's summary should indicate majority and minority positions." We feel these rules were violated in that there did indeed exist a sharp difference of opinion, and no indication was made in the final goals of majority and minority positions.

Several members of this committee spent literally hundreds of hours doing research for the committee, and their findings were completely ignored in the final draft of goals. The only other committee members to do like amounts of research were those funded by various grants and private companies, and the results of their research done in another capacity were reported to the committee.

The Land Transportation Committee consisted originally of 32 members. About 20 members attended 3 or more meetings. The average attendance at the meetings was about 15 or less. The 10 signers of the enclosed statement attended 3 or more meetings. Most of them were regular attenders. The original committee contained no mass transit experts or transit systems engineers. There were on the committee representatives of many local contracting firms, engineering firms, building suppliers, etc., who were directly involved in building streets and freeways for the city. Technical Assistants to this committee were men from City Hall, already committed to implementing an extensive system of freeways in our Valley.

We feel that the signers of this statement represent more nearly a majority position than a minority. They represent at least 1/2 of those attending 3 or more meetings, thus qualifying themselves to have an opinion, and the other 1/2 of the committee contained many persons already committed to building freeways for our area, and who could not be expected to have an entirely objective opinion about our transportation needs.

The goals of our committee probably do not represent the desires of the majority of the citizens, either. A recent poll by the Arizona Republic indicated only 33% of the citizens were in favor of auto-freeway transit. A marketing student at Phoenix College made a professional survey of more than 300 people in cities of the Valley, and 100% of them answered the question: Do you feel there is a need for public transportation? affirmatively. 88.6% said "Yes" when asked: Do you feel an electric subway would be beneficial to your health due to the decrease in smog? 2.3% were negative, and 9.1% were undecided.

Our intense concern is that the policy of building freeways in the cities of our Valley, and calling these freeways "mass transit" be reevaluated immediately. The plans for our Valley's transportation are extremely archaic, being laid back as far as 1960; when the environmental consequences of freeways in cities were not adequately

known. Now that we have experienced some of these consequences we feel the purpose for our committee's existence will be satisfied if we can move to prevent the future exploitation of the environment of Phoenix and her sister-cities.

Because the procedural rules were not honored, and a statement by the "minority" was not included in the goals submitted for our committee, we would like to leave to your discretion the disposition of our problem.

Very truly yours,

/s/ Gerard F. Judd

Gerard F. Judd

cc: Mort L. Monson, J. R. McDonald

A STATEMENT BY MEMBERS OF THE LAND TRANSPORTATION

COMMITTEE OF THE PHOENIX FORWARD TASK FORCE

January 5, 1970

Signed by:

/s/ Clyde E. Brown

/s/ Gerard F. Judd

/s/ _____ (8 following signatures not legible)

/s/ _____

/s/ _____

/s/ _____

/s/ _____

/s/ _____

/s/ _____

/s/ _____

A STATEMENT BY MEMBERS OF THE LAND TRANSPORTATION

COMMITTEE OF THE PHOENIX FORWARD TASK FORCE

January 5, 1970

When the Phoenix Forward Task Force was formed, it's [sic] Chairman, the Rev. Culver Nelson, stated that we must "move beyond the haphazard approach to community problems in which we face up to them only after they become critical." Many of our most serious problems are directly related to land transportation. It is necessary, therefore, to put these problems in their proper perspective.

Metropolitan Phoenix, unlike older cities, has developed with the automobile in existence. While this has allowed us to have a low population density, the dispersal of population which has been made possible by the automobile has, in turn, made us completely dependent on the private motor vehicle as a means of transportation. Presently in Maricopa County there are two motor vehicles for every three persons and these vehicles are used to meet every transportation need.

Thus while our population density is, indeed, relatively low, our motor vehicle density is relatively high and, of course, will get much higher as our population grows. And the use of these vehicles is also proportionately higher than in older cities with a well developed public transit system.

This rapid expansion of motor vehicles and their use has, in turn, created a new complex of difficulties for our urban living. We have now reached the stage where the sheer number of vehicles and it's [sic] side effects is resulting in ever increasing traffic congestion, air pollution, urban sprawl, noise pollution, traffic accidents, immobility of the non-driver, and the waste of precious resources.* It is virtually certain that if present trends continue most, if not all, of these problems <u>will become severely critical within the next few</u>

* For a more detailed discussion of these problems, see appendix.

years. As our population grows and we become a major city, it is obvious that continued dependency on the private motor vehicle to meet all of our transportation needs can only have increasingly deleterious effects and that if this is to be avoided something must be done to reverse this trend.

It is with alarm, then, that we as members of the Land Transportation Committe of Phoenix Forward, view the draft of our committee's goals as formulated under the direction of it's [sic] co-chairmen Mort Monson and Jim McDonald. We feel that these goals are not in harmony with the best future interests of Phoenix and her sister-cities in the Valley.

It is stated in these goals that the most "desirable" and "practical" form of transportation for Phoenix is the "flexible individual transportation unit, providing portal to portal services and individually controlled comfort and privacy and that "high quality service can be provided now by modern urban major street and freeway design." What this means, in essence, is that we should continue our present trend of depending exclusively on the private motor vehicle and instead of solving our problems we, in fact, further encourage the very process that is creating these problems.

Our studies indicate strongly that merely building improvements into our existing system of transportation, i.e. building freeways, adding smog devices on cars, etc., cannot hope to cope with the transportation needs of our city even in the immediate future and they are at best expensive palliatives for our transportation related ailments. But even if freeways did represent a solution, by 1980 when our population is expected to reach 1.6 million, we'll have fewer miles of freeway than we need right now to relieve congestion even "if everything goes right." (See appendix: (1) Traffic Congestion.) And it is estimated that by 1980 the total number of daily vehicle trips in the Phoenix metropolitan area will be more than double.

On the other hand, by making use of the available technology in public transit, combining recent innovations with greatly improved conventional means, really dramatic improvements in service are possible almost immediately which would offer us a degree of convenience that is not now available even to those who drive their own cars. Phoenix and the other communities of the Valley could be linked together in a way that would bring new freedoms and amenities to our urban living--for the dweller in South Phoenix as well as for the surburban housewife--for the one-car family and the no-car family. Since parking would be eliminated and congestion significantly reduced, public transit for many trips would be faster and cheaper than by private motor vehicle, especially in the years to come. And in addition to giving us greater mobility, it would virtually eliminate the adverse environmental and social effects as outlined in the appendix.

We do not believe that trend is destiny, but in the words of the Rev. Culver Nelson, "Phoenix is young enough in development and spirit to avoid some of the wrenching conditions which presently plague every major American city." We feel that Phoenix has a unique opportunity in that new technology and innovations in public transit are available now before the problems which face us become critical. Literally we can become the first major city in the world to really face and solve it's [sic] transportation problems.

Furthermore, we believe our federal, state and local governments have an immediate and pressing duty to protect the health and welfare of the residents of Phoenix. Since the construction of freeways in Phoenix will greatly encourage our dependence on the private motor vehicle as our means of transportation, we specifically recommend that before any additional freeways are built the City of Phoenix be required to provide a detailed statement concerning the adverse environmental and social consequences of such action and that an alternative plan be provided which would act to eliminate these

adverse effects, and at a reasonable time after publication of this statement a public hearing be held to discuss it.

Since the only alternative to a transportation system based on the private motor vehicle is one which will enable more people to move in fewer vehicles, we also recommend that the City of Phoenix, in cooperation with the State Legislature, immediately initiate action to establish a valley-wide Transit Authority and that the goal of this Authority be to immediately formulate both a short and long term transportation plan for the Valley.

The short term plan should be on a temporary, emergency basis with the object of alleviating peak hour traffic in our most congested areas by applying special purpose innovations in public transit and by upgrading the service of the regularly scheduled transit system.

It should be a matter of public policy to make certain trips (particularly for commuters to large work areas) more convenient, faster and cheaper by public transit than by private car. And since the net result of such a policy would be beneficial to the community at large in terms of less overall congestion and greatly reduced air pollution levels, as well as other related economic and social benefits (see appendix), it would be appropriate for all levels of government to support it financially in proportion to their ability.

Simultaneously, steps should be taken to formulate a long term plan in order to cope with our projected population growth. The approach to this plan should be for the Transit Authority to contract on bids a firm, experienced in systems technology, to design and manage the construction of a Valley-wide transportation system. The specifications in the contract should be that such a system meet the following requirements: (1) it should eliminate traffic congestion; (2) it should be non-polluting, both in regard to noise and air pollution; (3) it should discourage urban

sprawl; (4) it should provide mobility for the non-driver; (5) it should be compact so as not to waste space and lose revenue in property taxes; (6) it should be fast and convenient to the user; (7) it should be economical in terms of the amount of natural resources needed to operate it; and (8) that such a system be completed within 5 years of approval.

If the end product of the Land Transportation Committee's goals is, as stated, "the provision of adequate facilities to serve the public and retain a high quality of urban living," then we feel it is essential that, at the minimum, the steps as outlined above be taken <u>with all deliberate speed</u>.

In such a complex phenomenon as land transportation the average motorist cannot be expected to be aware of all the factors involved and there is no use denying that the best interests of the community do not always coincide with the vested interests of quite powerful groups, or with the desires of citizens who have not studied the problem thoroughly. The task before us of educating the citizenry of Phoenix to our real needs and building a transportation system as recommended in this report will certainly not be easy, but in the words of Gunnar Myrdal:

"Foresight and planning to improve the outcome of the development that we foresee, particularly action to avert dangers ahead, is the essence of whatever rationality there is in human life."

Appendix

Factors to be Considered in Planning Transportation for Phoenix

1. Traffic Congestion.--The streets of Phoenix are now carrying up to 30% more traffic than their designed capacity and are 12% more crowded with vehicles than they were just a year ago. The downward trend of average peak hour speed has gone from 30 mph in 1957 to 24 mph today and it is estimated that with the projected increase in vehicles it will be only 15 mph in 1980.

Garry Driggs, vice president and economist for Western Saving states that this is the No. 1 problem of Phoenix. If we don't do something about it, says Mr. Driggs, our economy will slow down and Phoenix will "become famous for it's [sic] traffic snarls the same way Los Angeles is."

The committee's goals state that "high quality service can be provided now by modern urban major street and freeway design." But Phoenix Streets Administrator, Ed Hall, testified before the committee that "we are going to be without the freeway system we need well into the late 70's and early 80's no matter what we do." Apparently this was optimistic because by 1980, when the population is expected to be 1.6 million, "if everything goes right," continued Mr. Hall, we'll then have 56 miles of freeway, or less than the 70-80 miles Mr. Hall says we need right now. Mayor Graham recently summed up the situation when he admitted that "we're going to have to mend a surgical wound with band-aids."

It would seem obvious, then, if we continue to rely solely on the private motor vehicle as a means of transportation, traffic congestion will become severely critical within the next 2-5 years, and that the committee has not realistically faced this problem. Even if we were able to get all the freeways we want and when we want them, most transportation experts are agreed that merely adding freeways which will attract more automobiles, which in turn require more freeways

is no solution to the problems of urban development. This has been demonstrated in Los Angeles where, despite the nation's most ambitious highway building program, the city still faces motorized chaos.

We believe that to solve this problem we must look to other forms of transportation in which more people can be moved by fewer vehicles and that we must immediately devise a way to do this, particularly during peak hours and within our most congested areas.

2. Air Pollution.--The overwhelming source of hazardous air pollution in the Phoenix area is the private motor vehicle. The great numbers and use of these vehicles combine with the topographical and meteorological conditions of the Valley to make air pollution a serious threat of increasing significance to our health and welfare. At the present time and for at least the past several years we have frequently been subjected to levels of automotive air pollution which far exceed what is considered reasonable from the standpoint of public health, to say nothing of the aesthetic problems of smog and dirt. If present trends continue, the projected increase in traffic within the next 10 years could well produce a situation assuming emergency proportions. Therefore a solution to this problem is needed almost immediately.

The committee recognizes this problem, but believes it can be solved through placing emphasis "on producing technological innovations," i.e. the anticipated production of a non-polluting vehicle. Most experts are agreed that a breakthrough in this approach is at least a decade away and even then there can be no guarantee of success. Furthermore, when and if such a breakthrough is achieved it will probably be another decade before benefits will be widely felt since the life-span of the average car is 10 years.

It would seem certain from the apparent remoteness and uncertainty of this approach that it would be unreasonable to rely solely on it as a solution. The risks are too high

for that. We would agree with the U. S. Department of Transportation's advice to also pursue the approach of reducing the use of pollution-prone vehicles by use of transit travel. It is estimated that if just one-half the commuting motorists would use public transportation, this alone would reduce pollutants from the automobile to about 1/6 the present levels, and the technology to accomplish this is available now.

3. Urban Sprawl.--When the Land Transportation committee began formulating it's [sic] goals, it was agreed that they should be coordinated with those of the Urban Form Committee of Phoenix Forward because of the direct relationship between transportation and urban form.

One of the specific findings of the Urban Form Committee was the recognition of our present unchecked urban sprawl with it's [sic] accompanying monotany [sic] of the city's texture and with all the related undesirable physical and social characteristics of a Los Angeles type city. It was also recognized that the urban sprawl city is stimulated and developed by a singular dependency on the automobile as the only effective means of public transportation. The committee concluded that the formless, non-centered, sprawling, uneconomical city inevitably produced by this process cannot be the Phoenix of tomorrow.

Recognizing this existing trend and specifically moving against it, the Urban Form Committee established two important goals: (1) "Discourage urban sprawl and guide and control the orderly growth and expansion of the city to insure a centrally oriented community and an optimum usage of land;" and (2) "Develop an effective and rapid metropolitan mass transit system as an integral factor in determining urban form."

Thus the goals as stated of the Land Transportation Committee are in direct conflict with those of the Urban Form Committee. It should be noted that the Land Transportation Committee was informed of these goals prior to the establishment of it's [sic] own goals.

4. Noise Pollution.--Dr. Samuel Rosen, consulting ear surgeon at Mt. Sinai Hospital in New York City, terms noise "one of our most severe health hazards." The overall loudness of environmental noise is doubling every 10 years and Dr. Vern O. Knudson, a man who has spent 40 years studying sound, contends that if the noise level we live with today continues to increase at the same rate for the next 30 years as it has for the last 30, it could become lethal.

It is an established fact that motor traffic constitutes the principal source of noise in urban areas such as Phoenix and that noise can even be harmful when it is not consciously heard. The committee recognizes this problem, but it's [sic] solution--"the design of transportation systems should aim toward eliminating offensive noise"--seems remote and vague. In essence, the blame is shifted to Detroit, and in the meantime we encourage more traffic and more noise. It should be noted that, as in the case of air pollution, if and when a silent car is designed, it will probably take at least another decade before benefits will be widely felt. And, as in air pollution, the problem is now. At the present time it is only by decreasing the use of the automobile through increased transit travel that noise from this source can be effectively reduced.

5. Transportation Safety.--Dr. William Haddon, former director of the National Highway Safety Bureau states that we as a nation are "injuring almost precisely 10,000 people each day as a byproduct of operating our roads." These injuries, says Haddon, are "far and away the leading form of violence in American life, exceeding the aggregate of all crimes of violence by nearly 10 to 1."

Over 70% of all traffic accidents in Arizona occur in urban areas. In greater Phoenix there were 25,434 accidents in 1968 with over 16,000 people injured and over 12,000 of these accidents involving "major" property damage.

The approach of the committee to this problem--traffic engineering, driver education, and enforcement of traffic laws--appears to us to be totally inadequate. This is the approach we are using now. It is inadequate now and it most certainly will be inadequate as our traffic doubles. On the other hand, a reduction of the use of vehicles by use of transit travel would proportionately reduce the chances for accidents.

6. The Immobility of the Non-Driver.--The committee recognizes that the young, old, disabled, disadvantaged and others are not able to obtain satisfactory transportation in our automobile-oriented system. This situation will be further aggravated if the legislature decides to adopt a tougher attitude toward the physical minimum to qualify for a driver's license. And if tougher inspection laws are adopted to regulate the amount of pollutants emitted by automobile exhausts, a number of people who can't afford to fix their cars will also be denied transportation.

The committee believes that these people "must be provided some form of transportation," but it specifies that any public transit system that would do this should be self financing. An adequate system would have to be on an area wide basis, and so long as the vast majority of people are being encouraged to use private motor vehicles it seems unrealistic to think that such a system could possibly pay for itself. If the recommendations of the committee are followed, the already inadequate public transportation we now have will further deteriorate and the "transportation poor" will be further isolated from the community, denied the mobility needed for full access to the city's opportunities for employment and it's [sic] cultural and social amenities.

We feel the city has the major and presently ignored responsibility in this matter and that it is yet another reason for an effective public transit system.

7. Waste of Resources.--According to Dr. Charles F. Park, Jr., professor of geology and of mineral engineering at Stanford University, the world population may already be far beyond the level that, in the future, could be supported by this planet's limited resources. The proliferation of automobiles and freeways represents a useless waste.

The average automobile, in metals alone, consists of nearly 2 pounds of magnesium, 23 pounds of zinc, 32 of lead, 36 of copper alloys, 70 of aluminum, and over 2,600 of iron and steel. In addition, oil and gas reserves are running out according to the National Research Council, which states that nuclear power at the moment offers no permanent answer to impending power shortages.

So long as there is no effective alternative to the private motor vehicle we are, in effect, encouraging the waste of materials on a gigantic scale. On the other hand, if we had a good public transit system, families would no longer be forced to operate two or more vehicles in order to function and could thereby help significantly to alleviate this problem which can no longer be ignored by those who have a responsibility for planning.

Conclusion.--The committee recommends that transportation planning for the future "should define the total costs occasioned by each transportation system and delineate upon whom the various costs will fall." We agree and have tried to indicate what a few of these costs are when the transportation system is the private motor vehicle. A recent study in Washington, D.C. showed that each additional automobile entering the downtown area in the rush hours requires additional investment in street and parking space of about $25,000. This would come to about $4.00 per round trip for each such car. Other costs which should be considered are (1) traffic control; (2) traffic engineering; (3) losses to central Phoenix in terms of development; (4) losses in property tax revenue in land taken for freeways and parking lots; and (6) [sic] the total cost to the individual motorist for operating and maintaining his vehicle.

We believe that when all of these costs, both purely financial and social are considered and compared to the costs and benefits of an effective public transit system, the savings which would result from such a system would ultimately more than pay for it.

A MASS TRANSIT SYSTEM for

MARICOPA VALLEY

MARICOPA VALLEY TRANSIT CORPORATION

under

MARICOPA VALLEY TRANSIT AUTHORITY

Feasibility Study Prepared for
the Land Transportation Division
of Phoenix Forward Task Force

September 16, 1969

Gerard F. Judd

Abstract: A mass transit system employing underground and surface railway is proposed as a Maricopa Valley Transit System to be operated under Maricopa Valley Transit Authority. It is to be supplemented with automobile, maxicab, commuter pools, computerized bus, bicycle, walking and other short distance portal-arrival modes, as well as giant parking lots adjacent to portals. This system when completed with [sic] cost about $1.8 billion dollars and furnish much faster, more convenient, cheaper and cleaner transportation than the auto. A map with successive stages of the lines is presented with estimated times of travel, headways, portal separation distances, construction schedule and specific costs.

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A MASS TRANSIT SYSTEM for MARICOPA VALLEY,
MARICOPA VALLEY TRANSIT CORPORATION under
MARICOPA VALLEY TRANSIT AUTHORITY

1. Comparison, car and mass transit method of travel

Automobile travel rates are down to a low average of 24 mph in the Valley, with downtown rush travel rates at 5-15 mph. Delay is common throughout the valley with 15 mph, 25 mph, and 35 mph speed limits prohibiting progress everywhere. It is estimated the average peak hour speed in 1980 will be 15 mph![1] Numerous people are without even the poor transportation of the auto due to poverty or untoward circumstances. Pollution of the air, 80-85% caused by the car, is intolerable and a great hazard to health.

It would seem that there should be an emphasis away from freeways in the city proper.[2] The Papago Freeway should not be built because it will shove a large load of traffic into downtown Phoenix, bring a high noise level to the areas near our libraries and desirable high-rise areas, pollute the air further, provide an eyesore contrary to what her builders claim, further confuse the inner-city development plans by requiring more parking and ambulating space for the car, and pave over more of our desirable city. Freeways have a purpose, but it would seem sensible to circumscribe the city, not ruin it.

What then, is an acceptable alternate to carapace transportation in terms of Mr. John Doe, the average citizen? It would appear that by looking at the inefficient method of the car, where one lane of a rail line could replace 21 lanes of freeway traffic would look attractive to him. Further, he should be impressed by huge economies already alluded to.[2] There is little question

1. Ed Hall, City Streets Manager
2. Clyde Brown, The Automobile and Freedom of Choice in Phoenix

that he would be singularly happy to be left in the pure air left by the demise of the auto and to leave to himself more space for living. A single car requires as much space to operate in a city as a family does to live in (2400 sq. ft.).

A 65 mph average rate should easily be attainable in a rail system using transit cars with the routes carefully planned through the entire valley. To negotiate small distances about 1,000 buses and minibuses in conjunction with the system should bring travel to within a few blocks of all citizens in the confines of Maricopa Valley. Computer systems should put average rates at 50 mph, better than twice our present average car rate, and 4-5 times the speeds in downtown Phoenix. Furthermore there would be no pollution with electric-powered cars.[3]

There can be little doubt that people would leave the car for such an efficient system. Studies have proven people will gladly leave their cars home if a suitable transportation system is available. Last year in Toronto, which has a large auto traffic as well as probably the best transit system in the world for a moderately sized city, 11 million people rode the subway for the first time. Their 2200 vehicles move about 1 million people daily. Our system could be better than their system, because the stops necessary in the congested system create delay which lowers the average speed of their subways tremendously.

Much information is available on successful transport systems.[3-7] We have taken the viewpoint that a major high speed artery out of the way of street traffic would

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3. G. F. Judd, Successful Transit in Toronto
4. G. F. Judd, Report on Cleveland Rail Transit System.
5. SEPTA, A Successful profit-making rail transit system.
6. Paris subways, current financial reports and descriptive information.
7. Pennsylvania line from New York to Washington.

be the only possible way to solve the problem. We used Toronto[3] as sort of a model since they have a very successful system employing subways, streetcars, trolleys and buses. We also took cognizance that much of Maricopa Valley was still open land with large concentrations of population in between. We also went on the thesis that there was much available know-how in the way of cars, computerized transit systems, etc. in the general public and corporations to negotiate small distances quickly. We also went on the hypothesis that carapace transportation, i.e., 1 car, 1 person was untenable in the city, either for transporting large numbers of people or for eliminating air-pollution. It has been established that a single rail transit line is equivalent to 21 lanes of freeway traffic. It has also been shown that as soon as a freeway is completed, it is crowded past capacity, loads up arteries and side streets and creates a whole new series of problems and expenses. A mass transit system such as the one we envision could carry all possible loads far into the 21st century.

Our main object was to eliminate delay caused by the congestion of the car and short stops, and assure ourselves of a system with very high speed capability. It was necessary after considerable evaluation of information to reject high speed (over 40 mph) rubber-tired transportation as unproven and probably impractical because of experience with the monorail and the attendant vibration and sway connected with the "air-cushion" of a high load. We also rejected overhead transit for the same reason in addition to the fact that experts say it is not amenable to large loads,[8] and makes a very unattractive appearance. The top planned speed of 75 mph for the monorail has never been reached in practice, either here in the United States or in Japan where it is in operation. Sway begins in the loaded monorail in Japan at 35 mph. Seventy-five miles per hour is also a

8. Ross Kelly, Toronto Transit Lines Public Relations Agent.

very low top speed compared to rail transit, which is supposed to reach 154 mph and does reach 132 mph in practice in Japan.

A figure of 110-125 mph for top speed levels with 65 mph average can easily be achieved over the long stops in the lines planned.

2. Organizing Maricopa Valley Transit Authority and Maricopa Valley Transit Corporation.

The following steps are felt to be vital in organizing a successful transit system in Maricopa Valley:

(1) Immediate and intensive education of the public.
(2) Vote to ascertain whether citizens want mass transit in all cities.
(3) Disband MAG and VATTS
The Mayor of Phoenix should disband MAG and VATTS, which were set up to get government funds for building streets and freeways. He should try to get cooperation from the other mayors and principals in the cities through a series of meetings for support of the mass transit principle. Decongesting the streets and solving the air pollution problem should draw those persons together in a common cause.
(4) Maricopa Valley Transit Authority should be organized formally (by cities).
(5) Maricopa Valley Transit Corporation should be organized with a group of about 3-5 men to conduct the operations of the lines.
(6) There should be an operational division, a research division and a public relations division to keep balance in expansion vs present service.

3. Position of the Lines; Order of Completion

It is realized that an origin-destination study in detail is needed to pin-point people transit a little better, but it is felt that great usage will occur anyway,

and usage of one design over another will be very minor. It was claimed by a county official that an origin-destination study was made back in 1964, but it is too far out of date to be applicable now. The lines were set up as follows to give the greatest possible usage.

(1) Origin-Destination Questionaire [sic]: This questionaire [sic] is to be sent out to all registered car owners this year, with a map pinpointing their own domicile and places of destination and questions about whether they would leave their car and whether they need transportation. Such a study is so long overdue that it is ridiculous not to have the information. The suggested form is shown on page [sic]

(2) STAGE 1:

1. Airport Line. Between McDowell and Thomas Road. Buckeye to Scottsdale with branching line at 32nd street going south under Sky Harbor airport; thence to Tempe, by Transmission Road to Apache Junction. 75 miles

2. 7th Avenue Line. From South Mountain (Dobbins) to North Mountain (Cactus Road). 18 miles

Total Miles in First Stage: 93

(3) STAGE 2:

1. Paradise Valley Line. Between Olive and Northern. Luke Field to Paradise Valley (Pima Road). 26.8 miles

2. 76th Avenue Line. Lower Buckeye to Peoria (Thunderbird Road). 13.1 miles

3. Pima Road Line. Chandler (Williams Field Road) to Carefree (Bell Road). 90 miles

4. Litchfield Park Line. Avondale-Goodyear (Lower Buckeye Road) to Luke Field. 10.3 miles

Total Miles in Second Stage: 74.2

(4) STAGE 3:

1. Maryland Line. Between Bethany Home and Camelback. Litchfield Park to Apache Junction. 38.5 miles

2. Thunderbird Line. Litchfield Park Road to Paradise Valley 29.5 miles

3. Buckeye Road Line. Litchfield Road to Tempe (Kyrene Road). 24 miles

4. Warner Road Line. 56th Street to Powers Road. 15.2 miles

5. 58th Street Line. Between 56th Street and Kyrene Road. Warner Road to Deer Valley Road. 23.5 miles

6. 32nd Street Line. Baseline Boulevard to Deer Valley Road. 18 miles

7. 7th Avenue Line Extension. Thunderbird Road to Deer Valley Road. 4.35 miles

8. 43rd Avenue Line. Baseline Road to Deer Valley Road. 16.4 miles

9. 75th Avenue Extension Line. Thunderbird Road to Deer Valley Road 4.35 miles

10. 107th Avenue. Southern Avenue to Deer Valley Road 18.5 miles

11. Litchfield Park Line Extension. Luke Field to Deer Valley Road. 8.7 miles

12. Cooper Road Line. Pecos Road to Shea Boulevard. 19.7 miles

13. Williams Field Line. Williams Field to Maryland. 13.3 miles

14. Pima Road Line Extension. Deer Valley Road. 2 miles

Total Miles in Third Stage: 236

Total Mileage in First, Second and Third Stages: 403

(5) STAGE 4:

A research and public relations group in conjunction with citizen groups should keep abreast of community growth so as to keep up to date in construction. They should anticipate areas which need attention.

4. Above Ground, Below Ground Schedules and Costs.

(1) Purpose of Above Ground Construction.

A key factor in planning the MVTC system is to put it into operation as soon as practicable, to obtain experience, build up ridership, eliminate hazards such as pollution, install efficiencies and obtain revenue needed in the process.

It was felt this could be achieved readily by purchasing twice the needed right of way for the sub line. Rails could immediately be laid alongside the portion later to be dug and as the subway was completed, the tracks could be moved underground. Once completed, the entire right of way could be sold back to the property owners, leaving only ventilation bays exposed. This type of operation was proven to be acceptable to property owners where Bart was built in San Francisco and has worked out very well economically.

Overpasses would be necessary every mile in some places, but only at very scarce intervals in others in order to give the lines closed right of way. It is felt desirable to build a shell over the line in order to prevent various kinds of vandalism and criminal acts.

The overpasses would later be useful to speed up auto traffic.

If we wait a few more years, we will lose the advantage of having open fields to lay tracks in. Wherever we now have streets, it is suggested that the lines be moved several hundred yards from the designated lines in the map. This is

because it costs far more to dig up a street, move associated utilities and disrupt traffic than it does to buy up right of way and then later sell it back.

The automobile should give way to the mass transit system and not vice versa. This is why the overpasses are necessary. The cost should be borne from funds already allocated to highway construction, for example, the proposed Papago Freeway.

(2) Costs of a Double Line.

Costs of a double line (8 single rails) are not double, but an estimated 1.7 times that of a single line.[9] Therefore it is proposed that a double line be constructed as the Airport Line, and the 7th Avenue Line, so that there could be both a local and a limited express system on these important arterials, which will collect traffic from all the other lines. This will prevent congestion in rush times and fill all needs late in the 21st Century. Otherwise, we may find ourselves wanting to build another tunnel parallel and alongside these lines later on.

(3) Emergency Updating of Transportation

Senior citizens, indigents, students and others demand a solution to the transportation problem immediately, rather than when the lines indicated are completed.

Buses and minibuses will be needed on the new lines. It is estimated that 1000 of these will take care of the needs for short space bussing once the lines are completed. This estimate is made on the basis of the number of vehicles serving Toronto (2200). These buses could be purchased immediately and put into service through some arrangement with the Phoenix Transit Corp. The Phoenix Transit Corp. should also be given help of a computer-electronics travel programming group.

9. Mr. John Fowler, Tanner Construction Co., estimate.

Several streets in the Valley should be made one-way in order that the buses put on these lines could travel at high speeds without interference of traffic, and with the light systems programmed in such a way as to give them preference to auto movement. Thus our present citizen's transportation would be assured and experience in programming transportation could be built up. Of course, the rate of travel on such a line would still be only about that of the automobile (24 mph average), but that is better than having to be completely without transportation. When the lines were completed, the buses would be redistributed in such a way that the headway would be 10 minutes or less on fixed lines, and much less than that on those lines programmed by passenger selection.

(4) Type of Buses to Purchase.

The type of bus to be purchased is important. It is expected that steam or freon-driven buses which do not pollute the air so badly will be available in the next year or two. It is important not to purchase too many internal combustion-driven buses, because they will soon be obsolete. It is felt battery-powered buses will never be used because the efficiency of the system is only around 10%, whereas the internal combustion engine has an efficiency of around 30% and the steam engine-turbine combination around 40%. Fuel cell systems will probably not be suitable because of the difficulty which is had with these high temperature systems in making a stable cell except from hydrogen and oxygen. It is not felt that the public can be expected to use hydrogen and oxygen for such cells.

Steam or freon-driven buses will be powered by the heat from normal petroleum products. The buses should have adequate power for good air conditioning.

5. Time Table for Construction of Mass Transit System

1. Organizing: Complete by March 1971.

2. Financing: Autos assessed by March 1971.

3. Purchase buses: September 1971.

4. Complete architectural plans for lines: September 1971.

5. Let contracts for above ground and below ground construction: March 1972.

Stage 1: (complete by Marcy [sic] 1974) (surface line by March 1973).

Double Airport line:
20 miles tunnels
55 miles surface rail

Double 7th Avenue Line:
8 miles tunnels
10 miles surface rails

Stage 2: (complete by March 1974) (surface by March 1973)

4 lines of 74.2 miles to be completed

Stage 3: (complete by March 1979) (surface by March 1974)

14 lines of 236 miles to be completed

6. Purchase Streamlined Subway Cars. March 1973

The time table for construction of tunnels is such that approximately 80 miles per year would be built, or that 403 miles could be built in 5 years, following installation of the surface lines.

6. General Costs of Items

1000 buses, fully air-conditioned, half mini buses:

1000 x $50,000	$50 MM

Computerizing the system and installing 2-way electronic communication	$30 MM

123 Steel, fully self-powered, air conditioned rail transit cars, 80 passengers

123 X $170,000	$210 MM
Right of way: 60 feet (7.36 acres) ($2500-$7500 per acre)	$36,800 per mile
90 feet (11 acres)	$55,000 per mile

Overpasses: $300,000 per mile

Administrative costs: 9.4% $43,200 per mile
(includes architect and engineer and executives)

Total
(Surface Rail, single line) $533,300 per mile
double line $560,000 per mile

Subway under city: $20,000 per mile (includes stations)

Subway on outskirts:

Cut single line	$375,000	(average of $200-$500,000)(Tanner)
double line	$640,000	(factor 1.7)(Tanner)

Install, complete:	
single line (without stations)	$750,000 per mile
double line (based on many tunnels, where completed tunnels usually can twice the cost of tunnelling)	$1.28 MM per mile
Right of Way:	
single line:	$36,800 per mile
double line:	$55,000 per mile
Stations: Every 4 miles: $1.6 MM each	$0.4 MM per mile
Move Utilities: $75,000 per mile	
Overhead: 9.4%	
65 miles of double	$120,000 per mile
9.4% 312 miles of single	$81,000 per mile

Total per mile:

Double	$1.98 MM per mile
Single	$0.94 MM per mile

7. Specific Expenditure

Stage 1:

Double Airport Line:
20 miles tunnels x $20 MM/mile=$400 MM
55 miles surface rail x $0.560=$30.5 MM
55 miles (double line) x $1.98=$109 MM
Double 7th Avenue Line:
8 miles tunnel x $20 MM/mile =$160 MM
10 miles surface rails x $0.533=$5.33 MM
10 miles double sub x $1.98 =$11 MM

Total for Stage 1: $715.8MM

Stage 2:

4 lines of 74.2 miles:
Surface, single line x $0.533 =$39.6 MM
Subway, outskirts: x $0.94 =$70.0 MM

Total for Stage 2: $109.0 MM

Stage 3:

14 lines of 236 miles:
Surface, single x $0.533 =$126 MM
Subway x $0.94 =$222 MM

Total for Stage 3: $348.0 MM

Operating Expense for 7 years:

Assume 250,000 passengers per day, 4 trips per passenger, 0.25 cost per person-trip per year $90 MM
7 years $630 MM

Total Cost of Subway: $1.80 Pillion [sic]

8. Secondary Feeders

(1) Buses. These buses should be purchased as soon as possible after the MVTC can be organized. They should be put on a computerized system where telephoned instructions can be fed to a central office, the signals collated there, a signal fed to a bus in the area as to designated pick-up points, and signals fed back to the citizen

as to where he would be picked up and when. Mini buses should be used where clientele is small.

(2) Stations: These should be provided by parking lots, preferably constructed by the shopping centers. They should be constructed with auto and bicycle parking space. They should have a drive-through area so that passengers could be deposited. They should be so constructed that the passenger would have a coded card which would trip the gate, and send a signal to the central office that a trip was being made. Plenty of space should be allowed to enter the subway portal, since it was the experience in Toronto that they did not have enough and had to reconstruct. Cards will prevent theft and facilitate record keeping.

(3) On Train Communication: The train should have a means of transmitting a signal to the central office that the individual desires to get off at a certain point. This signal would be activated by the individual through use of his card. Thus, any vandalism or jimmying of the system would be prevented.

9. Efficiencies in Planning

Planning is extremely important in saving moneys in constructing the MVTC system. The following items are to be considered in advance and implemented at the correct time:

(1) Eliminate feasibility studies. Many studies have already been made, and our need is urgent. Begin education of the public immediately.

(2) Obtain right of ways as soon as possible so lines can cover the entire valley. Purchases [sic] them with the provision they will be sold back when the subway is complete.

(3) Ask for businesses who want portals under their business and who will provide parking space, to apply.

(4) Build rails on all lines where there is no right of way problem. (see the map) Where there are streets, move a few hundred yards and build lines. Purchase 30, 60, or 90 feet of right of way so that subway construction can continue concurrently with operation of the surface lines.

10. Financing, Method and Amounts. Time Table. Borrowing and Paying for the Debt and Lines.

It is the philosophy of the researcher that the system to serve the Maricopa Valley should be paid for by the car-owners and the riders who do not own cars. It is believed that they both should be assessed the same. The reason for this philosophy is that the hidden costs of the auto to the city are about 3-5 times what the auto assessment tax is anyway, and therefore it is wise to consider that the subway transit system could be easily built out of these hidden costs. Consider a car, for example, which pays $70 for registration. The total cost would therefore be $210-350 to the city. It would therefore be easy for the owner to pay a mere $100 annually to support the system construction.

Another feature of this problem is that the car owner is contaminating the atmosphere of the city with 7 pounds of carbon monoxide per day and he should either discontinue this practice by riding the mass transit, or pay the cost of reclaiming it, and returning pure oxygen and nitrogen to the atmosphere. It is estimated that this cost would be at least 1000 times the cost of oxygen, which is 7 x 0.264 or $1.80 per day. Thus the cost to the car owner would be $1800 per day.

The advantage of paying a fee on the car in return for high speed, cheap transportation is very evident to the normal citizen. Only freeway-builders stick to the silly concept that the car owner should only be charged for fees to construct streets, on which they travel. It would seem that the car owner, who requires as

much room in the city to move his car as he does for his house, has just as much obligation to pay taxes for city affairs as the home owner. This is especially true when he is using the city sky for a garbage can, and the city streets to cause the city, state, county and property owners, and even the hospitals, police department, coroner and others tremendous expense.

It has been decided, then, to charge the car owner $100 the first year and in turn, give him credit to ride the lines for a year. Perhaps there should be some limits set on the total number of trips that could be taken by each car owner, and a charge made on those trips above that, but in general, he should be permitted to travel freely on the lines with his card.

Since there is an inflationary trend always in motion, this has been considered in calculating the money to come in from auto registrants. Current registration of cars was used for the first year, a 7% growth rate considered (this year was 12%) for the first 6 years, 3% the next 9, and 2% from then on.

The following schedule of income ensued:

							Annual	Total
1971	$100	x	.62	x 10^6	=		$ 62MM	$ 62MM
1972	$108	x	.67	x 10^6	=		$ 72MM	$ 134MM
1973	$116	x	.72	x 10^6	=		$ 83MM	$ 217MM
1974	$125	x	.77	x 10^6	=		$ 96MM	$ 313MM
1975	$134	x	.82	x 10^6	=		$109MM	$ 422MM
1976	$143	x	.87	x 10^6	=		$124MM	$ 546MM
1977	$152	x	.92	x 10^6	=		$140MM	$ 686MM
1978	$162	x	.97	x 10^6	=		$157MM	$ 843MM
1979	$172	x	1.0	x 10^6	=		$172MM	$1015MM
1980	$182	x	1.04	x 10^6	=		$189MM	$1204MM
1981	$192	x	1.09	x 10^6	=		$209MM	$1413MM
1982	$202	x	1.12	x 10^6	=		$226MM	$1639MM
1983	$212	x	1.15	x 10^6	=		$243MM	$1882MM
1984	$222	x	1.18	x 10^6	=		$262MM	$2144MM
1985	$232	x	1.21	x 10^6	=		$280MM	$2424MM
1986	$242	x	1.24	x 10^6	=		$300MM	$2724MM
1987	$252	x	1.26	x 10^6	=		$318MM	$3042MM
1988	$262	x	1.28	x 10^6	=		$335MM	$3377MM
1989	$272	x	1.30	x 10^6	=		$353MM	$3730MM
1990	$282	x	1.32	x 10^6	=		$372MM	$4102MM

			Annual	Total
1991	$292 x 1.34 x 10^6	=	390MM	$ 4492MM
1992	$302 x 1.36 x 10^6	=	408MM	$ 4900MM
1993	$312 x 1.38 x 10^6	=	426MM	$ 5326MM
1994	$322 x 1.40 x 10^6	=	444MM	$ 5770MM
1995	$332 x 1.42 x 10^6	=	462MM	$ 6232MM
1996	$342 x 1.44 x 10^6	=	480MM	$ 6712MM
1997	$352 x 1.46 x 10^6	=	498MM	$ 7210MM
1998	$362 x 1.48 x 10^6	=	516MM	$ 7826MM
1999	$372 x 1.50 x 10^6	=	534MM	$ 8360MM
2000	$382 x 1.52 x 10^6	=	552MM	$ 8912MM
2001	$392 x 1.54 x 10^6	=	570MM	$ 9482MM
2002	$402 x 1.56 x 10^6	=	588MM	$10070MM
2003	$412 x 1.58 x 10^6	=	606MM	$10676MM
2004	$422 x 1.60 x 10^6	=	624MM	$11300MM
2005	$432 x 1.62 x 10^6	=	642MM	$11942MM
2006	$442 x 1.64 x 10^6	=	660MM	$12602M
2007	$452 x 1.66 x 10^6	=	678MM	$13280MM
2008	$462 x 1.68 x 10^6	=	696MM	$13976MM
2009	$472 x 1.70 x 10^6	=	714MM	$14690MM
2010	$482 x 1.72 x 10^6	=	732MM	$15422MM

It is anticipated that the following schedule will be followed in raising funds:

(1) Organize MVTA by March 1971
(2) Autos assessed by March 1971
(3) Funds acquired through bonds by July 1971

Half of the funds received should be used in paying off loans and half should be used to pay off costs due to the construction.

Interest costs (8.5%) will run the construction-operation costs from 1.8 billion to 3.4 billion, assuming 10 years pay-out. This does not include revenue from a large bulk of extra non-car owner riders.

Lest someone think the costs here are exhorbitant, let him consider that over 234 miles of freeway costing possibly 7 billion planned for the year 1990 for the Phoenix Valley would run into a total cost, with interest, of 19 billion dollars (20 year pay-out at 8.5%). Of course, this type of transportation does not pay for itself like the MVTC.

11. <u>Possibilities for an Improved Phoenix</u>

(1) Poverty vs jobs

There is no despair like the one created when it is impossible to reach a job because you do not have a car, cannot afford one, and cannot afford the expense to keep up a car. With the advent of a rapid transit, the poor can be educated to know how to improve themselves, with the hope that if they do, they can reach some type of employment without the deterring factor of transportation. By improving themselves, they will improve those around them, and hopefully create a much better community.

(2) Schooling vs the car

There are numerous students who enter college and are working long hours just to support a car. An alternative to that is that they spend long times fixing the car, miss classes and flunk their courses. The transit system will not dislocate all their troubles, but it will give them a better chance to choose whether they will spend their time on the car or on lessons.

(3) Disabled and old age

These people are sitting right next to us everywhere we go, and we just ignore their impossible situation of not having adequate cheap transportation. We think in the back of our head that they can drive until they drop dead, just because "my dad is 85, and he still drives a car." It is a pity that our city leaders have not listened to the problems of this large class of people and provided them transportation. We are about 50 years behind the times in doing this.

(4) Unlicensed citizens

The courts do not want drunk people to drive, or those who drink heavily, and so they suspend the licenses of people caught in such condition. Then they proceed to issue special permits for these people to drive to work and endanger the lives of others. These people should not drive, and the mass transit would then give them a further choice.

There are numerous other unlicensed citizens who should not be kept from travelling with as great mobility as those who drive. Young people under 16, blind, deaf and incapacitated, very old, nervous drivers constitute a few of these. When these persons are forced to drive it endangers all of us, at tremendous public expense.

(5) Visitors

Visitors to Phoenix come in on buses, planes, trains, or by other non-auto methods. They have a real problem of transit in Phoenix. The high speed transit line would help them carry out their assignments.

(6) Air Traffic

Thousands of people go through Sky Harbor and other local airports daily and find themselves stranded and overcrowding facilities.

Recently it was decided in the ligislature [sic] to have a Master Plan to handle air traffic in the area. To have a rapid transit system as the one we envision to handle air traffic would give us a capability not found in any other area in the United States.

(7) Community Solidarity

Cooperative citizen programs are expensive and difficult to handle because people who can teach and help others are frequently unable to quickly reach those who are asking for the help. This bottleneck would be alleviated by the MVTC.

(8) Cultural Attendance

It is a known fact that ball games, concerts and community cultural activities are less well attended in the west than the east. This has been attributed to the fact that people do not wish to carry their car to such affairs and have to find parking. We would immediately see a change for the better with the coming of MVTC.

ORIGIN-DESTINATION QUESTIONAIRE [sic]

(Revised 11-29-71)

(Fill out one for each travelling member of each family. Please indicate your origin by number and destination by number in the following questions. Select numbers placed closest to the selected geographical location you wish to designate.) Indicate every O-D trip in separate squares. (2 for round trip) (See 18 A for map)

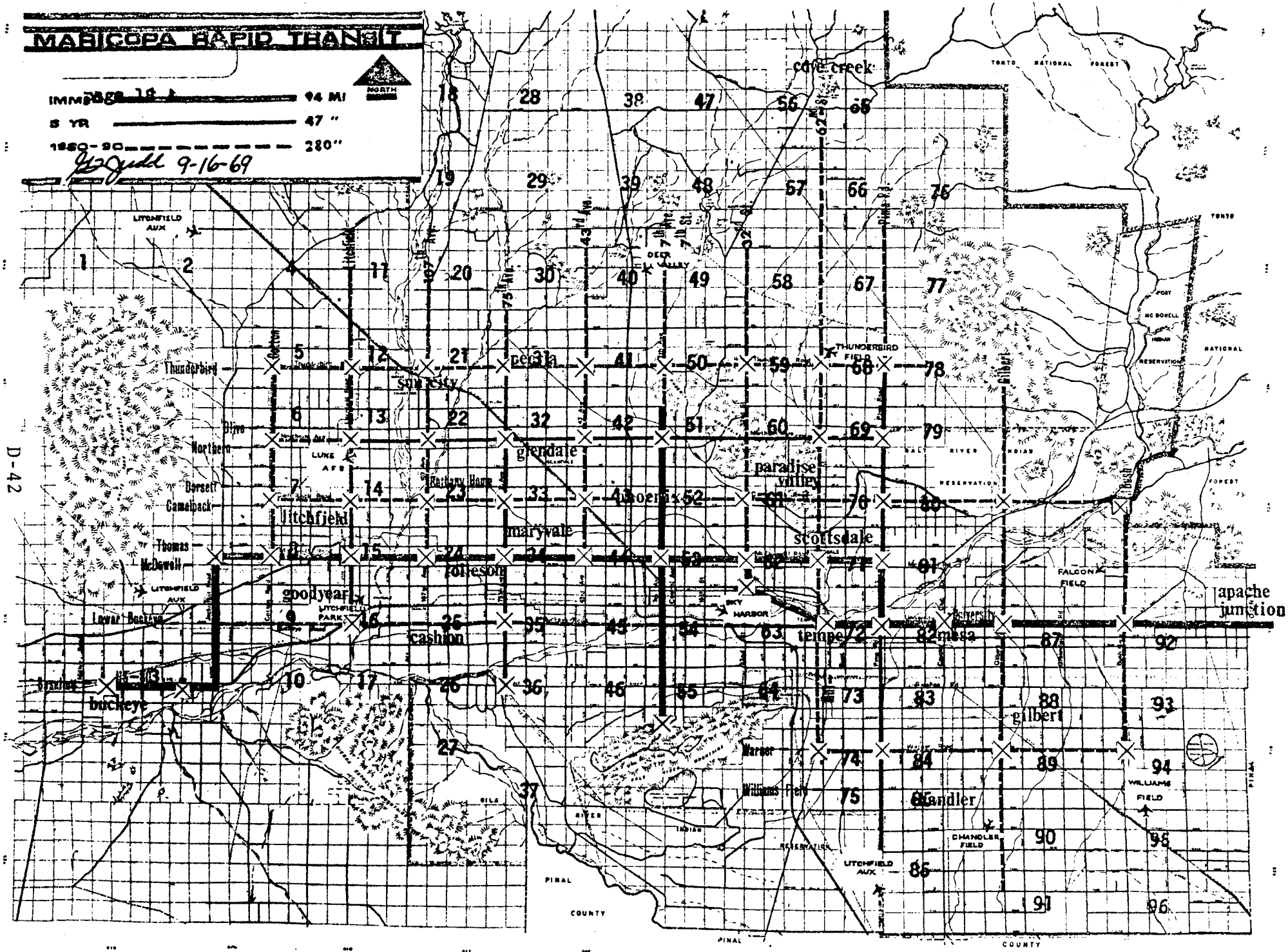
	Origin	Destination	Daily Mileage Total, each type
1. Daily work trips			
2. Daily non-work trips			
3. Trips leaving or entering some town daily, e.g. shop			
4. Daily trips to college, university or other advanced schooling			
5. Daily trips to high school			
6. Daily trips to junior high school			
7. Daily trips to elementary school			
8. Special schools (not listed above)			
9. Trips during the year not listed above			
10. Trips of your friends or relatives coming to Phoenix not listed above			

Total of all trips _____ mi

11. Would you ride a rapid transit system for most of your travel in Phoenix and environs if you could travel on a system which cost you $2.50 per week (about 1/7 your total car expense) on which you could travel over the whole valley, and which was twice as rapid as your car travel and on which you would never wait for more than 10 minutes to be picked up?

YES ☐ NO ☐

If not, why not?


MARICOPA RAPID TRANSIT
IMMEDIATE 94 MI
5 YR 47 "
1980-90 280"
NORTH
9-16-69
cave creek
sun city
peoria
glendale
paradise valley
phoenix
litchfield
maryvale
scottsdale
tolleson
goodyear
cashion
tempe
mesa
apache junction
buckeye
gilbert
chandler
Thunderbird
Northern
Dorsett
Camelback
Thomas
McDowell
Lower Buckeye
Bethany Home
Bethany
Glendale
Bell
Peoria
Indian School
Thunderbird
Litchfield
Litchfield Park
Litchfield Aux
Luke AFB
Deer Valley
Sky Harbor
Thunderbird Field
Falcon Field
Williams Field
Chandler Field
Warner
Williams Field
Tonto National Forest
Fort McDowell Indian Reservation
Salt River Indian Reservation
Gila River Indian Reservation
Pinal County
Pinal County

COSTS RELATED TO RAIL-SUBWAY TRANSPORTATION

Gerard F. Judd, Prof. Chem
Phoenix College 10/1/70

COST FOR CONSTRUCTION OF 24 FOOT DIAMETER TUNNELS IN VARIOUS TYPES OF TERRAIN[1]

	Million Dollars per Mile
1. Dry, stratified of schistose rock	$ 3.8
2. Dry, blocky or seamy rock	4.2
3. Dry, completely crushed sediment	9.6
4. Wet, crushed, unconsolidated sediment	30.6
5. Water, 90-100 ft. deep, 36 ft./hr w. shield	31.4
6. Water, 90-100 ft. deep, 4 " " " "	136
7. 2 parallel tubes, mech. excavator, 20 ft/24 hr	5.5

COSTS FOR CONSTRUCTION OF SUBWAYS IN SEVERAL CITIES AND WATER TUNNEL IN MEAD, NEVADA

1. BART, San Francisco, under SF bay (60 miles) (1963-70)	$ 15.5 (excl. stations)[2]
2. Mexico City, in mud and sinking soil at 20-40 foot depths (1966-1970)	9.2[3]
3. River mountain tunnel at Mead, Nevada, 2 miles through Rhyolite rock, with one ft. thick concrete, 10 ft. finished diameter	1.04[4]
4. Toronto: 1953-1970, 25 miles	14.3 - 20.0[5]
5. Montreal: 1962-1966. Estimated at 7.2 MM, constructed partly under lake	13.4[1,6]
6. London: Victoria Line 1964-1969 through gravel and silt	16.2[1]
7. Munich: --1970, tunnelling cost only	24.0[1]
8. Paris: Through water, sand, hard limestone	32.0[1]

ESTIMATED COSTS OF EXCAVATING AND INSTALLING SUBWAYS IN PHOENIX[7]

1. Mr. Adams, a contractor, completed and concreted tunnels at Arizona State University for $660,000 per mile cost. Tunnels were only 10' x 6'.

2. Tanner Construction Company gave estimates of $220,000 to $550,000 per mile to excavate double subway line and haul away the dirt. Sites were considered over most of Maricopa County cities. The terrain is said to be ideal here.

3. Complete estimate for construction and operation of 425 miles of subways here through 1990 was $1.8 billion, or an average of $5 MM per mile. In ten years it is estimated this will be more than quadrupled due to encumbering of the land with buildings and freeways. About 1000 non-polluting buses were included in the estimate.

COSTS OF MOVING PEOPLE WITH DIFFERENT KINDS OF TRANSIT

Rail (Toronto)	1.5 ¢ per person mile	(about 1/2 load)
Bus	3.5 ¢ per person mile	(about 1/2 load)
Automobile	20.0 ¢ per person mile	(1 person)
"	7.0 ¢ per person mile	(3 persons)

SUBWAYS IN OTHER CITIES: New York, Cleveland, Philadelphia, Chicago, Buenos Aires, Rio de Janeiro, Milan, Rome, Lisbon, Berlin, Moscow, Leningrad

REFERENCES

1. Tunnelling, the State of the Art, pp. 14-20, contract H-766 by Robert S. Mayo and Associates, January 1968, USDHUD, Robert C. Weaver, Secretary.
2. Report from Bart, 1969.
3. Dr. Vega, Phoenix College and Reader's Digest, Mexico City, 1970.
4. Western Construction, Dec. 1968, pp. 38-39, 52.
5. Toronto Transit Company Reports, 1969, Mr. Kelly, PR, personal communication.
6. New York Times, Oct. 22, 1961.
7. A Mass Transit System for Maricopa Valley, 19 page Feasibility Report of Phoenix Forward Task Force by Gerard F. Judd, September 16, 1969.

14. Times of Travel between Various Origins and Destinations

	Trip Measured*	Mileage	Rapid Transit	Car
1.	Buckeye to Apache Junction	65	60 min.	97 min.
2.	Cashion & Southern to ASU	20	18 min.	30 min.
3.	Glendale (75th & Northern) to ASU	25.5	24 min.	44 min.
4.	Chandler (Litchfield aux airport) to Sky Harbor	19.3	18 min.	22 min.
5.	Tempe to Cave Creek	34.8	32 min.	70 min.
6.	Peoria to Mesa	35.2	32 min.	70 min.
7.	Buckeye to Goodyear	15.3	14 min.	18 min.
8.	Glendale & Central to Washington & Central	6 miles	12 min. (3 miles off line)	15 min.
9.	27th and Union Hills Drive to Baseline and Alma School Road	26.8	37 min.	46 min.
10.	Deer Valley Airport to Apache Junction	37.5	46 min.	56 min.

*Car travel rates were not rush hour rates, which are 5-20 mph. Rates for the car were seldom selected below 35 mph, although the average rate is 24 mph in Maricopa Valley. Bus rates on the lines were considered to travel 30 mph average. At peak traffic times, the car travel times could double or tripple [sic]. The times for the Rapid Transit System would remain relatively steady.

EXCERPT FROM PHOENIX MAYOR MILTON GRAHAM'S STATEMENT AT THE PUBLIC HEARING ON JANUARY 23, 1969.

Based on city staff studies, five basic specific requests are presented.

1. It is important to our endorsement of the elevated concept that the park-like characteristics under the Freeway as presented in the Consultants' report be implemented as a part of the construction of the Freeway by the Arizona Highway Department. It is our understanding that the cost estimates do include landscaping of all the right-of-way area. The city will join with the Arizona Highway Department in the development of joint use of rights-of-way as specific proposals develop in the future. We are impressed with the main line Freeway structural design and careful attention in quality of environment that has been developed by the very able Dean Elmore and his associates as part of this design team concept and urge that this be implemented.

2. It is of real importance that the relocation of the people and businesses affected by this Freeway be done with the utmost care. We would urge that the Arizona Highway Department develop a careful public information program that would insure that all the individual property owners are kept informed as this project proceeds.

3. The basic purpose of this facility is urban traffic service. We recognize that many details and designs must be worked out. The city concurs with a development of full interchange connecting to the one-way [pairs] of 3rd, 5th Streets and 3rd and 5th Avenues. However, it is emphasized that we feel it is of equal importance that some sort of full or partial traffic connection be provided at 7th Street and 7th Avenue. This is essential in order to utilize the full traffic carrying potential of the north and south streets in the central corridor of the city, 7th Avenue and 7th Street.

We urge that the high priority consideration be given in working out a final decision that would utilize all these major north-south surface street routes. A planning consultants' study being completed by the City of Phoenix -- or for the City of Phoenix re-emphasized the great importance of maximizing the traffic service north and south in the central corridor through the use of 7th Street and 7th Avenue as well as the two one-way pair. And inasmuch as 7th Street and 7th Avenue have already been substantially developed to carry a major portion of the north-south traffic, we feel that they should not be excluded.

The city recognizes that it has a responsibility to construct an adequate major street system to connect to the Freeway as part of the total transportation system.

4. It is the understanding of the City of Phoenix that all costs related to the relocation of city water and sewer utilities as well as adequate provision for storm water drainage made necessary by the Freeway are included in the total cost of construction and will be paid by the Arizona Highway Department.

5. We recognize that a great many detail designs and much study leading to the final construction plan lies ahead. The city staff is most anxious to remain helpfully active in this development. Therefore, it is requested that the State Highway Department work most closely with appropriate city departments and divisions as final designs are developed. Certainly Traffic Engineering both from construction detour and system operation and related geometric design points of view is a key consideration to the city. Furthermore, the utility problems, water, sewer and storm water, require the closest coordination.

Following is a report of the transit system prepared by Dr. James P. Avery entitled An Economical Rapid Transit System for the Maricopa Valley.

AN ECONOMICAL RAPID TRANSIT SYSTEM
FOR THE MARICOPA VALLEY

(Talk given by Dr. James P. Avery, Department of Mechanics, ASU, before Citizens for Mass Transit Against Freeways in the Penthouse Room, Central Library. Dr. Avery did research on rapid transit during his sabbatical leave.)

Introductory Remarks:

In his excellent talk of a few weeks back, Mr. Clyde Brown suggested that "the burden of proof must be shifted from those who would preserve the environment to those who would exploit it." Were we to apply this to the specific area of urban transportation we would argue that it should be incumbent on city administrators and planners to show beyond reasonable doubt that the existing mode of transit is best, if they elect to stay with the present system. Recalling Clyde Brown's documentation showing the private motor vehicle to be wasteful of our natural resources and to be a prime contributor to environmental pollution we should then expect the decision-makers to have explored thoroughly all potential alternatives to complete reliance on the car. Only then should they attempt a justification for retaining the present patterns.

Unfortunately, a contrary situation seems to exist. The transit "planners" are prone to dismiss alternatives with a wave of the hand--and insist that those who find fault with the status quo produce a flawless system to replace it. Moreover, the financial burden for the changeover to the new system, they insist, be borne entirely by the new system. These conditions place a serious obstacle in the way of any environmental progress. It's easy to shoot down new propositions. No perfect scheme exists. Also it should be

clear that a thorough going feasibility study of a new transportation system would be a major undertaking--not possibly financed by a few civic-minded citizens.

In these apparently hopeless circumstances why should we then give serious thought and discussion to any specific new plan (or concepts) in transportation? The answer, I think, lies in the tone of such a discussion. I most certainly do not intend to outline a hard and fast proposal for a public transportation program. This would be presumptuous. Rather I would like to present a few thoughts on a transportation plan and some new technical concepts by way of an example of the directions or forms a transportation program might assume.

In doing this, I hope to accomplish the following:

(a) To indicate rather strongly that viable alternatives do exist to the threatening status quo (while the specific technical ideas presented may not represent the optimum solution--and certainly not in detail).

(b) That there exists sensible ways of financing the construction and operation of a public transit system.

(c) That the new system would fit comfortably into an overall environmental plan.

(d) That enough favorable evidence may even exist for these particular new technical concepts to justify a design and feasibility study in depth (this latter hopefully financed by local, state, and federal agencies).

What follows is then only a brief description of (1) a plausible transportation plan for the Valley, (2) certain specific design concepts in transportation hardware and (3) a plausible scheme for financing the development of a transit system.

Let us turn first to a possible Valley transportation plan. This might take the form of a multi-mode system with three interfacing links: An urban rapid transit system serving greater Phoenix, a complex of "feeder systems" to collect and disperse passengers of the urban system and thirdly an inter-city high speed service for the State.

A. Urban Rapid Transit System

If we allow our imaginations to run freely and pretend that a thorough study had been performed by a competent team of demographers, engineers, economists, and not the least environmental specialists, then a rapid transit layout similar to the following might evolve:

For the core of the system we might consider three large closed loops of transit line for two way vehicular traffic (i.e. both clockwise and counter clockwise flow) which would blanket the major area of greater Phoenix. An East-West loop would extend from Scottsdale and Tempe in the East to Glendale and Maryvale in the West and cut through the heart of Phoenix. Two parallel North-South loops would run from South Phoenix to North Phoenix and Sunnyslope. While switching from one loop to another would not be envisioned, transfer stations could exist at the points of intersection. Vehicles could likely operate at sixty miles per hour and stations could be distributed at two mile intervals. As feeder systems would interface with the transit line, effective service would be extended to include a swath of more than a mile width on either side of the transit line.

B. Feeder Systems

For the more densely populated residential areas or heavily trafficed business and commercial areas, either a jitney service or shuttle bus service could move passengers between points of origin or destination and the stations of the rapid transit system. The jitney service, in this instance,

might consist of mini-buses following more or less regular routes within a limited area. These could pick up and discharge passengers at the passenger's pleasure. The shuttle service on the other hand might be well adapted to service between two specific points, as for example, between a Deer Valley industrial plant and the nearest station of the rapid transit system.

In the more soarsely [sic] populated areas, the "dial-a-bus" system may be quite suitable. In this system radio controlled mini-bus vehicles are dispatched to a dial-a-bus stations (or to private homes) whenever a "dialed" or phone request is made. The bus would normally be shared by several passengers through adoptive routing of vehicle. Also in the outlying areas, the use of public parking lots adjacent to stations would serve as a simple expedient for a feeder system using private vehicles.

C. High Speed Inter-City System

At first thought a high speed ground inter-city transportation system seems out of place in the thinly populated Arizona. Indeed, if it were to serve only inter-city travel between existing urgan [sic] centers, it would not be at all realistic. However, if we consider high school service for quite different functions it may make considerable sense. Most planners and demographers forecast at least a million person increase in the State's population in the next decade or so. The question arises as to how best accomodate [sic] this growth. Shall it be a haphazard growth in the form of urban sprawl, with attendent ugliness and pollution? Or could there be a more rational way of planning for this growth and using Arizona's land resources effectively, aesthetically and in harmony with the natural environment? Many demographers, architects, city planners, environmentalists, have argued for the necessity of building wholly new communities, planned and engineered from the ground up to best meet the needs of the future. The new cities become a realistic possibility

with the construction of a two-hundred-mile-an-hour ground transportation link to existing metropolitan centers. Thus a prime reason for building a high speed extra-urban service would be to enable the development of new cities which in turn would rationally accomodate [sic] the State's population growth. There are also other interesting justifications for an inter-city service. It has been well argued that we should take major air traffic out of the urban centers to help reduce noise and air pollution. A 200-mile-an-hour service could make a remote super-jet port, located say 80 miles out, only minutes away. Such a jet port could be accessible from Phoenix, Tucson, and other population centers. Finally, a high speed transit line could connect Arizona's beautiful recreation lands with the urban dweller and allow for a carefully controlled environmental plan centered on recreation and enjoyment of nature. Imagine the possibility of leaving Phoenix at any time and arriving less than one hour later in the White Mountains, or the Snow Bowl!

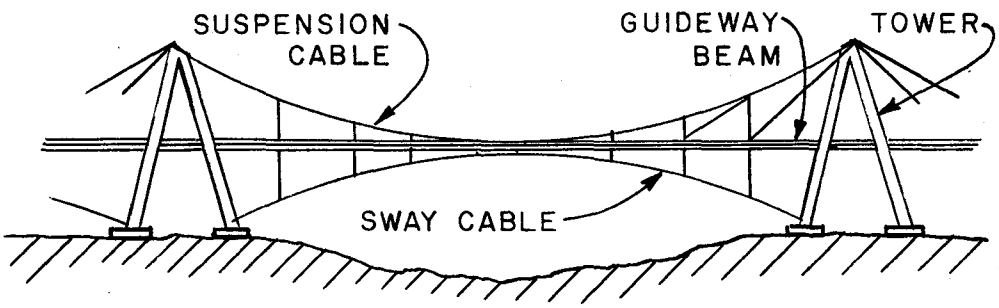
Urban Transportation Hardware Concept

To make possible a regional transportation plan as outlined in the foregoing, some form of modern engineering transportation hardware is necessitated. What follows are some preliminary thoughts on the essential engineering features or forms this hardware may assume.

In urban rapid transit we are faced with the options of surface transit (or grade level transit), underground systems or above ground systems. The latter is considered here, since right-of-way, safety and tunneling for underground is excessively expensive (order of 12 million dollars per mile). The above ground system of course does present its share of problems but the greatest promise for our requirements appears to lie in this option. A brief description of one above ground concept follows:

Concept I. Pre-tensioned cable structure:

Recognizing that structural costs account for a large part of the first cost of any above ground transportation system (estimated to be as much as 80 percent of the total initial cost) a sizeable reduction in weight of structure represents potentially great savings. The pre-tensioned high strength cable structure, illustrated schematically below, offers one of the best methods for using materials efficiently in long span structures. (Long spans are assumed desirable because of fewer support towers, lower foundation costs, shared right-of-way.)



A pre-tensioned structure is one in which all load carrying members are simple cables or tie rods in pure tension, except of course for the guideway beam itself (a flexural member). These tensile members are initially tensioned either by the dead weight of the guideway beam or through the use of pre-tensioning sway cable (perhaps a combination). Within live load magnitude limits, the structure may be analyzed as an elastic truss. Moderate live loads will cause an increase in the tension of some members while decreasing tension in others, still maintaining positive tensie [sic] force in all members. The resulting deflections are small--of the order of magnitude of the elastic elongations of individual members. If, however, live loads exceed critical magnitudes, certain members would have their

pretensions totally cancelled and would become slack, so that relatively large deflections would result and the structure consequently would assume a new equilibrium configuration.

It may be demonstrated (assuming live loads less than the critical values) that for comparable structural stiffness a pre-tensioned structure requires considerable less material weight than does a self-supporting girder beam, tube beam, or truss type structure. (The span is assumed long, say from 300-1000 feet). Structural costs are consequently less for the pre-tensioned structure.

Rough calculations for an urban transit line (using 300 foot spacing between support arches) indicate that for a safe design requirements approximate 300 pounds per foot of erected steel required inclusive of guide beam, cables and support arches. This would lead to the possibility of a total erected structural cost of less than one million dollars per mile, for a two way transit line.

Inter-city Transportation Hardware Concept

For the two hundred mile an hour extra-urban service, straight line routing becomes necessary and hence right-of-way a greater problem. The space above most city streets and highways, for example, could not be used exclusively. Consequently longer spans seem indicated (perhaps 1000 feet) to provide for a minimum of touch down points and to permit shared right-of-way. In longer spans it becomes very desirable to keep live loads (vehicle loads on the guideway beam) as small as possible at operational speeds, since riding comfort and vehicle stability would be adversely affected by large guide beam deflections. The following describes briefly one concept that may be effective in accomplishing a reduction in vehicle loads.

Concept II. Direct aerodynamic support and guidance:

One way in which vehicle live loads could be kept less than the critical values discussed above is through the use of lift surfaces on the vehicle that are trimmed to provide sufficient aerodynamic support at operational speeds. If the vehicle is supported largely by aerodynamic forces, the pre-tensioned structure can be made appreciably lighter than if it were required to carry the full weight of the vehicle and maintain small deflections. It should be noted, of course, that at low speeds or at rest the vehicle must still be fully supported. This poses no serious structural penalty, however, as a lightweight cable structure can safely carry large, live loads if the small deflection requirement is abandoned. Thus at slow speeds, large deflections occur (assumed tolerable at low speeds) but safe support is maintained. For operational vehicle speeds, the structure behaves as a relatively stiff elastic foundation with only small deflections.

Also at the higher speeds, it becomes increasingly difficult to maintain vehicle dynamic stability when relying only on an elastic support structure for vehicle guidance. Here again, vehicle aerodynamics could play a constructive role. Aerodynamic forces increase strongly with velocity and are readily controlled. For speed levels at which the guideway-vehicle interaction threatens to become unstable, aerodynamic control could be used to achieve the required stability.

Associated with the above-discussed concepts are engineering analysis problems that fall generally into one of the following study area categories:

(1) Static and dynamic behavior of the non-linear pre-tensioned structure in various three-dimensional configurations

(2) Dynamic stability phenomena (aeroelastic stability) and control theory for high speed operation

(3) Vibration isolation for passenger comfort

(4) Optimization and economic evaluation of the system.

The two concepts put forward are not linked to any particular propulsion scheme or vehicle suspension system. Available literature on propulsion and suspension technology provides adequate parameter values for the dynamic behavior study. Consequently, conceptual design research activity, centered on these concepts, need not overlap existing research and development projects in linear motors or magnetic suspension, for example, but would be compatible with technological developments in these areas.

Once again rough calculations have indicated that initial costs for the high speed transit line would approximate a million dollars per mile for two way service.

Possible Financing of New Transit System

It is often suggested by critics that mass transit in Phoenix (or anywhere in Arizona) is economically unfeasible because of our low population density. I would like to offer a few thoughts on a possible scheme for financing the construction and operation of a regional transportation plan. Of course, a financing program actually to be considered for adoption requires considerable detailed study of revenues, costs, benefits, and economics adjustments involved. The following is presented simply to show the existence of some possibilities in the area of financial support for public mass transit.

Let's consider the principle that those who would pollute the environment pay a punitive tax for their actions. Appropriate punitive or "environmental" taxes could accomplish two things: (1) reduce the acts of pollution, and (2) amass funds for environment renewal--in this instance, for the construction of an alternative transportation system.

Recent information released in news articles and television reports on pollution indicate that:

(1) Approximately 500,000 motor vehicles operate in Maricopa County

(2) About one million gallons of gas are sold daily in the Valley.

Suppose we were to levy a progressively increasing "environmental tax" on both vehicles and gasoline, say on vehicles--the first year 20 dollars and in succeeding years increasing to perhaps $100 per vehicle; and on gas the first 10 cents per gallon and building up to 50 cents or more per gallon. The consequences would likely be (1) a significant reduction in vehicle population and much lower gas consumption (2) the development of an annual revenue of the order of 80 million dollars per year (an average) over a five year period. If leased vehicles were to be used on the urban rapid transit system, preliminary estimates indicate that vehicle rental energy costs, line maintenance, other operational costs would total well below the revenue from "environmental" tax. It seems quite possible then that bonded indebtedness for the line construction could be paid off in five years while carrying all operating expenses. This opens the way to fare free urban rapid transit system. Thus the taxed car owner is not seriously inconvenienced as a free rapid transit system for greater Phoenix is at his disposal. Parenthetically, the feeder systems (while possibly subsidized) would most likely carry a nominal fare.

The inter-city transit appears to be another story. The initial cost of the line construction could be carried largely by the prime beneficiaries of the line. Enabling legislation might be passed to permit the increase in land values of the new planned communities (made possible by the high speed line) to be assessed in order to pay off the bonded indebtedness on the line. Operating expenses, on the other hand, could be borne by reasonable

commuter fared (yielding a sizeable revenue if a population of one million persons is accommodated by the new cities), recreational trips, air terminal traffic, and off peak-load cargo hauling.

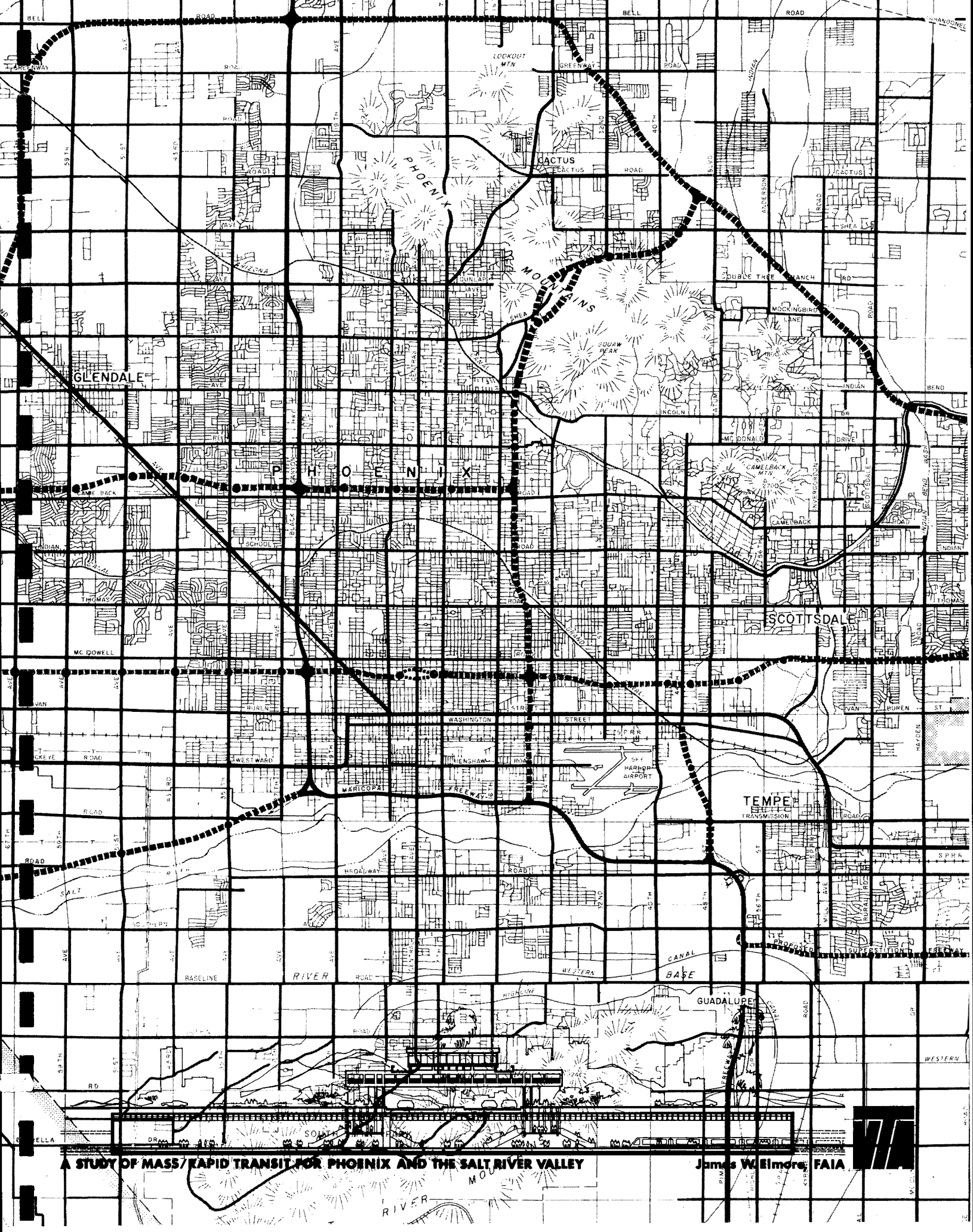
To summarize, an economical regional transportation plan seems feasible and deserves serious consideration. If we are willing to pursue imaginative approaches, and be prepared to make minor adjustments in personal living modes, it appears quite possible that we can reap significant social benefits and new freedoms from a carefully developed public transportation system. Not the least of these public benefits would be a major step toward a harmonious pollution-free relationship with the natural environment.

The following is the text of A Study of Mass/Rapid Transit for Phoenix and the Salt River Valley as prepared by James W. Elmore, FAIA.

A STUDY OF MASS/RAPID TRANSIT FOR PHOENIX AND THE SALT RIVER VALLEY

James W. Elmore, FAIA

July, 1970


PHOENIX
GLENDALE
SCOTTSDALE
TEMPE
GUADALUPE
PHOENIX MOUNTAINS
LOOKOUT MTN
SQUAW PEAK
CAMELBACK MTN
BELL ROAD
GREENWAY ROAD
CACTUS ROAD
INDIAN BEND
CAMELBACK ROAD
THOMAS ROAD
MC DOWELL
VAN BUREN
WASHINGTON STREET
BROADWAY ROAD
MARICOPA FREEWAY
SKY HARBOR AIRPORT
TRANSMISSION
SALT RIVER
BASELINE ROAD
WESTERN CANAL
PROPOSED PUBLIC TRANSPORTATION FREEWAY
SOUTH MOUNTAIN PARK
A STUDY OF MASS RAPID TRANSIT FOR PHOENIX AND THE SALT RIVER VALLEY
James W. Elmore, FAIA

VALLEY AREA TRANSIT

A STUDY OF MASS/RAPID TRANSIT FOR PHOENIX AND THE SALT RIVER VALLEY

Presently, it appears that Phoenix and the Valley of the Sun may never need or be able to support a system of public mass/rapid transit operating on exclusive, grade-separated rights-of-way. But if alternatives to present systems should ever prove to be required, they will best be provided if the need has been anticipated and the possible solutions considered both in advance planning and in the day-to-day decisions that would affect them.

A city is a set of systems--natural, social, philosophical, political, educational, economic and many others, including the transportation system--all reflecting human needs and aspirations. As the system that connects the others and makes them operative, the transportation system not only responds to identified need but it also generates, accommodates and channels growth. In so doing, it is possibly the most powerful single determinant of the form and character of the city.

Almost all growth in United States cities since World War II has responded to the possibilities opened by the private automobile. Arterials, freeways and the vehicles they carry have proved their worth in meeting the enormous and growing demands for ground transportation of people and things. But they have also combined to produce urban sprawl, air pollution, congestion, and deterioration or abandonment of the public transportation that might serve those unable to own or operate cars. Evidence is accumulating that any city that grows very large must provide a balanced transportation system--one that has freeways doing what they can do best and mass/rapid transit doing what it can do best--one that offers both a

choice to the owner of the private auto and the only hope of essential mobility to one less advantaged.

Like many other cities, metropolitan Phoenix is rapidly approaching the point at which it must know the cost and potential of mass/rapid transit--and also the lack of it--if it is to continue to make fully considered determinations regarding its transportation needs and its future form. Developing a model from which this knowledge might be gained is the purpose of this study. It asks and suggests an answer to the question:

> Given the present and predictable state of transit technology and the 1970 and expected future size and nature of the Phoenix urban area, HOW MIGHT MASS/RAPID TRANSIT SERVE AND HOW MIGHT IT LOOK?

A well conceived transit facility can provide both an effective service and a pleasant experience to those using it. And it can be inserted into the city in ways that will truly grace it.

Ultimately, the feasibility of mass/rapid transit will have to be demonstrated by exhaustive engineering and economic studies and whatever proposals might be made will have to be subjected to equally comprehensive studies to characterize costs and benefits and to propose responsible ways of financing both capital and operating needs. The present study is focused on the conceptualization of a system that might be worthy of investigation in more extensive detail.

For providing the support that has enabled me to complete this study, I am most grateful to the following individuals and the organizations they head:

Rod J. McMullin, General Manager,
Salt River Project

Walter T. Lucking, Chairman of the
Board, Arizona Public Service Company

Walter R. Bimson, Chairman of the
Board, Valley National Bank

Harry Montgomery, Associate Publisher,
and Mason Walsh, Executive Vice-President
and General Manager, Phoenix Republic and
Gazette

Sherman Hazeltine, Chairman of the Board,
and Edward Carson, Executive Vice-
President, First National Bank of Arizona

I am hopeful that the study will prove to be a useful reference as Phoenix and its neighbors continue to plan and act with respect to their futures.

James W. Elmore, FAIA
Architect
July 1970

"IT IS IMPORTANT THAT AN ULTIMATE TRANSIT PLAN, HOWEVER TENTATIVE, BE IN VIEW AT ALL TIMES. THIS IS NECESSARY TO PROVIDE A BASIS FOR PUBLIC DISCUSSION, TO GIVE DIRECTION TO PLANNING EFFORTS AND TO GIVE DIMENSION TO ANTICIPATED FUNDING REQUIREMENTS."*

*from Technical Report Number Three, "Development of a Long Range Transit Improvement Program for the Twin Cities Area," by Alan M. Voorhees and Associates, Inc., November, 1969

A STUDY OF MASS/RAPID TRANSIT FOR PHOENIX AND THE SALT RIVER VALLEY

This report is presented in two volumes, one of text in 8-1/2" x 11" format and one of graphic material on sheets 30" x 23".

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   Discussion of the "state of the art" and the directions anticipated for future development.

2. Status of Mass/Rapid Transit in Major Cities 6

   Characterization of systems in use or proposed in the 40 most populous urbanized areas of the United States (in 1980) and certain other cities.

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   Description of a test plan employing presently proven technology.

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A series of maps, plans, drawings and sketches prepared by Julian Clark, delineator, to show visually a concept of mass/rapid transit for Phoenix and the Salt River Valley.

A STUDY OF MASS/RAPID TRANSIT FOR PHOENIX AND THE SALT RIVER VALLEY

Following completion of the two volumes of this report as described on the preceding page, additional studies were made and are included as follows:

THIS VOLUME - TEXT

Section		Page
3.	A Second Alternative Model showing urban transit service to the broad area that might ultimately be developed	19a
	Half-sections thru Aerial Line showing Alternative Possibilities for Structure, Suspension and Noise Control	19b

OTHER VOLUME - GRAPHIC MATERIAL

An additional plan/map showing the Second Alternative Model as described on page 19a.

JWE 1 Dec., 1970

Section 1

TRANSIT TECHNOLOGY--PRESENT AND FUTURE

With the growing concern for the apparent inadequacy of existing transportation systems to meet future or, indeed, even present needs, a great deal of study has been given to alternative ways of moving people and goods. It has been both productive and promising. Some innovations are being adopted to improve existing older systems and some are being incorporated in systems under construction or planned. All hold bright hope for cities that are only recently or just now beginning to recognize their probable future need.

With the technology developing as rapidly as it is, any city is rightly reluctant to commit substantial energy and resources to planning for the use of systems that may shortly be obsolete. Ideas have been advanced that would suggest a diminishing need for transportation, among them:

a. Our whole technology may so change our life-style that we will come to depend on communication rather than transportation--we will stay at "home" as a routine for work, school, shopping, etc., moving about the city-scape and the countryside only for recreation.

b. It may become possible for us to de-materialize ourselves in one place and re-activate elsewhere, thus needing no routes or vehicles for transportation.

There is presently nothing that would suggest either of these eventualities as a reasonable basis for future planning. It would seem that for the foreseeable future, we will need a path to go from here to there.

Any trip from any point a to any point b (or return from b to a) can be diagrammed as shown in Table 1. It begins in a local area, which may be a residential area or a major activity center such as a central business district, a shopping center, or a university. It then passes for some time and distance through an extended area or, in the case of the city an urban area. And it ends in another local area or major activity center. The trip may or may not follow a straight line in an uninterrupted sweep of movement. It may be made by foot, horseback, bicycle, boat, bus, train, plane, auto, or any combination of these.

The vehicle that has come to dominate 20th century transportation--the automobile--has the capability of providing for the whole trip. We keep it in a special place at home, under the same roof as the other members of the family, and are sorely aggravated if we can't park it within a few feet of wherever we go. Under even less than the best conditions, it provides a convenience with which it is difficult for other forms of transportation to compete.

Now, after more than a half-century of use, the auto has generated a totally dispersed pattern of urban development with densities and travel desires that are inimical to operation of current modes of public transit. And yet it is increasingly evident that the auto alone cannot indefinitely accommodate the urban growth and movement that is projected.

Although existing public transportation systems and the new ones under research, development and testing present a bewildering array of guiding principles and approaches, an attempt is here made to identify and classify those that are current.

Present Possibilities

Among projects and proposals having potential for immediate application to the improvement of existing systems are:

for Bus Systems

1. Provision of exclusive bus lanes.
2. Reservation of certain city streets for use by buses.
3. Traffic control in which traffic signals and access to freeways are regulated to give preference to heavily loaded buses over private autos.
4. Computer assisted scheduling.
5. Better design of vehicles.
6. Dual mode buses with ability to operate either on streets or exclusive high speed rights-of-way.

for Rail Systems

1. Automated operations.
2. Improved vehicle design.
3. Improved braking, suspension, coupling, roadbeds, maintenance and cleaning.
4. Better noise control.

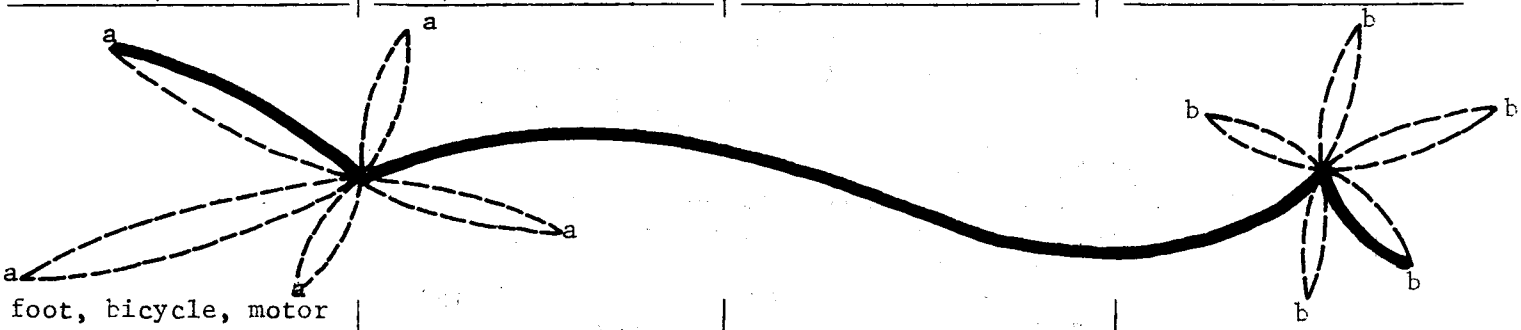
for All Systems

1. Improved ticketing and fare collection efficiently recognizing distance travelled, time, frequency, billing procedure, etc.
2. Increased security using improving surveillance and communications techniques.
3. Improved management and operations.
4. Better station design.
5. Improved graphics and dissemination of information on routes, schedules and service.

Future Possibilities

Of the concepts being examined for the longer-range future, some of the most promising are summarized in Table 1 and further described in Appendix A. A still more extensive survey is given in the ASCE publication, Modes of Transportation, which is further identified in the Bibliography. An examination of these data will suggest the variety of possibilities that have been opened for further exploration and potential application.

TABLE 1--PRESENT AND PROPOSED TRANSIT SYSTEMS
(See further descriptions in Appendix A)

LOCAL TRANSIT LOCAL AREA SERVICE SINGLE MODE COLLECTOR/DISTRIBUTOR	LOCAL AND URBAN AREA SERVICE DUAL MODE COLL/DIST & LINE HAUL	URBAN TRANSIT URBAN AREA SERVICE SINGLE MODE LINE HAUL	LOCAL TRANSIT MAJOR ACTIVITY CENTER SERVICE SINGLE MODE COLLECTOR/DISTRIBUTOR
			
foot, bicycle, motor bike, golf cart, auto, taxi, bus	auto, taxi, bus	auto, taxi, bus, rail rapid transit	auto, taxi, bus, minibus, tram, moving sidewalk, escalator, elevator, foot
SHORT TRIP SYSTEMS	DUAL MODE SYSTEMS	FAST TRANSIT LINKS	ACTIVITY CENTER SYSTS.
Small Car Systems Electric Car	Small Car Systems Public Auto Service MIT Metran--1. Auto StaRRcar Urbmobile MIT Metran--4. Automated Guideway	Conventional Montreal Metro Expo Express BART	Horizontal Elevators Minirail People Mover Skybus Transveyor Carveyor MIT Metran--3. PERC
Bus Systems Minibus	Bus Systems Automated Dual-Mode Bus Dial-a-Bus MIT Metran--5. Genie	Prototype Westinghouse Transit Expressway MIT Metran--2. BOS	
	Pallet or Ferry Systems TransDrive	Monorail GE Aerial Transport Alweg System	
		Gravity Vacuum Edwards GVT Tubeflight	
		Ground Effect Hovercar Aerotrain Levacar Uniflo MIT Glideway Hovair	
		Personal Rapid Transit Teletrans Dashaveyor Multi-Mode Synch Trans	
		Air Transit	

Section 2

STATUS OF MASS/RAPID TRANSIT IN MAJOR CITIES

It is generally accepted that an urban area must have a population of at least 2,000,000 and a quite high degree of density if mass/rapid transit is to be economically sound and fully effective.

Systems of grade-separated mass/rapid transit are now in operation in eight North American cities: New York, Chicago, Philadelphia, Boston, and Cleveland in this country, Toronto and Montreal in Canada, and Mexico City. Elsewhere there are well-established systems in London (built in 1863), Paris, Berlin, Madrid, Stockholm, Moscow, and Tokyo, to name a few, with others complete or in various stages of development in such cities as Caracas, Rio de Janeiro, Rotterdam, Amsterdam, Helsinki, Frankfurt, Cologne-Dusseldor-Essen, Venice, Naples, and Glasgow.

In this country most cities that have a population of 1,000,000 or more or are even approaching it, are actively engaged in planning for mass/rapid transit to work with streets and freeways in a balanced transportation system. San Francisco has the Bay Area Rapid Transit system under construction, Los Angeles, Washington, D. C., Atlanta, and Seattle have completed detailed plans, and at least ten other cities have specific test plans under study. A comparative presentation of the "Status of Mass/Rapid Transit in Major Cities" is given in Table 2 and some elaboration of the data is contained in the explanatory notes in Appendix B.

There are several major steps that any city takes in developing a mass/rapid transit system. They are:

1. Identification of the questions that must be asked and answered to determine the city's need, present and future, and also its ability to meet that need with the economic and technological resources available.

2. Completion of extensive surveys and studies to provide the answers to the questions so identified.

3. Conceptualization of one or more systems to be tested for feasibility.

4. Demonstration of feasibility of systems under consideration through exhaustive engineering and economic studies to characterize costs and benefits and to propose responsible ways of financing both capital and operating needs.

5. Adoption of system to be developed.

The study currently being made by Professor Mathew Betz of Arizona State University for the Valley Area Traffic and Transportation Study is entirely related to Step 1, this study to Step 3. It is expected that the two will complement each other in useful ways.

In San Francisco, it is now expected that the first trains will roll in 1972. This will be 21 years after planning began in 1951. The enormous amount of lead time required for planning, design and construction of anything so complex is a critical factor in recognizing and meeting transportation needs. The effort must be begun at the earliest possible time.

TABLE 2--STATUS OF MASS/RAPID TRANSIT IN MAJOR CITIES
(See explanatory notes concerning each urbanized area in Appendix B)

#	POPULATION Persons in 1000s 1966	1975	1980	URBANIZED AREA (Areas listed in order of rank in 1980)	ROUTE MILES OF GRADE-SEPARATED MASS/RAPID TRANSIT: In test plan	In adopted plan	In system under construction	Complete and in operation	In extensions under construction or planned
1	16,039	18,158	19,652	New York City--N.E. Jersey				272	49
2	7,986	9,843	11,066	Los Angeles--Long Beach, etc.		89			
3	7,430	8,439	9,120	Chicago--N.W. Indiana				91	48
4	4,716	5,236	5,610	Philadelphia--S. Jersey				61	8
5	4,124	4,490	4,765	Detroit					
6	2,967	3,466	3,781	San Francisco--Oakland			75		
7	2,612	3,218	3,599	Washington, D. C.		97			
8	2,693	2,925	3,070	Boston				42	29
9	2,303	2,672	2,931	St. Louis	72				
10	2,375	2,572	2,716	Pittsburgh	60				
11	1,748	2,243	2,607	Houston					
12	2,065	2,036	2,479	Cleveland				19	31
13	1,964	2,235	2,402	Baltimore	29				
14	1,381	1,829	2,143	Dallas	65				
15	1,615	1,899	2,116	Minneapolis--St. Paul	71				
16	1,252	1,616	1,858	Atlanta		40			28
17	1,344	1,537	1,647	Milwaukee					
18	1,221	1,464	1,635	Seattle--Everett		47			27
19	1,188	1,448	1,621	San Diego					
20	1,081	1,406	1,613	Miami	67				
21	1,324	1,498	1,602	Buffalo					
22	1,346	1,495	1,593	Cincinnati	37				
23	1,045	1,377	1,582	San Bernardino-R'side-Ontario					
24	930	1,312	1,572	San Jose					
25	1,182	1,421	1,570	Kansas City	19				
26	1,073	1,347	1,510	Denver					
27	1,041	1,292	1,463	New Orleans					
28	838	1,157	1,371	Phoenix					
29	1,006	1,180	1,286	Indianapolis	22				
30	878	1,110	1,278	Tampa--St. Petersburg					
31	916	1,068	1,166	Portland, Oregon					
32	758	986	1,152	Sacramento					
33	827	993	1,115	San Antonio					
34	840	983	1,069	Columbus					
35	818	967	1,063	Rochester					
36	805	964	1,060	Dayton					
37	784	895	965	Louisville	42				
38	848	895	929	Providence--Pawtucket--Warwick					
39	748	853	916	Memphis					
40	734	834	907	Birmingham					
a	590	684	744	Honolulu	29				
b	6,816			Mexico City				9	13
c	2,158			Toronto				21	4
d	2,437			Montreal				16	
e	401			Edmonton		25			

Note: b, c, d and e are "latest official estimates" given in World Almanac, 1970.

Section 3

A MASS/RAPID TRANSIT MODEL FOR PHOENIX AND THE SALT RIVER VALLEY

A concept of mass/rapid transit is characterized in the following paragraphs and the accompanying plans and sketches. It applies the pattern discussed in Section 1 to the Phoenix metropolitan area and is developed to employ such proven technology as that of BART in San Francisco or the Westinghouse Transit Expressway for urban transit and conventional buses for local transit. It is expected that there will be substantial and probably dramatic advances in transit technology during the years of planning the Valley system. However, it is believed that with whatever modifications may be indicated, the routes and concepts described can be adjusted to take advantage of the best systems current at the time the critical decisions are made.

An Urban Transit System-- The Basic Loop and Extensions

One of the accompanying drawings, a plan/map of Phoenix and Environs, shows the setting and structure of the urban area with its natural features and its canals, railways, streets, and freeways indicating the areas that are occupied. A mass/rapid transit system, complementing the street and freeway systems, is then suggested in relationship to these and to the people and functions to be served.

A 50-mile "figure eight" loop is the nucleus of the system. Automated, electrically driven vehicles operating either separately or coupled into trains on exclusive grade-separated rights-of-way provide a fast transit link, urban transit, connecting 23 stations that are served by local transit. The "Loop," or the "8," as it might be called for the sake of brevity and convenience, serves such traffic generators as uptown and downtown Phoenix, Sky Harbor

Airport, Arizona State University, Tempe, Scottsdale, and Glendale.

Anticipated in this study are 50 miles of extensions that would replace local transit with urban transit service to other points. Using portions of the "Loop," additional lines would connect Mesa with Sun City, South Phoenix with Skunk Creek, and Litchfield Park with Paradise Valley. At the same time, all those points would be connected with stations on the "Loop."

Storage and maintenance yards would be located along the Santa Fe right-of-way and Grand Avenue between Indian School Road and the Paradise Freeway. Control would best be located where the "8" crosses itself at Central Avenue and Indian School Road. At this point a very substantial building might be provided to serve as headquarters for the "Valley Area Transit Authority" and to accommodate a variety of municipal and other functions.

In addition to the "Loop," express bus service might be provided to connect stations along the Black Canyon and Papago freeways. These would be planned to interface with both the "8" and its extensions and local transit systems.

Routes and stations of the "Loop" are shown on the accompanying plan of Phoenix and Environs where, also, distances and travel times from station to station are indicated. Types of construction and kinds of right-of-way are summarized in the tabulation in Appendix C for both the "8" and the extensions. The accompanying drawings and sketches suggest the nature of the construction proposed in certain typical conditions and the character of the structures and stations as they appear in the city.

Throughout the system, the materials and construction techniques and the sounds, smells, forms, colors, textures and graphics will make an impression on the transit rider ranking in importance with that of the comfort and convenience the service gives him.

It is in the aerial mode, as it occurs along Indian School Road, that the transit structure will have its strongest impact on the resident of Phoenix, Scottsdale or Maryvale, as he moves through his city. Careful attention to the design of the aerial transit structure can make of it a visual as well as an economic boon. One possibility is suggested in the sketches.

The characteristics of the "Loop" can be summarized as follows:

Total route length (double track) (two way)	50.0 miles
Number of stations	23
Average station spacing-- entire route	2.1 miles
Average station spacing-- Central Avenue	1.0 mile
Average scheduled speed, including stops	42.0 MPH
Maximum speed	75.0 MPH
Minimum operating headways (under fully automated control)	90.0 sec.
Station dwell time	20.0 sec.
Vertical circulation at stations	Escalators
Fare collection	Fully automatic

Speeds and travel times are extrapolated from data given for the equipment and operation of BART, San Francisco, as shown in Appendix D.

It is expected that certain advantages can be realized from the continuous operation allowed by the figure eight route. There is no "end of the line." Vehicles go in one direction or the other and do not reverse in normal operation. Trains can have just one "front end" and cars can be added or taken away with minimum difficulty in response to varying demand during the day. Such advantages can be had for the extensions by providing turn-arounds at the terminals.

Although estimating the cost of a mass/rapid transit concept is not one of the objectives of this study, it is readily possible, using

data supplied by Westinghouse Electric Corporation to project the cost of the basic loop, the "8", if it were constructed as a Westinghouse Transit Expressway. The Westinghouse estimates are for "Typical Total Capital Costs per System Mile--Includes All Construction, Land, Stations and Rolling Stock" and they are further identified, in the publication Westinghouse Engineer for January, 1970, as "Construction and capital costs based on Transit Expressway Report--February 20, 1967. These basic costs have been inflated substantially over those reported in the Report to allow for increases in construction costs." The projection, then, in January 1970 was as follows:

Type of Construction	Westinghouse Cost per Mile	No. of Miles	Total Cost
Subway	17,000,000	6.5	$110,500,000
Aerial	8,000,000	34.5	276,000,000
Surface	6,200,000	9.0	55,800,000
Total		50.0	$442,300,000

Using this same basis, the cost of the entire system, employing types of construction and rights-of-way as characterized in Appendix C, can be summarized in Table 3 following:

TABLE 3--SUMMARY DATA ON ORIGINAL MODEL

Unit	Const. Type	No. of Miles	No. of Stations	Total Cost
Basic Loop--"8"	Subway	6.5	5	$110,500,000
	Sub/Aerial	--	1	--
	Aerial	34.5	15	276,000,000
	Surface	9.0	2	55,800,000
Total Loop		50.0	23	$442,300,000
Extensions to:				
Mesa	Aerial	6.5	4	52,000,000
Sun City	Aerial	5.5	3	44,000,000
South Phoenix	Aerial	4.0	3	32,000,000
Skunk Creek	Subway	4.0	1	68,000,000
	Aerial	10.0	5	80,000,000
	Total	14.0	6	148,000,000
Litchfield Park	Aerial	9.0	4	72,000,000
Paradise Valley	Aerial	6.5	3	52,000,000
	Surface	4.5	2	27,900,000
	Total	11.0	5	79,900,000
Total Extensions		50.0	25	427,900,000
Total Loop & Extensions		100.0	48	$870,200,000

The ultimate function of the "Loop" and its extensions is to work with the local transit system in providing for area-wide movement. The two systems are interdependent, the "Loop" providing rapid "line-haul" and the "bus net" frequent local service in neighborhoods and major activity centers.

The "8", as proposed would serve many of the Valley's population and activity centers as they exist even in 1970. The extensions shown are planned to employ natural corridors and serve the areas of projected growth as forecast in the report Mobility - Phoenix Style and other documents listed in the Bibliography. (Additional information on future growth is expected to be included in the forthcoming Phoenix - 1990 study by the Phoenix Planning Department.) Both the "Loop" and the extensions are seen as energizing bus or "bus-like" service in local areas by furnishing the fast urban link that would effectively make the local "bus net" work.

A Local Transit System--Feeder Lines and/or Transit Service Areas--The "Bus Net"

While the urban transit system, in this case the "8", is the heart of it all, it must interface with local transit systems, collecting at one end and distributing at the other, to complete the usual trip. At the "home" end of the trip--and most begin or end at home--one kind of system may be indicated while at the other end, at the place of work or other activity (major activity center), yet another system may be more appropriate. In this study, no distinction is made between the two ends of the trip and both are provided for in a single local transit system referred to as the "bus net" since the movements required have characteristics for which buses are presently most suited and in use.

An accompanying plan/map shows a system of feeder bus routes and/or transit service areas which blanket the Valley area and provide, within one-half mile of any place, service to a station on the "8". Two kinds of operation are anticipated with these "bus nets".

a. Buses, perhaps of standard size and design initially, would follow continuous, clockwise, one-way routes around the periphery of each area, as indicated by the lines and arrows. Almost all bus turning movements would be righ turns thus reducing somewhat the traffic problems on surface streets.

b. Buses, or mini-buses, or limousines, or jitneys, or taxis would serve the areas with flexible routes or perhaps a combination of fixed and flexible. The Dial-a-Bus principle could be employed. The service might be rendered by the "Valley Area Transit Authority" or by licensed private enterprisers in the separate areas.

In either (a) or (b) above, the size and nature of the routes or areas would be adjusted to the optimum as determined by operating experience. Additionally, it can be expected that many riders on the urban transit, the "8", would supply their own local transit with private vehicles, using "kiss-'n-ride" or "park-'n-ride" techniques for which provision should be made in land acquisition and station design.

An Alternative Possibility

During all the years that will be occupied with the development of the ultimate Valley Area Transit plan, many ideas will be advanced and must be evaluated. Indeed, one variation on the central theme of the present concept is suggested on the plan/map that is the last of the accompanying drawings. Using principles previously enunciated and employing types of construction and rights-of-way as indicated, an alternative possibility for the "Loop"

would be as shown on the drawing and summarized in Table 4. Working with this alternative basic loop--"8"--would be a feeder system or "bus net" as previously described.

TABLE 4--SUMMARY DATA ON ALTERNATIVE MODEL

Unit	Const. Type	No. of Miles	No. of Stations	Total Cost
Basic Loop--"8"	Subway	10.5	6	$178,500,000
	Sub/Aerial	--	1	--
	Aerial	35.0	17	280,000,000
	Surface	13.0	3	80,600,000
Total Loop		58.5	27	$539,100,000
Extensions to:				
Mesa	Aerial	6.5	4	$ 52,000,000
Sun City	Aerial	5.0	3	40,000,000
South Phoenix	Aerial	4.0	3	32,000,000
West Phoenix	Subway	1.5	1	25,500,000
	Aerial	3.0	2	24,000,000
	Total	4.5	3	49,500,000
Litchfield Park	Aerial	9.0	4	72,000,000
Paradise Valley	Aerial	6.5	3	52,000,000
	Surface	4.5	2	27,900,000
	Total	11.0	5	79,900,000
Total Extensions		40.0	22	$325,400,000
Total Loop & Extensions		98.5	49	$864,500,000

The Possibilities of Presently Unproven Systems

The foregoing descriptions, in which the urban and the local systems are seen as employing different kinds of vehicles and operations from each other, are based on the use of technologies already proven. During the time that the Phoenix metropolitan system is being studied and developed, it could be that systems will be perfected that will permit any trip using the mass/rapid transit system to be negotiated in a single vehicle, as in an auto, without the need for a transfer.

For instance, it may indeed become possible for small, 2- or 3-passenger personalized and privately owned vehicles to pass from any place to any place with manual operation permitting complete freedom of choice in local areas and fully automated mass/rapid transit techniques facilitating their extended movement through urban areas in the same stream that carries public transit vehicles. Such a versatile system would afford an attractive choice to the advantaged while at the same time meeting the needs of the poor, the aged, the young and the handicapped. Such a sophisticated system would appear to require larger and more elaborate stations to provide for merging such a variety of public and private vehicles into and out of the mass/rapid stream, but the stations would probably be in the same places for the sake of the people and activities to be served.

The "Loop", its extensions and its supporting "bus net", as proposed, meet certain assumed criteria that may well prove inappropriate in the light of further and later studies. Perhaps it will turn out that there should be a closer station spacing providing better area coverage but slower service. Perhaps both express and local service on the urban transit system will prove to be required.

Perhaps it will develop that, for the sake of the residential areas and work centers to be served, one or more of the suggested extensions--or one not suggested--should be seen as part of the basic system with the "Loop". But any system in prospect, of those currently proposed and being discussed as identified in Section 1 and Appendix A, can be expected to require routes and stations and rights-of-way and "transit zones" very like the present proposal. Thus, the model willprobably have some relevance in planning for whatever needs and whatever systems the future may hold.

Future Transit Planning

The potential for development of Phoenix and the Salt River Valley is well known. The quantitative growth of our metropolitan area seems assured. Indeed, it may be regarded as being inevitable no matter how unwilling we may be to accept the urban sprawl, commercial blight, waste and pollution that our current development patterns and practices so consistently generate.

According to the projections of the Advance Transportation Planning Team of the City of Phoenix, as set forth in its publication, Mobility - Phoenix Style, April, 1969, metropolitan Phoenix, by 1990, can be expected to have 2,000,000 people living in an urbanized area of 458 square miles. The amount, location and nature of the growth actually to be experienced will be determined in large measure by the kinds of transportation systems that are available or being developed to anticipate and accommodate that growth.

It is now possible for us to determine what kind of city we will have when our numbers have doubled, what quality of life we will aspire to in twenty years, and what sort of environment we will experience at the end of the century. But the options

won't remain forever open. We must make early and wise decisions in many areas, including that of transportation. For, as suggested at the beginning of this report, the transportation system is possibly the most powerful single determinant of the form and character of the city.

A STUDY OF MASS/RAPID TRANSIT FOR PHOENIX AND THE SALT RIVER VALLEY

Supplementary to the above titled study dated July 1970, a Second Alternative Model is suggested by the accompanying drawing and Table 5 below.

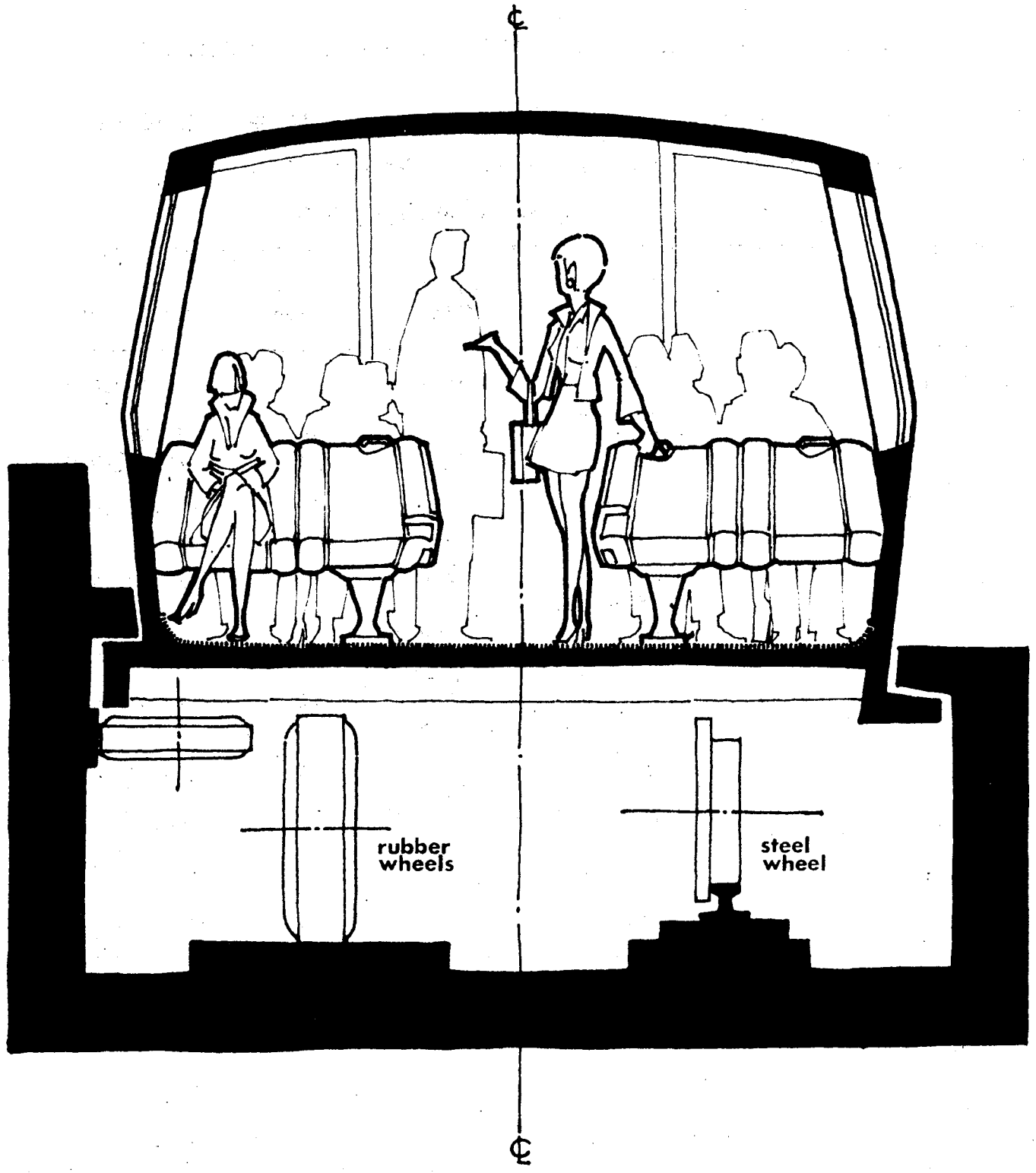
TABLE 5--SUMMARY DATA ON SECOND ALTERNATIVE MODEL

Unit	Const. Type	No. of Miles	No. of Stations	Total Cost
Basic Loop--"8"	Subway	10.5	6	$178,500,000
	Sub/Aerial	--	1	--
	Aerial	46.5	20	372,000,000
	Surface	12.0	3	74,400,000
Total Loop		69.0	30	$624,900,000
Extension A	Subway	2.0	1	$ 34,000,000
	Surface/Aerial	--	1	--
	Aerial	41.5	18	332,000,000
	Surface	7.5	2	46,500,000
Total Extension A		51.0	22	$412,500,000
Extension B	Aerial	20.0	8	$160,000,000
Extension C	Aerial	7.5	3	$ 60,000,000
Extension D	Aerial	18.0	8	$144,000,000
Extension E	Aerial	30.5	12	$244,000,000

This alternative suggests how urban transit might be provided within 3-1/2-4 miles of any place in the Valley--should it ever be needed.

Also supplementary are the attached half-sections showing possible configurations of the aerial structure. In both of these, the depth available for spanning between vertical supports provides also a potential for noise control.

JWE 1 Dec., 1970



HALF-SECTIONS THRU AERIAL LINE SHOWING ALTERNATES FOR STRUCTURE, SUSPENSION, AND NOISE CONTROL

0 1 2 3 4 5 feet

JWE DEC., 1970

APPENDICES

Appendix A

PRESENT AND PROPOSED TRANSIT SYSTEMS

As summarized in Table 1, the transit systems presently in general use in local and urban areas to provide both collector/distributor and line haul service are the auto, the taxi, and the bus. Other systems having some use are the bicycle, motorbike, and golf cart type vehicle in local areas, rail rapid transit in urban areas, and the tram or minibus in major activity centers. Systems now under research, development, testing, and in some cases, construction for each of the four categories of service summarized in Table 1, are described below.

LOCAL AREA SERVICE - SINGLE MODE - COLLECTOR/DISTRIBUTOR SHORT TRIP SYSTEMS employing low-speed, low-capacity vehicles for short-range use.

Small Car Systems--2- to 4-passenger vehicles.

Electric Car--a 2- to 4-passenger vehicle, battery powered, charged overnight.

Bus Systems--Vehicles carrying 10 or more passengers.

Minibus--a small, easy-loading, low-fare bus designed for major activity centers in Washington, D. C., and Detroit but having potential for fixed or flexible routes in local areas.

LOCAL AND URBAN AREA SERVICE - DUAL MODE - COLLECTOR/DISTRIBUTOR AND LINE HAUL DUAL MODE SYSTEMS with vehicles which can be individually driven and also converted from street travel to travel on automatic guideway networks.

Small Car Systems--2- to 4-passenger vehicles.

Public Automobile Service--a concept of small, electric, rental vehicles for short trips in local areas including connection to an intraurban transit station.

MIT Project Metran--1. The Automobile--a system to enhance auto travel, rather than compete with it, by adding automatic control capabilities and new power sources.

StaRRcar--a small dual-mode electric vehicle which the commuter would rent, keep at home where battery is recharged overnight, drive it manually to nearest guideway entrance, surrender control to automated guideway for travel at 60 mph to destination where vehicle is either stored or surrendered with another to be rented for return. Developed by William Alden.

Urbmobile--similar to StaRRcar with design anticipating manufacture by auto makers with minimum requirements for fitting the guideway. Developed by Cornell Aeronautical Laboratory.

MIT Project Metran--4. The Automated Guideway--a fourth component of Metran providing power and automatic control on the guideway network for vehicles able to operate elsewhere with electric motors having self-contained energy source.

Bus Systems--vehicles carrying 10 or more passengers.

Automated Dual Mode Bus--a system using large vehicles equipped with special retractable bogies to combine the high-speed capability of a rail system operating on its private right-of-way with the flexibility and adaptability of a city bus. The system has been demonstrated in New York City, Philadelphia, and Minneapolis.

Dial-a-Bus--a concept of bus-type service activated on demand of potential passengers, perhaps by telephone, after which a computer logs the calls, origins, destinations, location of vehicles, and number of passengers, and then selects the vehicle and dispatches it. The Genie system of MIT Project Metran is an example of this.

MIT Project Metran--5. The Genie System--the fifth component of Metran, it is a series of small 10-passenger soft-wheel vehicles for mass transit operations in suburban areas (low and medium density), with ability to operate under manual control off the guideway and by automatic computer control on it. Users desiring service request a vehicle directly by telephone dialing the desired destination zone code number. The destination is automatically recorded, the user automatically charged, and a vehicle is routed to the user's block.

Pallet or Ferry Systems--a concept providing for drive-on or the use of pallets for ferrying conventional cars, buses, or freight on automatic high speed guideways. The "Auto-Train" is an example of this.

TransDrive--a ferry system in which bogies on a monorail pick up cars and trucks by attachments on their roofs.

URBAN AREA SERVICE - SINGLE MODE - LINE HAUL

FAST intraurban TRANSIT LINKS with automatically controlled vehicles capable of operating either independently or coupled into trains, and serving metropolitan area travel needs between major urban nodes.

Conventional Systems--recent examples of the current "state-of-the-art".

Montreal Metro--a conventional rapid transit system using rubber-tired vehicles.

Expo Express--an automatically controlled, conventional rapid rail system used at Expo 67, Montreal.

BART--the San Francisco Bay Area Rapid Transit system employing specially designed, electrically driven, steel-wheel-on-steel-rail vehicles automatically controlled and operating at up to 80 mph in trains of up to ten 72-seat cars.

Prototype--conventional type systems under research, testing, and development.

Westinghouse Transit Expressway--a rapid transit system using lightweight, electric,

automatically controlled, rubber-tired vehicles to provide continuous round-the-clock service with a train every two minutes, meeting fluctuating passenger volume demands with trains of from one to ten 28-seat cars (70 maximum capacity), operating at speeds up to 50 mph. Proposed for medium density areas.

MIT Project Metran--2. The BOS System--(Bus Only Street)--a system reserving every third or fourth street for specially designed soft-wheel vehicles having low silhouette for easy access and a multidoor arrangement for rapid loading.

Monorail--a single track system with the vehicle either suspended or supported.

General Electric Aerial Transport System--a rapid transit system employing the monorail principle as pioneered by the French SAFEGE Company with rubber-tired vehicles suspended from an aerial beamway operating at speeds up to 100 mph.

Alweg System--a monorail supported from below on a single track. A short line operates in Seattle, built for access from downtown to the World's Fair.

Gravity Vacuum--systems employing gravity and vacuum principles for movement of vehicles in underground tubes.

Gravity-Vacuum Transit--(GVT)--a system proposed by L. K. Edwards employing gravity and atmospheric air pressure for acceleration, propulsion, and deceleration of cylindrical, pressure-tight trains traveling at up to 500 mph through steel tubes in underground tunnels of variable depth.

Tubeflight--a pneumatic system concept similar to Edwards GVT but allowing air to remain nearly at rest with the train propelling itself by transferring the air fore-to-aft through and around itself in the tube, the principle of

ground effect supporting the vehicle and banking it on curves. Proposed by Professor Joseph V. Foa of Rensselaer, it is theoretically capable of speeds up to 2000 mph.

Ground Effect--principle of supporting vehicles on a cushion of air.

Hovercar--a tracked Hovercraft or Air Cushion Vehicle (ACV) being developed by British Hovercraft Development Co. to employ ground effect in a tracked ground transportation system. With vehicle supported by cushion of air friction is reduced and 500 mph speed is theoretically possible.

Aerotrain--a ground effect vehicle being tested by French government. Riding on thin air cushion on a concrete track it would carry 80 passengers 70 miles in 25 minutes. Chief drawback is excessive noise.

Levacar--a technical system of cars having pads instead of wheels riding along two rails on a thin film of air--studied by Ford.

Uniflo--a small-car system using ground effect with power provided by jets positioned along the guideway--under development by Rosemount Engineering Company.

MIT Glideway--a ground effect system with modules varying from small personalized carriers to larger ones carrying cars, trucks, or buses operating separately or in trains, supported on a thin cushion of air, and propelled by a linear induction motor. Proposed by MIT for Northeast Corridor.

Hovair--a system studied by General Motors employing ground effect vehicles propelled by linear induction motors--similar to MIT Glideway.

Personal Rapid Transit--a concept of small vehicles traveling over exclusive rights-of-way, automatically routed from origin to destination over a network guideway system, primarily to serve low- to medium-density areas.

Teletrans--a system of automatically-controlled, electrically-powered vehicles running in an enclosed tube on non-metallic wheels and aluminum rail.

Dashaveyor--a system of individually powered modules interlocked to a track within a rectangular tube and capable of moving horizontally like a train, vertically like an elevator, or on an incline like a conveyor belt at speeds from 3 to 50 mph. Invented by Stanley Dashew for handling copper ore but potentially capable of adaptation for moving people, baggage, cargo, freight, and mail.

Multi-Mode--a transit concept in which electrically self-powered, automatically controlled carriers move in cantilever fashion in one- or two-way traffic along a special narrow guidebeam, guided and supported by pneumatic tires, with unique switches and interchanges permitting high-capacity, unitized traffic flow as well as personalized scheduling and flexible routing. Proposed by Multi-Mode Systems, San Francisco, for applications ranging from in-plant industrial conveying systems to low-speed systems for major activity centers to regional networks.

Synch Trans--a transit concept of a mechanically synchronized pattern of movement of small cars on an electrically powered, constantly moving, closed loop, "beltway"--proposed by Transyt Associates, Dallas.

Air Transit--systems employing helicopters or vertical-take-off and landing (VTOL) or short-take-off and landing (STOL) craft to

transport people or goods, either individually, palletized, or in other vehicles, in urban settings.

MAJOR ACTIVITY CENTER SERVICE - SINGLE MODE - COLLECTOR/DISTRIBUTOR Systems for major activity centers including continuously moving belts, escalators, capsule transit systems, elevators, horizontal elevators, and similar systems designed to move large numbers of people over relatively short distances.

Horizontal Elevators--high-volume, moderate speed service.

Minirail--a small light-weight slow-moving, open-air train supported on a monorail--used at Expo 67, Montreal.

People Mover--small cars moving slowly and continuously on powered guideways with passengers being loaded from platforms revolving at the same speed as the cars--used at Disneyland.

Skybus--Westinghouse Transit Expressway modified to provide frequent automatic shuttle service over short distances--to be used between central air terminal and outlying boarding and deplaning areas at Tampa International Airport.

Transveyor--a system of small, windowed compartments continuously moving on belts on two levels, slowly to permit entering from the rear and leaving to the front and faster during the trip. Each module accommodates two or three adults, standing, with room for wheel chairs and baby carriages. Proposed by Battell Institute, France.

Carveyor--a series of wheelless cars on a conveyor belt track traveling bumper to bumper at 1-1/2 mph in synchronization with a moving platform in stations to permit passenger boarding, then accelerating to cruising speed of 15 mph between stations. Developed by Goodyear Tire and Rubber Co.

MIT Project Metran--3. The PERC System--PERsonalized Capsule)--a sub-system, working with the automatic guideway, consisting of two- to four-man capsules and having a channel capacity, conceptually of 20,000 people per hour at 20 mph operating speed in highly dense major activity centers.

Appendix B

STATUS OF MASS/RAPID TRANSIT IN MAJOR CITIES

The population figures for U. S. cities in Table 2 are taken from "Projections to 1980 for States and 224 Metropolitan Areas," by Joe Won Lee and William B. D. Hong, Economists, National Planning Association Center for Economic Projections, published in the monthly NPA report Looking Ahead for July, 1969, and made available by the Valley National Bank. Data to characterize the systems of various cities and to identify the sources of information concerning them are contained in the following separate paragraphs for each.

1. New York City--N. E. New Jersey. The first elevated opened in 1868 and New York's first subway on 27 October 1904. The system now dwarfs all others. The New York City Transit Authority, created in 1953, operates a system that has 484 stations and over 7,000 cars; it handles nearly 6 million revenue passengers daily with about 8,000 daily train trips. Construction of New York City rapid transit lines cost over $2-1/2 billion; replacement today would cost in excess of $8 billion. These data and route mileages are taken from information supplied by the NYC Transit Authority. It also reports 726 track miles (total miles of single track) as opposed to 240 route miles (total of mileages between points served). Of the total route miles, 137 are underground, 80 on elevated structures, and 23 on the surface or embankments or in open cuts. Additional route mileages of other systems in the metropolitan area are included in the 272-mile figure in the tabulation. These are taken from the Automotive Safety Foundation report, "Urban Transit Development in Twenty Major Cities," dated March, 1968. They are: the 14-mile service of the Port Authority Trans-Hudson Corporation (PATH), the 14-mile line of the Staten Island Rapid Transit Railway Co., and the 4-mile long Newark Subway.

2. Los Angeles--Long Beach. Estimated to cost about $2.5 billion, this five-corridor, 89-mile system was rejected by the voters on 5 November 1968 by the margin of 45% Yes, 55% No (60% majority required for passage). Route mileages from "Final Report," Southern California Rapid Transit District, May, 1968. Population figures include Anaheim--Santa Ana--Garden Grove.

3. Chicago--N. W. Indiana. Route mileage is from "Statistics," Chicago Transit Authority, Rev. 1-2-69, with note added to include Dan Ryan and Englewood extensions. Report shows "track mileage" which is single track and is therefore halved to show approximate 2-track route mileage for comparison with other cities' systems. (159.6 + 22.8 = 182.4. 182.4/2 = 91.2 say 91)

4. Philadelphia--S. Jersey. Service was begun on 4 March 1907 and the system is still being extended. Route mileage, from data furnished by Southeast Pennsylvania Transportation Authority, includes 46 miles operated by SEPTA and the new 14.5-mile Lindenwold Line in New Jersey operated by the Delaware River Port Authority.

5. Detroit. Letter 9 December 1969 states, "The Department of Street Railways of the City of Detroit is beginning the initial planning for a subway system for Detroit as announced by our Mayor from the National League of Cities Conference."

6. San Francisco--Oakland. The Bay Area Rapid Transit District was born on 25 July 1951 as a special Commission created by the California legislature to study Bay Area transportation problems. This system is now under construction with completion anticipated for about 1972. Route mileage is from BART data with the 75-mile total consisting of 19 miles of subway, 27 miles of surface lines, 25 miles of aerial lines, and the 4-mile long underwater Trans-Bay Tube.

7. Washington, D. C. The National Capital Planning Act of 1952, passed by Congress on 19 July, directed the National Capital Planning Commission and the National Capital Regional Planning Council to prepare plans for movement of people and goods in the region. The Washington Metropolitan Area Transit Authority adopted a 97.2-mile regional system 1 March 1968 and voters authorized a bond issue with 71% approval on 5 November 1968. Route mileage is from adopted plan as furnished by WMATA.

8. Boston. In 1897, the Tremont Street Subway was placed in service--it was the first in the country. Modernization and expansion are now in progress. Present route mileage is from ASF "Urban Transit in 20 Major Cities," March, 1968. Extension mileage is from "Capital Expansion Program," Massachusetts Bay Transportation Authority.

9. St. Louis. Route mileage of test system is from "St. Louis Metropolitan Area Rapid Transit Feasibility Study" for East-West Gateway Coordinating Council, July, 1969. Both bus and rail systems are to be tested on the 72-mile network proposed.

10. Pittsburgh. Route mileage is from Architectural Forum, November, 1969, and data from the Port Authority of Allegheny County. Included are 2 bus roadways on streetcar and abandoned railroad rights-of-way totaling 18.4 miles and an 11-mile Westinghouse "Sky bus" line from downtown to suburbs in the South Hills.

11. Houston. Road and Transit, a report prepared by consultants for the Houston-Galveston Area Council, July, 1969, includes recommendations to "...Augment and expand the public segment of the metropolitan transportation system through: early development of a grade-separated rapid transit system, and expansion of express and local bus service coordinated with the rapid transit system...."

12. Cleveland. The first 8-mile segment was opened 15 March, 1955. Route mileage is from data furnished by Cleveland Transit System for both the existing system (including extension to Hopkins International Airport) and planned extensions.

13. Baltimore. Route mileage is from ASF "Urban Transit in 20 Major Cities," March, 1968. Letter from General Manager of Metropolitan Transit Authority, 15 December, 1969, states: "Although the previous studies generally indicate the desirability of a rail rapid system, current thinking indicates that this must be examined closely with relationship to the various corridors under consideration. It is conceivable that upon adoption...the system may include rail rapid transit in certain corridors and bus rapid transit in other corridors--some on exclusive right-of-way and some in combination traffic."

14. Dallas. Route mileage is scaled from conceptual plan by Ponte-Travers Associates, consultants to the City of Dallas, not formally adopted by the city.

15. Minneapolis--St. Paul. Report to the Twin Cities Area Metropolitan Transit Commission by Alan M. Voorhees & Associates, Inc., November, 1969, recommends: (1) rail rapid transit with 19 miles by 1980, 31 miles by 1990, and an ultimate network of 71 miles; (2) limited stop bus operation on freeways and arterials; (3) a network of feeder lines; and (4) complementary service within high activity areas.

16. Atlanta. Route mileage is from data furnished by the Metropolitan Atlanta Rapid Transit Authority. The 40.3-mile system was referred to the voters on 5 November, 1968, and turned down by a vote of 43% Yes and 57% No.

17. Milwaukee. Letter, 18 December, 1969, states: "...We are in the preliminary stages of planning a modified bus rapid transit systems to operate in mixed traffic and on exclusive roadways...."

18. Seattle. Route mileage is from "Report on a Comprehensive Public Transportation Plan for the Seattle Metropolitan Area," October, 1967, by DeLeuw Cather & Company, Consulting Engineers. The system has been proposed to the voters and rejected.

19. San Diego. Letter from San Diego County Comprehensive Planning Organization dated 13 January, 1970, reports that "...three jobs directly geared to transit are underway: (1) The 'Transit Survey' is in the final-report writing stages. This job surveyed all bus riders in the region. (2) The 'Transit Development Plan and Improvement Program' is a 5-10 year operations-improvement program being prepared by a consultant, and (3) The 'Candidate Transportation Systems Study' will identify those innovative modes most applicable to San Diego."

20. Miami. Route mileage is from "Miami Urban Area Transportation Study: Corridors for Transit Improvement," July, 1968. Letter from Director, Metropolitan Dade County Planning Department, 20 October, 1969, states: "Twenty-four miles of automated transit and a 22-mile express busway system has been recommended for construction prior to 1985...."

21. Buffalo. Letter from the Mayor dated 22 September, 1969, states: "...mass transit studies are presently in the planning stage. We do not as yet have such studies geared specifically for the needs of this frontier community."

22. Cincinnati. Route mileage is from "Ohio, Kentucky, Indiana Regional Transportation Study," March, 1968. More specifically, it was scaled from a map labeled "Proposed Transportation System for Analysis--Test Plan 1B" dated 14 March 1968 and stamped "Preliminary--for Discussion Only."

23. San Bernardino--Riverside--Ontario. This can be expected to be an extension of the Los Angeles system.

24. San Jose. This is planned as an extension of the Bay Area Rapid Transit system of San Francisco-Oakland.

25. Kansas City. Route mileage is from "KCI Rapid Transitway," October, 1969, an engineering design report for the Kansas City Area Transportation Authority. The plan is for a grade-separated transit freeway for buses, convertible in the future to a rail system. This first 19-mile segment from downtown to Kansas City International Airport is viewed as the north leg of an eventually more extensive metropolitan system.

26. Denver. Studies are underway as part of the Center Cities Transportation Project funded entirely by the Department of Transportation and including Pittsburgh, Dallas, Seattle, and Atlanta as well as Denver. Other regional studies are being funded by DOT and the Colorado Legislature.

27. New Orleans. Letter from Director-Secretary of the City Planning Commission of New Orleans, 19 March, 1970, includes these statements:
"The City of New Orleans, in conjunction with the Regional Planning Commission, is in the process of preparing an application for a Rapid Transit Feasibility study.... New Orleans is the only city of comparable size with a directly subsidized public transit system. This system was only recently allowed to increase its local fare to 15¢ and its express fare to 20¢.
...At the present time, the general approach apparently emerging for the area is two-fold--a) Establish forms of rapid transit between high concentrations of passenger activity such as the Airport and the Central Business District as well as new corridors of transit linked to the expanding industrial areas particularly along the Mississippi River. b) The reinforcement and enhancement of the existing transit system serving the Central City...."

28. Phoenix. "Mobility-Phoenix Style," a summary report by Advance Transportation Planning Team, City of Phoenix, April, 1969, states: "The Phoenix urban area projected size, density and form would not support a rail transit system in the frame of present long range planning, through 1990. Rail rapid transit is primarily intended to serve centrally oriented commuters along dense travel corridors, a situation which is not foreseen for Phoenix. However, there should be periodic re-evaluation of the transportation system and its various modes with due consideration for the desires of the people. Further, as the urban area population approaches 2,000,000 the City should undertake a broad base mass transit study to explore the potentials of all transportation modes. Phoenix can take advantage of new technology and experience of other urban areas in the field of mass transit over the next decade."

29. Indianapolis. Route mileage from "Indianapolis Regional Transportation and Development Study," June, 1968. Plan recommends 22 miles of special grade-separated rights-of-way for bus rapid/transit and also 55 miles of bus rapid-transit service operating in the traffic streams of several freeways.

30. Tampa--St. Petersburg. Letter from Tampa Department of Public Works, 2 January, 1970: "...Tampa has no bus or rail rapid transit planned. Future system may be considered from the Airport to Downtown." No response from St. Petersburg.

31. Portland, Oregon. Letter from Public Affairs Coordinator, 8 October, 1969: "Recently the local council of governments has made application for a planning grant to undertake a transportation study."

32. Sacramento. Letter from Sacramento Regional Area Planning Commission, dated 11 March, 1970, states: "Although we

investigated the potentials and opportunities for rapid transit systems on exclusive grade-separated rights-of-way, our conclusion is that such a system would not be applicable to the Sacramento Region for some time in the future. Our alternatives to be tested in the transportation model, therefore, are based on buses utilizing surface streets and freeways."

33. San Antonio. Letter from Director of Traffic and Transportation, 25 September, 1969: "...rail and rapid transit has no place in our plans....All of our planning is in the direction of a bus transit system."

34. Columbus. Letter from the Mayor, 26 September, 1969: "...It is my judgment that the extremely fast growth of this community...will call for some type of a rapid transit system; and the planning should commence as soon as possible.

35. Rochester. Letter from Rochester Transit System, 17 October, 1969, enclosing "The 1990 Transportation Plan," states: "...study will soon be undertaken...express buses on I-490, separated busways...and a downtown terminal to interface these express services with our regular urban system."

36. Dayton. Letter from Transportation and Development Planning Program, 29 September, 1969: "...The mass transit element of our transportation planning program is currently in the inventory phase."

37. Louisville. Route mileage is from "Rapid Mass Transit Study--Louisville Metropolitan Area," September 1969, DeLeuw, Cather and Company.

38. Providence--Pawtucket--Warwick. "Master Plan for Circulation," approved by City Plan Commission of Providence, 28 November, 1965, shows complete dependence on streets, highways, freeways, and the vehicles they carry.

39. Memphis. Letter from President, Memphis Transit Authority, 2 October, 1969, states: "Construction that relies principally upon special lanes as a part of expressways is likely to have major consideration."

40. Birmingham. Letter from Director, Birmingham Regional Planning Commission, 13 October, 1969, states: "In view of the physical setting of the community and the nature and density of development likely to occur in the future, mass and rapid transit seem likely to be still related to the highway system."

a. Honolulu. Route mileage is from "Oahu Transportation Study--Summary Report--1985," dated 1967, showing for "fixed route," 26 miles grade separated and 3 miles subway.

b. Mexico City. Data from Arizona Republic, 17 July, 1969, reporting 9 miles to go into service "next month" and two other lines "next year," the completed network to consist of 22 miles at a cost of $320 million.

c. Toronto. Canada's first subway was opened 30 March, 1954. Route mileage is from "Subway Progress Report No. 9," furnished by Toronto Transit Commission, 26 September, 1969.

d. Montreal. Service was begun 14 October, 1966. Route mileage is from "General Description of the Montreal Metro," furnished by the Montreal Transportation Commission.

e. Edmonton. Route mileage is from study "Rapid Transit for the City of Edmonton," completed by Canadian Bechtel, Ltd., in June, 1963.

Appendix C

A MASS/RAPID TRANSIT MODEL FOR PHOENIX AND THE SALT RIVER VALLEY

Construction and Right-of-Way Data--Initial Model

Construction: Right-of-Way:	Subway Street	Aerial Street	Aerial Canal	Aerial Wash	Aerial RR	Aerial Fwy	Aerial Total	Surface Freeway	Total All
Basic Loop--"8"	6.5	15.5	3.0	5.5	4.5	6.0	34.5	9.0	50.0
Extension to:									
Mesa	--	1.0	--	--	5.5	--	6.5	--	6.5
Sun City	--	--	--	--	5.5	--	5.5	--	5.5
South Phoenix	--	4.0	--	--	--	--	4.0	--	4.0
Skunk Creek	4.0	--	10.0	--	--	--	10.0	--	14.0
Litchfield Park	--	9.0	--	--	--	--	9.0	--	9.0
Paradise Valley	--	--	2.0	4.5	--	--	6.5	4.5	11.0
Total Extensions	4.0	14.0	12.0	4.5	11.0	--	41.5	4.5	50.0
Total Loop and Extensions	10.5	29.5	15.0	10.0	15.5	6.0	76.0	13.5	100.0

Appendix D

DISTANCE AND TIME CALCULATIONS

Extrapolation of BART Data for Application to VAT

BART	Miles	Minutes	Average MPH
12th St. to Fremont	23.85	28	51.0
12th St. to Concord	20.84	25	49.8
12th St. to Richmond	12.23	19	38.4
12th St. to Daly City	15.32	23	39.6
Total	72.24	95	
Miles per minute	.76		
Miles per hour			45.6
Minutes per mile		1.31	

VAT (Valley Area Transit)

Assume:

Miles per hour			42.0			
Miles per minute	.70					
Minutes per mile		1.43				
Station 1 - 2	1.00	1.43		say	1.4	1.50
2 - 3	1.00	1.43			1.4	1.50
3 - 4	1.25	1.79			1.8	1.75
4 - 5	.75	1.07			1.0	1.00
5 - 6	3.50	5.00			5.0	5.00
6 - 7	3.00	4.29			4.3	4.25
7 - 8	2.00	2.86			2.9	3.00
8 - 9	1.50	2.15			2.2	2.25
9 - 10	1.75	2.50			2.5	2.50
10 - 11	3.25	4.65			4.6	4.50
11 - 12	2.25	3.21			3.2	3.25
12 - 13	1.50	2.15			2.2	2.25
13 - 14	2.50	3.58			3.6	3.50
14 - 1	2.50	3.58			3.6	3.50
1 - 15	3.50	5.00			5.0	5.00
15 - 16	2.00	2.86			2.9	3.00
16 - 17	2.00	2.86			2.9	3.00
17 - 18	3.50	5.00			5.0	5.00
18 - 19	1.50	2.15			2.2	2.25
19 - 20	1.25	1.79			1.8	1.75
20 - 21	2.75	3.93			3.9	4.00
21 - 22	2.00	2.86			2.9	3.00
22 - 23	2.75	3.93			3.9	4.00
23 - 1	1.00	1.43			1.4	1.50
	50.00	71.50			71.6	72.25
Average Station to Station (24 spaces)	2.08	2.9				

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General Electric Aerial Transport System, General Electric Company, 2901 East Lake Road, Erie, Pennsylvania 16501.

Urban Gravity-Vacuum Transit, Tube Transit Corp., P. O. Box 11335, Palo Alto, California 94306.

The Multimode Transportation System, Multi-Mode Systems, 500 Sansome Street, San Francisco, California 94111.

Synchtrans--"a new concept in transportation systems"--Transyt Associates, 3505 Turtle Creek Blvd., Dallas, Texas 75219.

Transit in Major Cities

Two documents characterizing transportation systems in 20 major cities. Additional data describing systems in use or under study in the 40 most populous urbanized areas of the United States (in 1980) and certain other cities are given in the documents assembled by the author and referred to in Appendix B.

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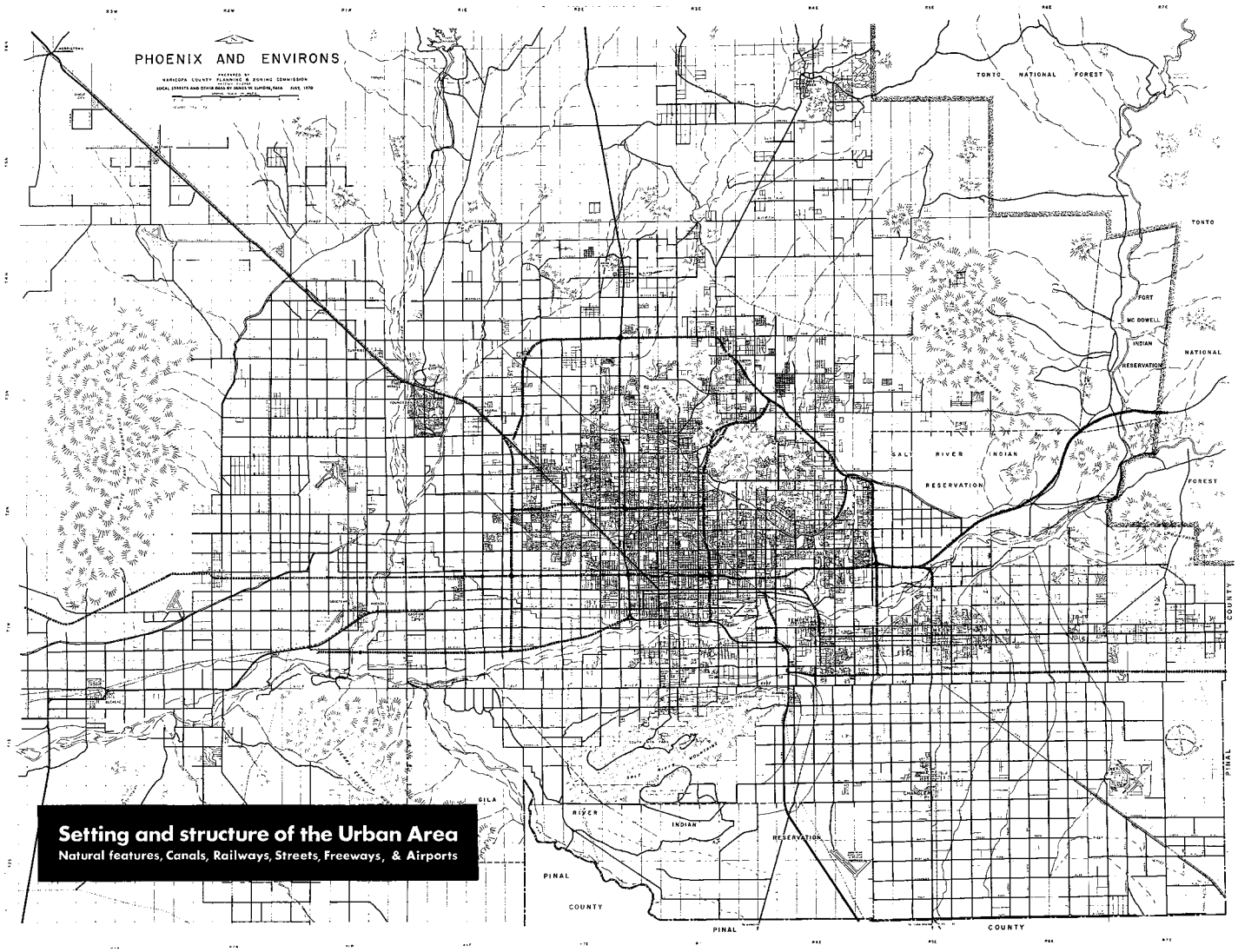
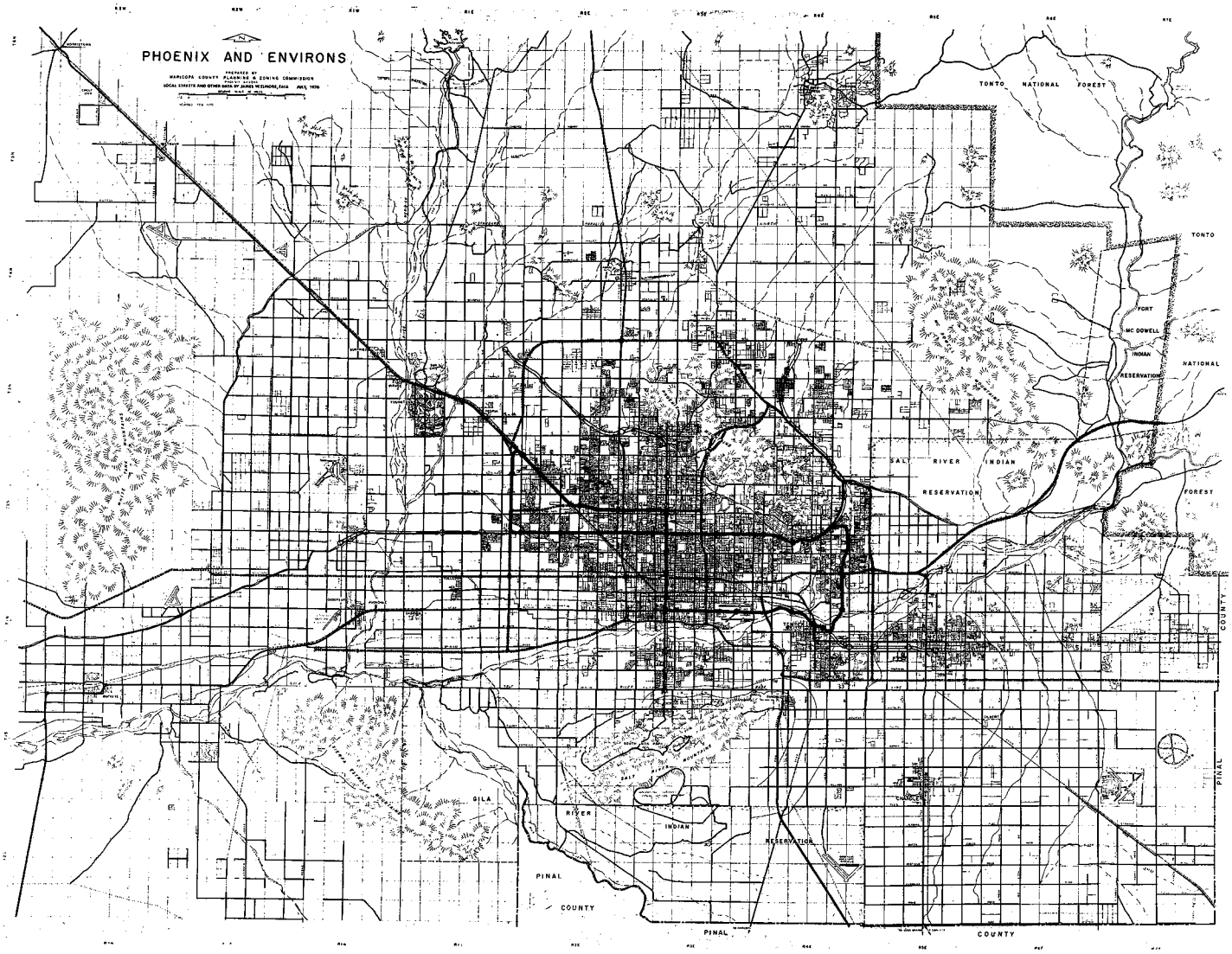


Setting and structure of the Urban Area

Natural features, Canals, Railways, Streets, Freeways, & Airports


PHOENIX AND ENVIRONS
TONTO NATIONAL FOREST
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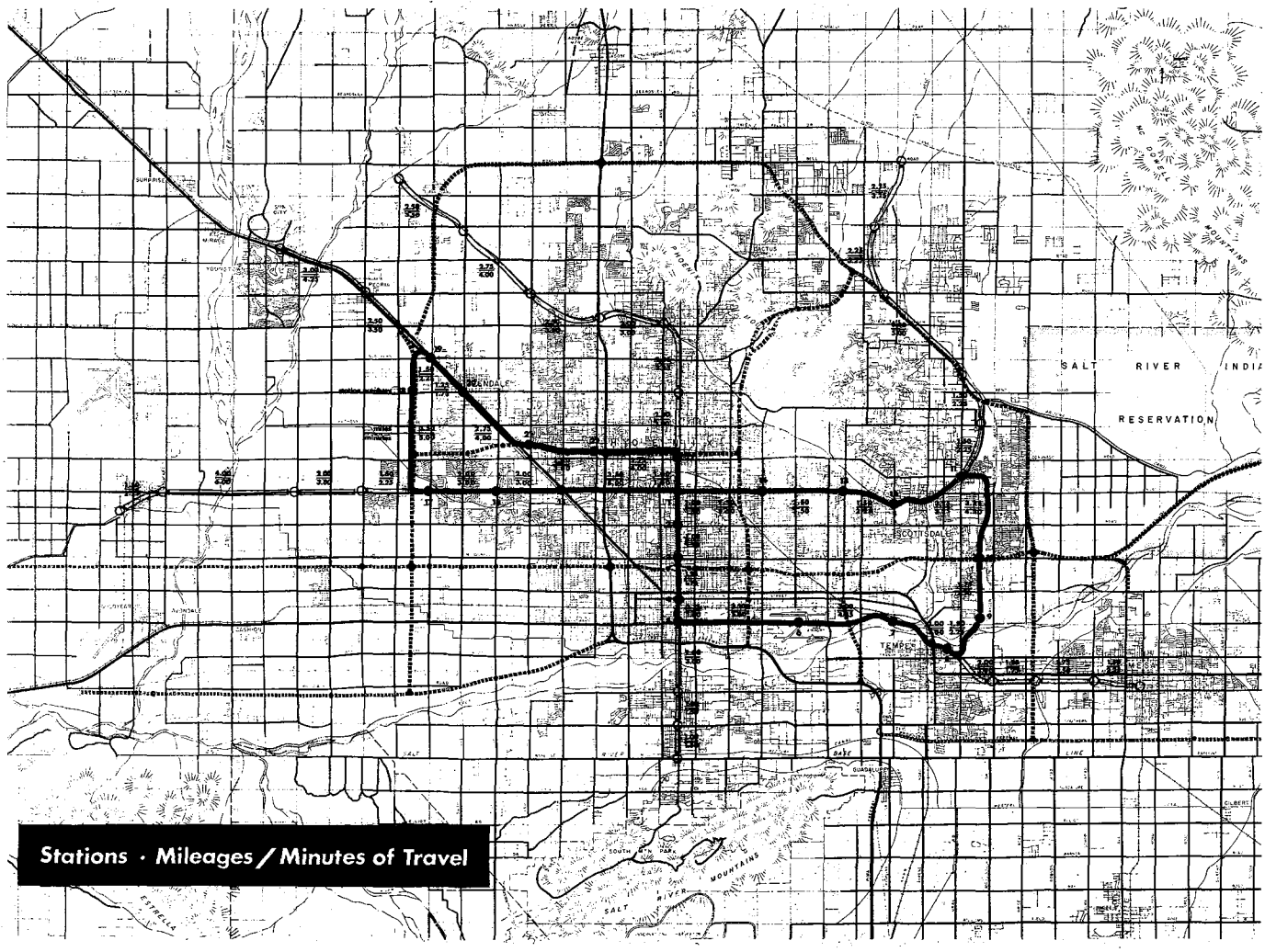
Stations · Mileages / Minutes of Travel
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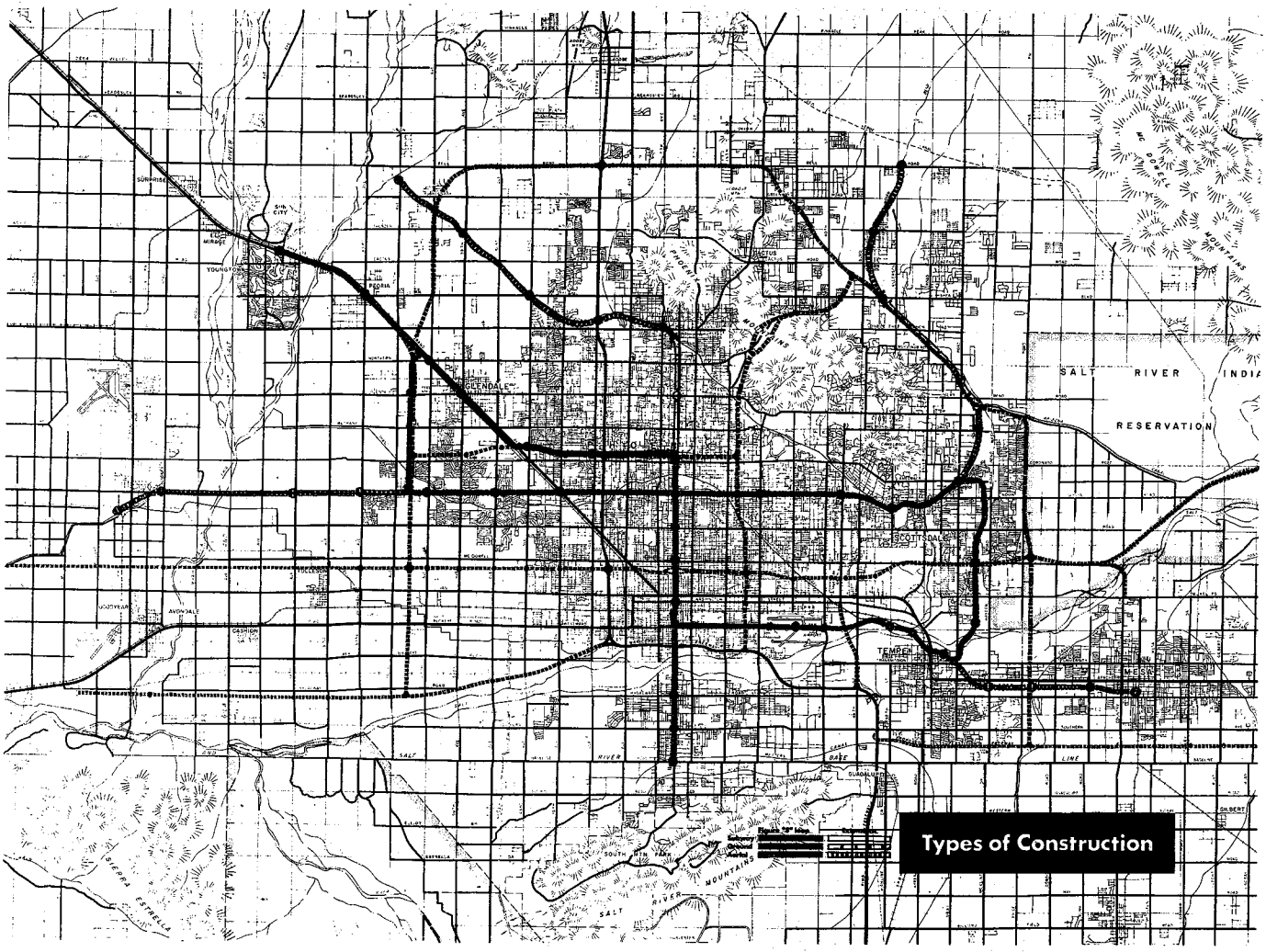
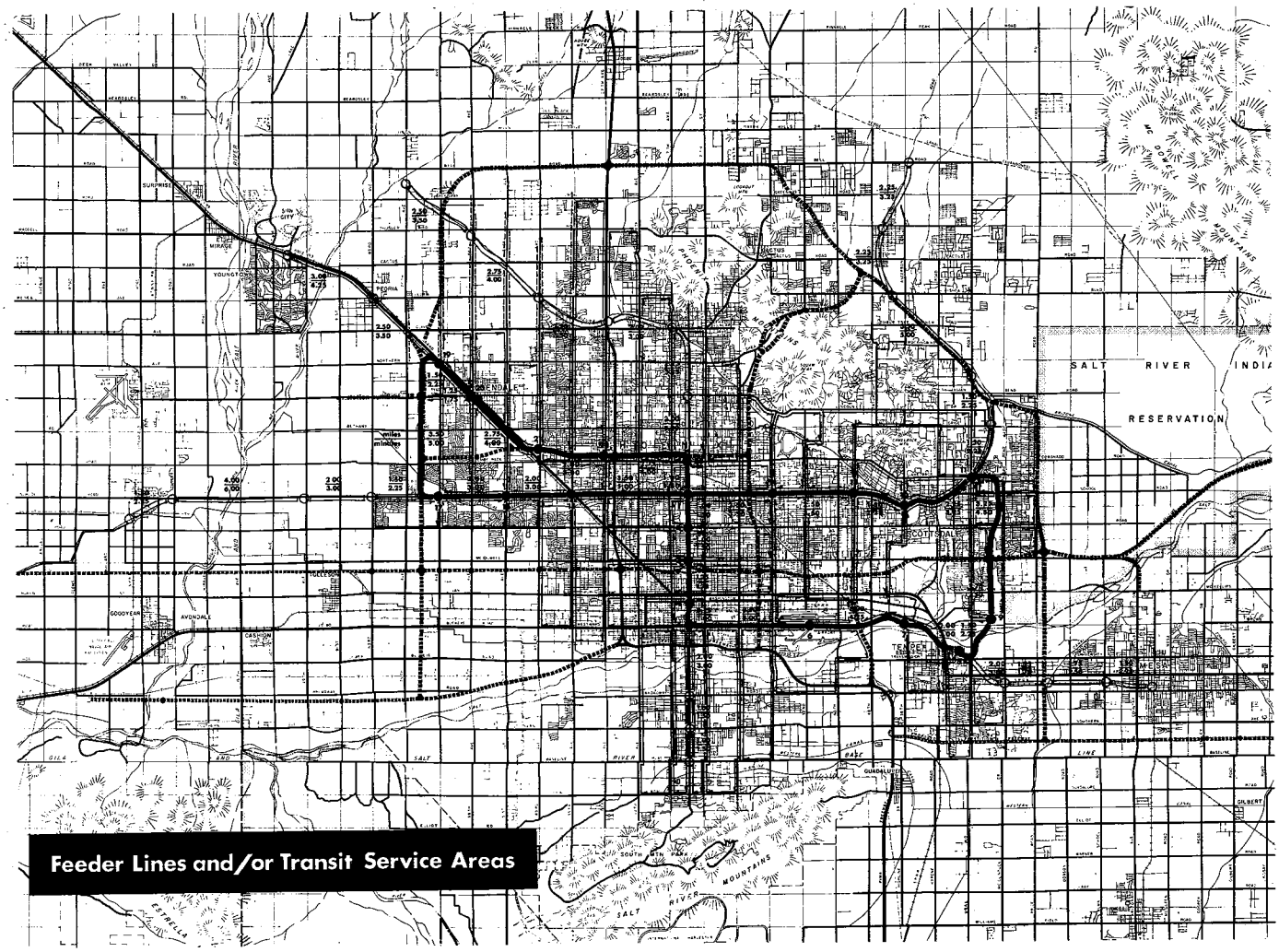
RESERVATION
GLENDALE
SCOTTSDALE
TEMPE
SURPRISE
ESTRELLA
MOUNTAINS
SALT RIVER


SALT RIVER
RESERVATION
Types of Construction


Feeder Lines and/or Transit Service Areas
SALT RIVER INDIA
RESERVATION
SUNRISE
YOUNGTOWN
PEORIA
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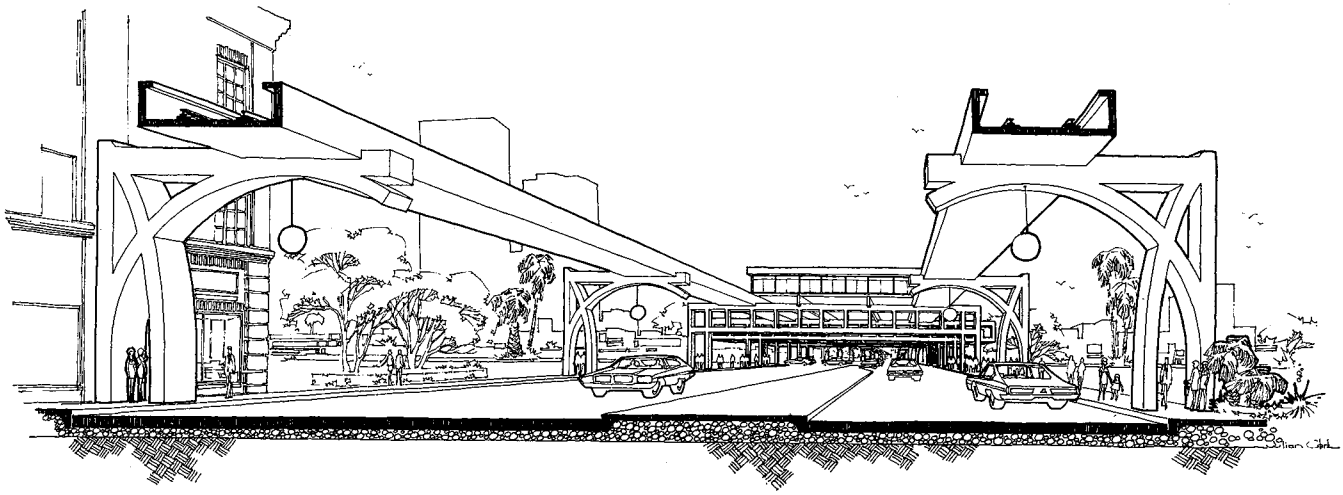
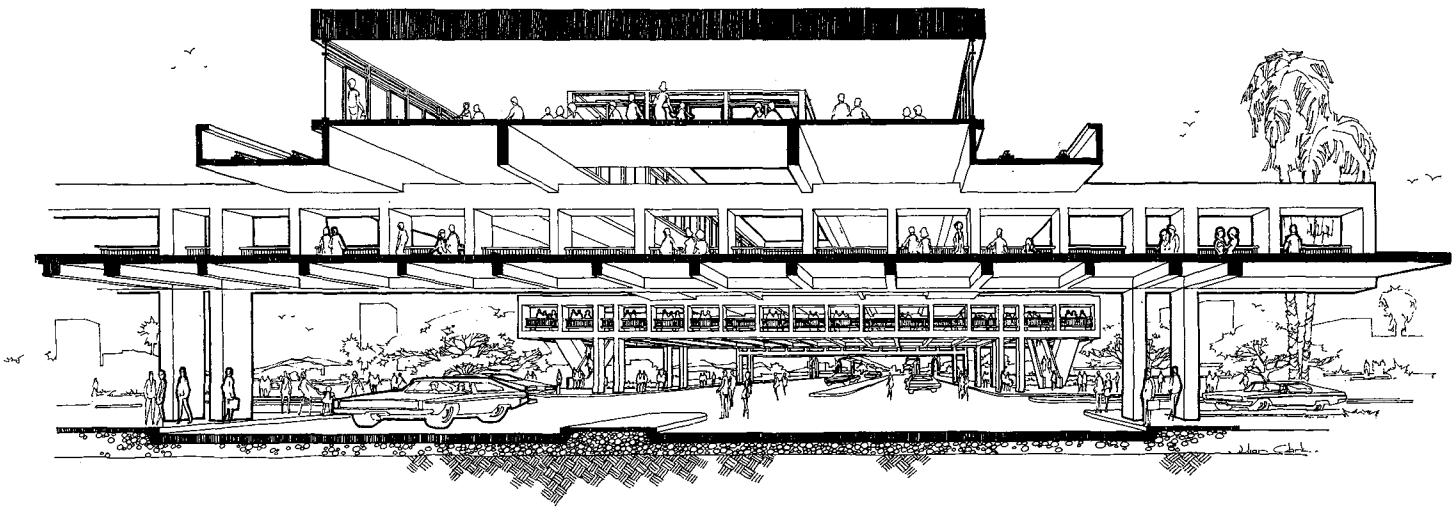
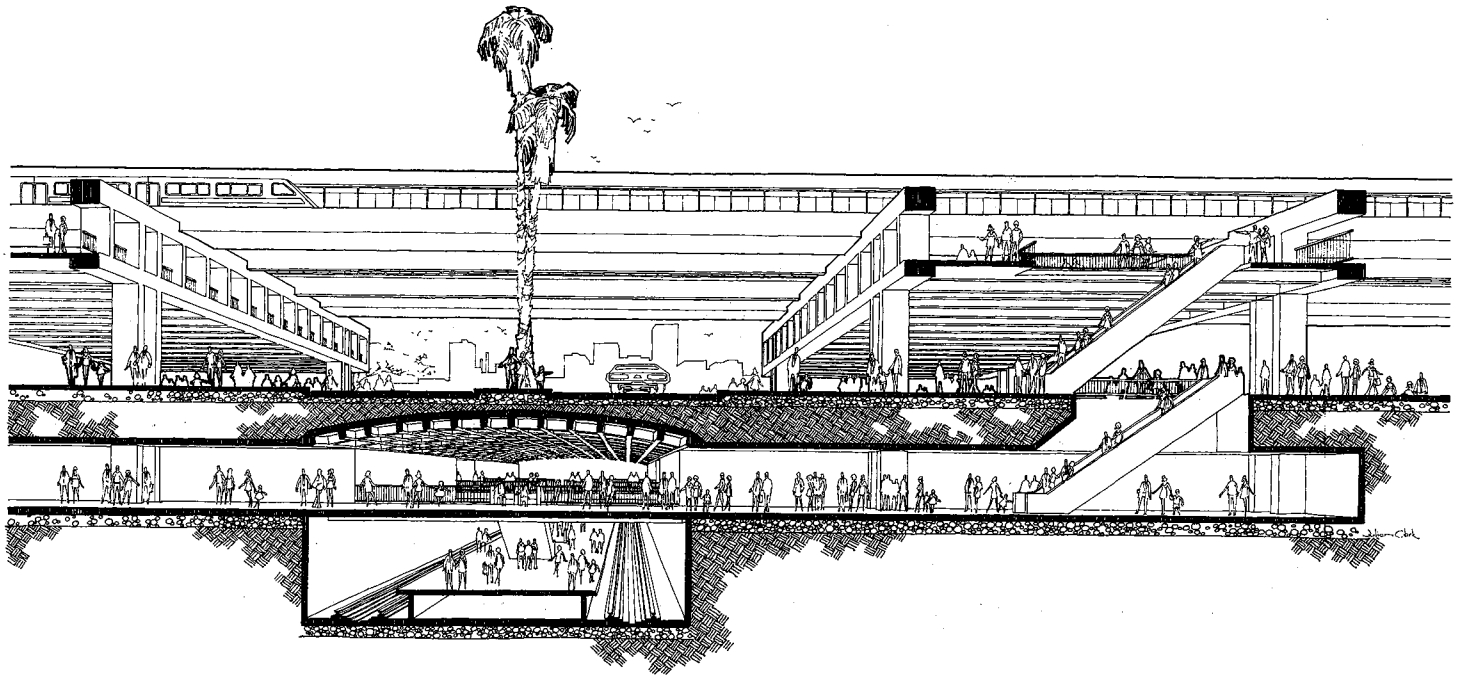
SCOTTSDALE
TEMPE
GOODYEAR
AVENDALE
CASHION
GILBERT
SALT RIVER MOUNTAINS
ESTRELLA



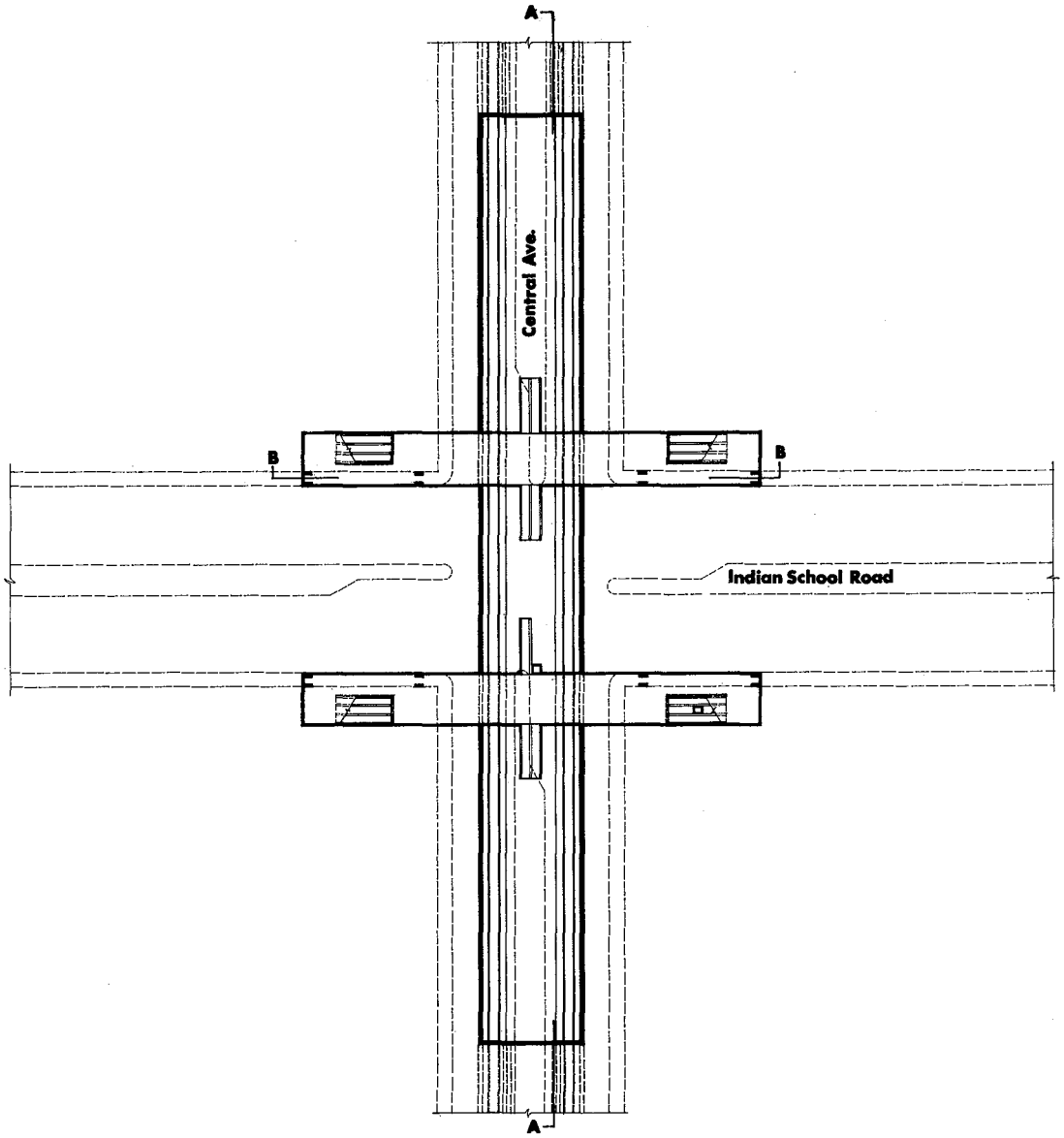
PERSPECTIVE-SECTION RAIL STRUCTURES AERIAL STATION **looking west on Indian School toward Central**



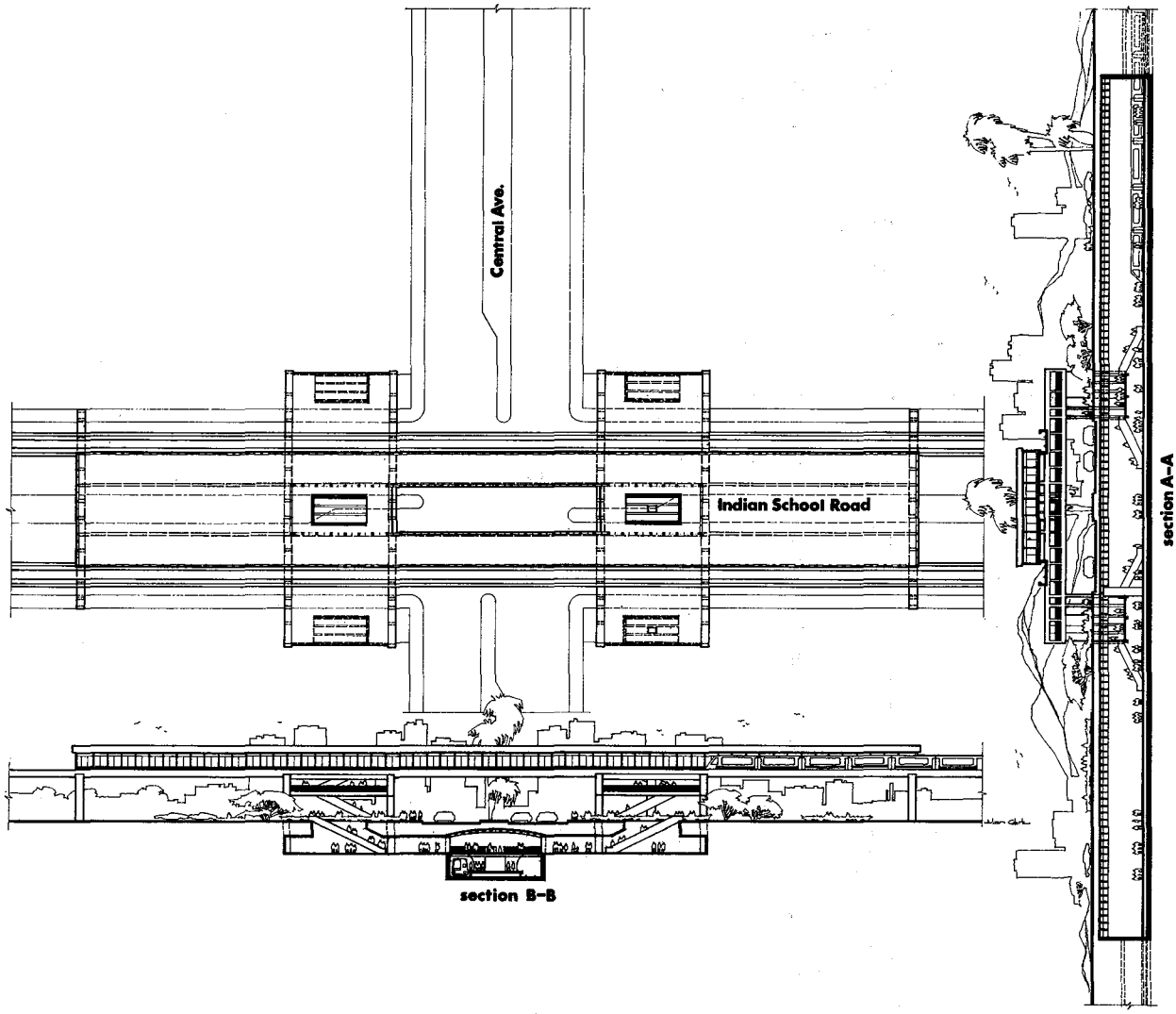
PERSPECTIVE-SECTION AERIAL STATION looking west on Indian School at Central



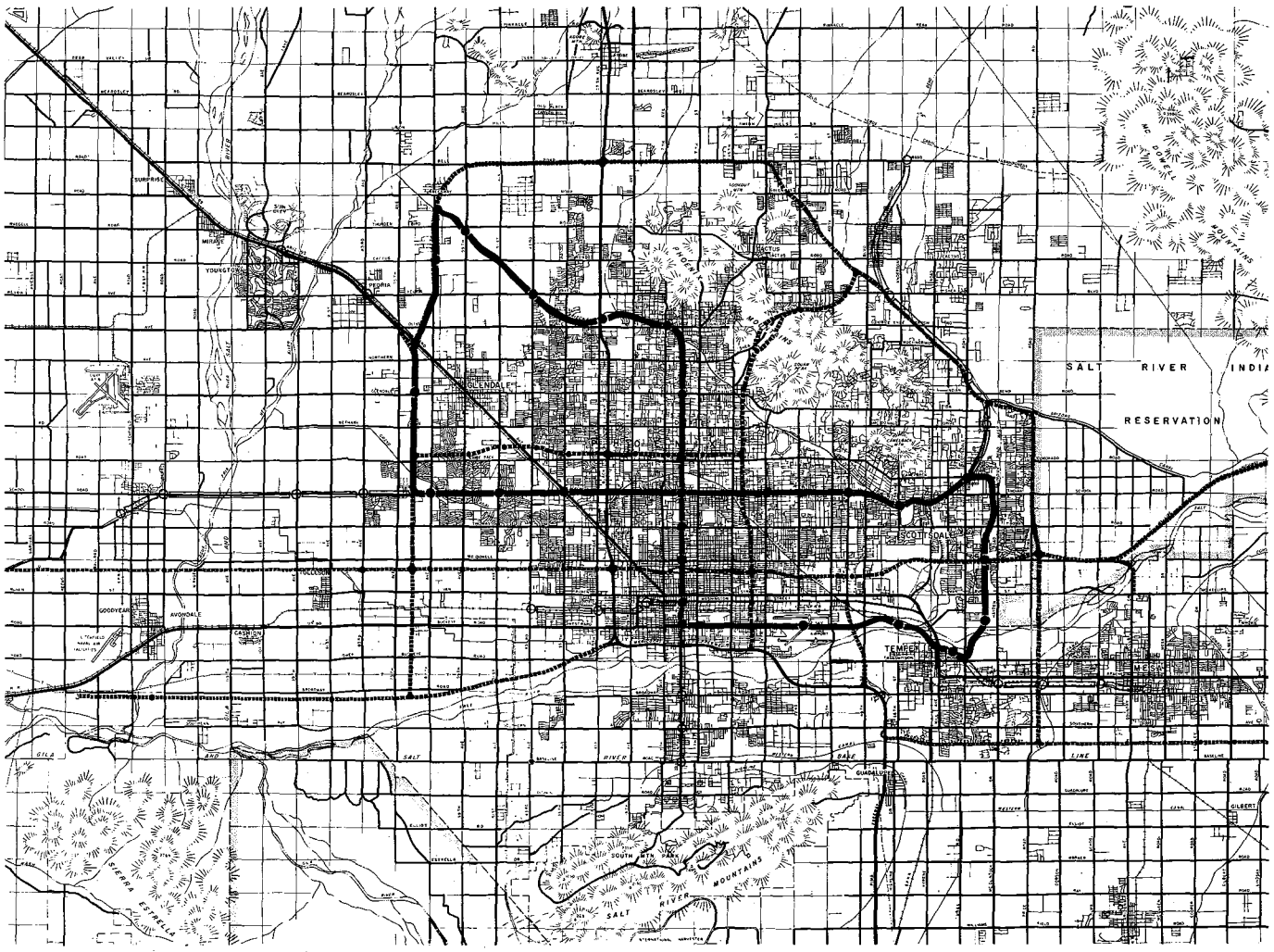
PERSPECTIVE-SECTION AERIAL & UNDERGROUND STATIONS looking south on Central at Indian School



PLAN UNDERGROUND STATION Indian School Central



PLAN ELEVATIONS AERIAL STATION SECTIONS UNDERGROUND STATION Indian School Central


SURPRISE
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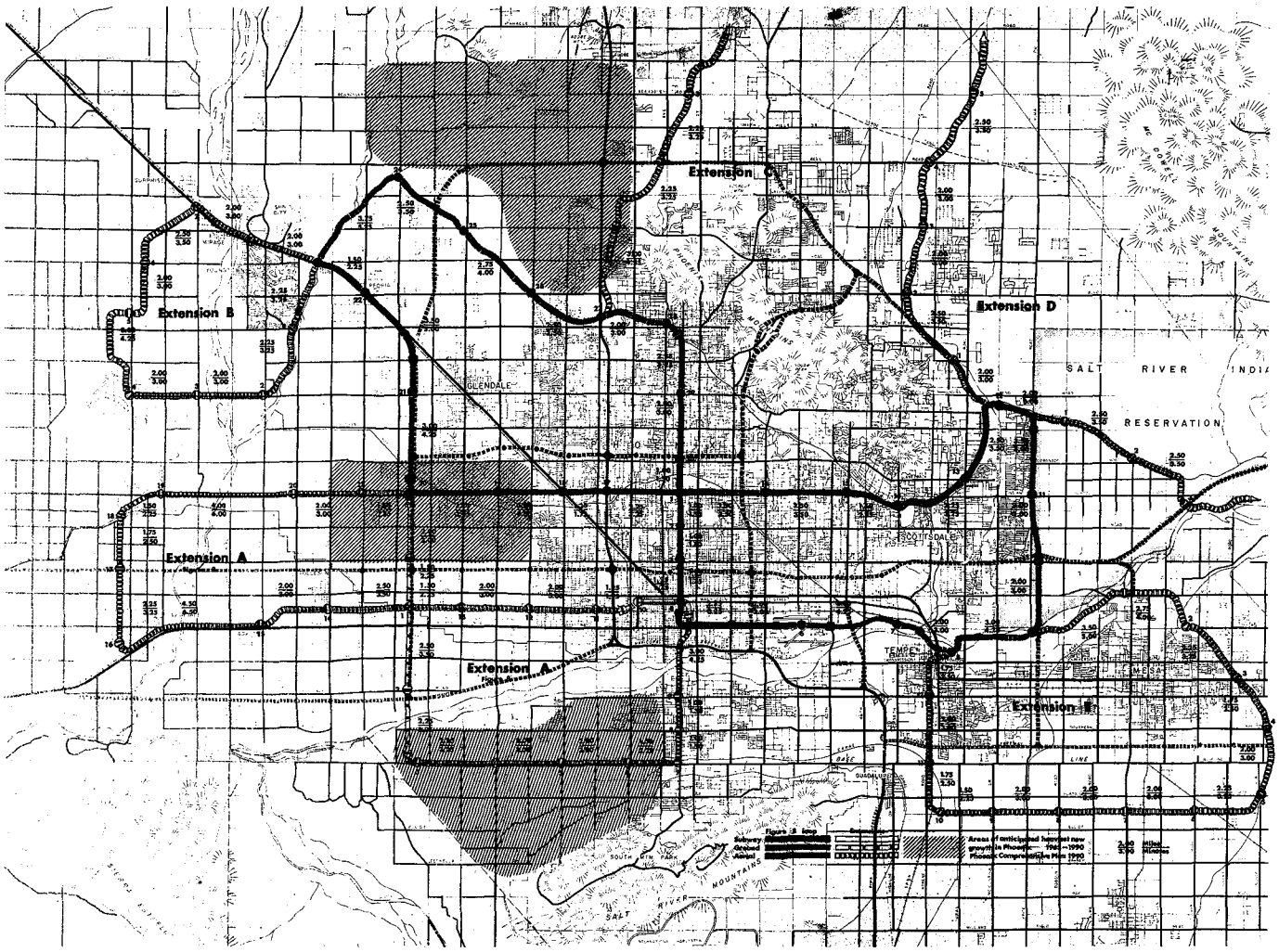
RESERVATION
SIERRA ESTRELLA
SALT RIVER
MOUNTAINS


Extension C
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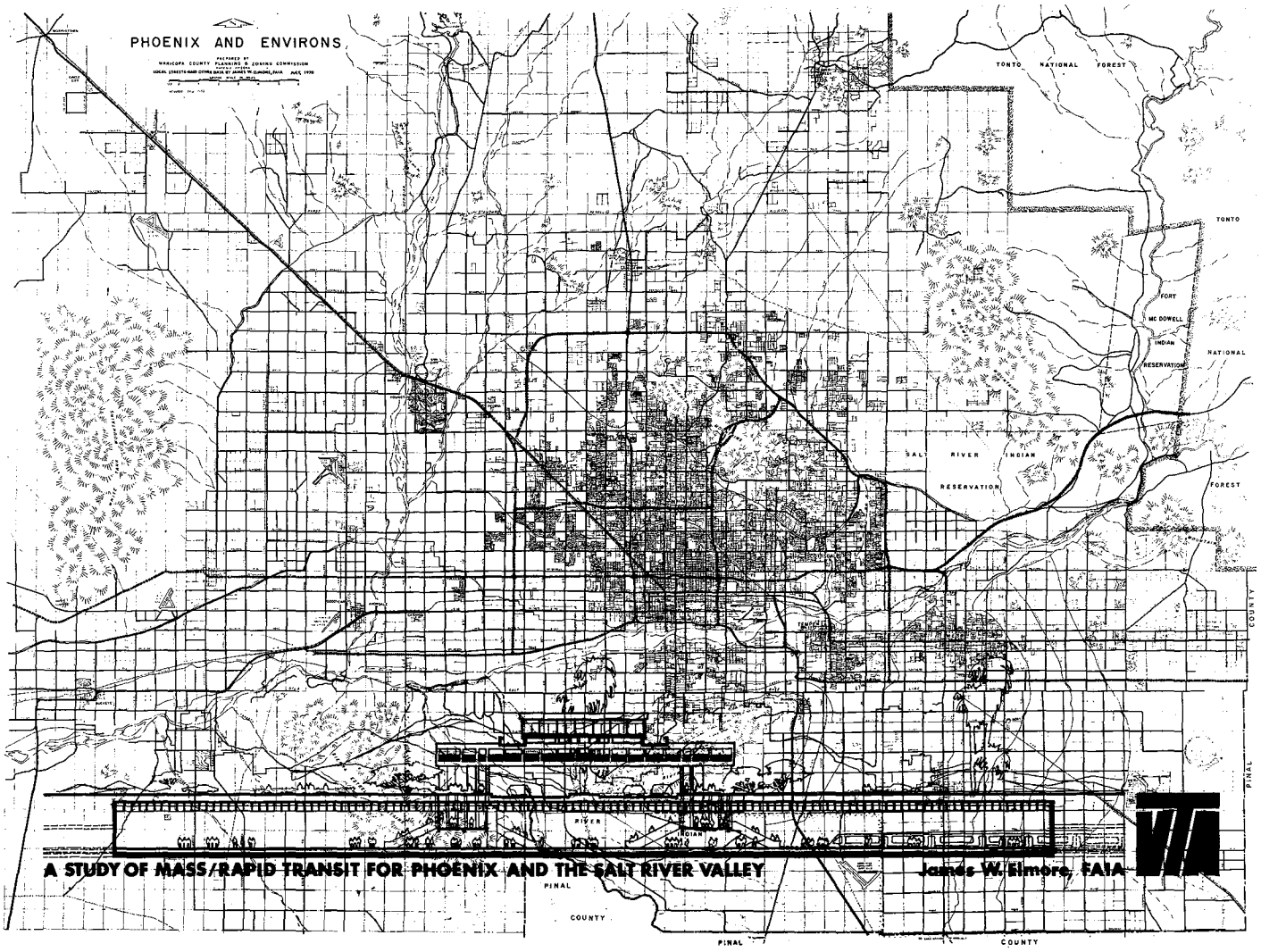
SALT RIVER
MOUNTAINS


PHOENIX AND ENVIRONS
TONTO NATIONAL FOREST
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FORT MC DOWELL INDIAN RESERVATION
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SALT RIVER INDIAN RESERVATION
FOREST
PINAL COUNTY
PINAL COUNTY
PINAL COUNTY
A STUDY OF MASS/RAPID TRANSIT FOR PHOENIX AND THE SALT RIVER VALLEY
James W. Elmore, FAIA

The following are excerpted from A Street Arterial Plan for Phoenix, Arizona.

Street Arterial Plan for Phoenix, Arizona, The Arizona Highway Department in cooperation with the city of Phoenix, Maricopa County and the Bureau of Public Roads, 1950.

SUMMARY OF FACTS

The detailed analysis of the traffic survey, as well as related economic data for the Phoenix area, provided the basis for the street arterial plan treated in this report. The more pertinent facts are:

• 1. THE TRAFFIC SURVEY OF 1947 INDICATED A POPULATION of 83,000 within the city limits and 78,600 in the suburban area included in the survey.

• 2. THE SURVEY AREA COMPRISED 60 square miles, of which 10.5 square miles constituted the corporate area of Phoenix.

• 3. THE MOTOR VEHICLE REGISTRATION in Maricopa County in 1947 was 88,536 and the number of persons per vehicle was 3.4.

• 4. THE TRAFFIC VOLUMES in the Phoenix area increased 40 percent from 1941 to 1947, the last pre-war normal year. It is estimated that the traffic of 1960 will increase 75 percent over that of 1947.

• 5. THE HIGHEST MORNING PEAK HOUR was between 8 A.M. and 9 A.M. and represented 7 percent of the total daily traffic. The highest afternoon peak hour between 5 P.M. and 6 P.M. was 9 percent of the total daily traffic.

• 6. THE RESIDENTS OF THE PHOENIX AREA on an average week day made 6.87 trips per dwelling unit by all modes of travel.

• 7. RESIDENTS AND NON-RESIDENTS WHO ENTERED THE AREA, made an average of 579,754 daily trips. Auto drivers made 289,870 trips,

taxis made 1,805 trips and trucks made 88,381 trips. Passengers traveling in motor vehicles made 128,360 trips and those using mass transportation made 71,318 trips.

• 8. OF THE 63,318 TRIPS PASSING THE EXTERNAL STATIONS, 3,747 trips or 5.92 percent were trips made through the area without stopping. Of the 3,747 through trips, 942 were made by trucks. Of the 33,984 trips approaching the area, 11 percent or 3,747 trips were destined to points beyond.

• 9. OF THE 380,056 MOTOR VEHICLE TRIPS MADE WITHIN AND FROM OUTSIDE OF THE AREA on an average week day, 106,716 trips or 28.1 percent were destined to or originated in the central business district. In addition, 16,161 trips or 4.7 percent of all motor vehicle trips had both origin and destination within that district.

• 10. OF THE 88,381 TRUCK TRIPS MADE IN THE AREA, 17,000 trips or 19.4 percent were made to or from the central business district.

• 11. THE PERCENTAGE OF TRIPS MADE BY AUTO DRIVERS for various purposes were as follows; 27.1 percent en route home, 23.4 percent to work, 9.3 percent to transact business, 12.7 percent for social or recreational purposes, 12.2 percent for shopping and 15.3 percent for miscellaneous purposes.

• 12. THE AVERAGE PASSENGER CAR OCCUPANCY in this area was 1.53 persons.

CONCLUSIONS

• 1. It is shown by the survey data that of the traffic passing the external stations, 94 percent was destined to or from the area. Of the traffic approaching the city, 89 percent was destined within the area and 11 percent passed through without stopping. It is therefore evident that Phoenix is not bypassable by main highway routes leading into the area.

• 2. Survey data and desire line charts indicate clearly the need for an east-west truck route penetrating the industrial area, situated south of the central business district, in the vicinity of Grant Street.

• 3. In order to accommodate rapidly increasing traffic volumes, the proposed improvement of arterials and State highways should be initiated at an early date.

• 4. Of utmost importance is the need of enabling legislation permitting the State Highway Department to acquire control of access on main highway routes to prevent their early obsolescence.

The following are comments extracted from A Major Street and Highway Plan, Phoenix Urban Area.

A Major Street and Highway Plan - Phoenix Urban Area - Maricopa County, Arizona, Wilbur Smith and Associates, May, 1960.

> The decline in transit patronage in the Phoenix urban area in recent years is consistent with a national trend. However, despite adverse trends, it is not reasonable to expect that the decline in the absolute volume of transit patronage in the Phoenix Urban Area will continue. The number of non-school transit trips is already close to the practical minimum; these trips can be expected to increase as the city grows if adequate services are provided. The development of modern major street and highway facilities will permit significant reductions in transit travel times and operating costs, resulting in a more efficient transit operation and increased patronage. The establishment of express routings will become practical with population growth and the construction of freeways. It can also be expected that increased business activity and employment in the downtown area, coupled with possible limitations on available parking space near major traffic generators, will result in increased transit riding. Accordingly, traffic projections have been based on the assumption that adequate public transit facilities will be provided to serve about 75,000 trips per day by 1980. This estimate represents a substantial increase over the 1957 absolute volume of transit use, but a moderate decline in the proportion of the total trip production served by transit. The existing and planned low densities of land use development, anticipated high levels of automobile ownership, and trends in transit use do not support optimism regarding a greatly expanded role for public transit in Phoenix. (page 45)

No discussion of alternate forms of mass transportation was presented.

The following is excerpted from the Thirteenth Arizona Town Hall on Traffic and Highways.

Thirteenth Arizona Town Hall on Traffic and Highways, Arizona Academy, with research by Arizona State University, October, 1968.

The town hall agreed that mass transportation in Arizona is inadequate. However, for the present and the foreseeable future, most participants felt that freeways are the only practical answer. Alternative methods of mass transportation, such as subways and monorails, are impractical in Arizona because of the present population distribution.

A majority of the participants recognized, however, that government has an obligation to insure some form of transportation for the public. Some method of transportation must be provided, such as adequate bus service, even if this may require governmental subsidies. The conferees hoped that some technological break through in mass transportation will produce an ultimate acceptable solution. Many felt that funds should be made available to encourage intensive studies in this area. (page iii)

To a large extent, especially in the Southwest, it is the movement of people in private automobiles that is of major concern. There is every indication that this will remain the case in the foreseeable future, unless there are major changes in the type of urban area spawned in the Southwest. Therefore, the majority of emphasis will be placed on automotive transportation. (page 45)

This section is concerned with the fundamental factors which cause a demand for urban transportation and the variations of this demand within a given city. The basic premise is that transportation is not an end in itself, but a response to demands placed on the individual in order to optimize those factors which he considers important to attain his greatest satisfaction and comfort in a complex urban environment. Thus, from the very beginning, it is emphasized that the socio-economic systems of a particular urban area (as reflected in land use

patterns, distribution of housing, etc.) is of primary importance in determining the extent of current transportation problems and the structure of solutions to future problems. Thus urban transportation cannot be understood, managed, or planned as an independent subsystem of the urban complex. It, probably more than any other urban subsystem, is affected by decisions concerning the desirability of different urban forms. The fact that many cities are in a period of transition with respect to land use density and the amount of centralization is reflected in their transportation problems. Thus, the city which had substantial growth during the rail transit era has found that the recent growth, which is more oriented to the automobile, low density residential development, and decentralization of many retail, industrial, and service activities, has caused shifts in the urban complex. This has not been the case for the urban areas within the State of Arizona. The phenomenal rise of vehicle ownership and use has occurred since World War II. This period has also seen the most rapid growth of population within the state. For example, in 1950 the State of Arizona had a population of 750,000, the Phoenix metropolitan area had a population of 332,000, and the Tucson area had a population of 141,000. Current estimates indicate the population of the state to number 1,630,000, the population of the Greater Phoenix Area to be 857,000, and the population of the Tucson area to be 337,000.[1] Thus, the state does not suffer from a heritage of urban development which occurred during a period when more intense land use and rail transit were prevalent. The above figures also indicate the fact that the majority of population growth within the State of Arizona has occurred within the two metropolitan areas. (pages 46-47)

In conclusion, it is vehicle ownership, population density, and possibly the overall size of the metropolitan area

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1. Wilbur Smith and Associates, and L. H. Bell and Associates, *Arizona's Future Highways; Highway Needs and Fiscal Study*, December, 1967, Chapter 2.

which will account for the variation in trip making in residential areas. From the planning standpoint, it must be emphasized that these factors related to residential land use are usually more difficult to forecast than the relatively straight forward factors used as measures of transportation generation intensity of non-residential land. (page 58)

The newer cities, especially those in the west, have essentially had their population growth in the automobile era. Thus, they present a very different picture with regard to the urban land use pattern. Phoenix is probably one of the nations prime examples of such a city, in that it possesses a very dispersed land use pattern. The old downtown area of Phoenix, although it was dominant at one time, was dominant only for a very small city, and never did possess the high intensity development typical of the older eastern cities. It is apparent, from an investigation of the Phoenix area, that retail activity, employment, and recreational facilities are dispersed throughout the entire metropolitan area. This dispersion has allowed Phoenix to grow with fewer acute transportation problems than cities of comparable size, though it lacks a significant number of transit riders and freeway mileage. (page 70)

Transit systems now in existence in American urban complexes essentially perform line-haul functions. Rapid transit has the technological potential of very high line-haul speeds. However, in most urban areas, rapid transit speeds range from 15 to 30 miles per hour. This relatively low value is probably due to the fact that the systems, and in many cases, the rolling stock, are not modern, and that stations must necessarily be relatively frequent, thus dropping the overall travel speed. Local transit, on the other hand, does not have the potential for high speed line-haul operations. Since the local bus transit must make numerous stops for the service of the passengers and further must flow in the same traffic stream

as the automobile, it seems obvious that the overall line-haul speed of local transit can never exceed that of automotive transportation. Operating speeds from typical local transit services average about 10 miles per hour, considerably below even the peak hour speeds realized by most automobile users today.

Although rapid transit has significant potential for a line-haul function, the total transit trip must always be analyzed. As with the automotive trip, the critical portions are the collection-distribution function and the transfer points. This is especially true with transit service for the transfer points necessitate a change in mode which requires the physical transfer of the individual from one transportation container to another or from a walking mode to the transportation vehicle. In addition the transfer point almost always entails delay. This delay is often irksome to the individual, especially because very little has been done in the way of communication systems to inform him as to when a vehicle will arrive. In many areas of the country this delay occurs while the individual may be exposed to very unpleasant environmental characteristics. These are some of the fundamental technological characteristics of transit which must be overcome if transit is ever to gain a dominant role in future urban transportation. They will be discussed in a later chapter.

The analysis of the total trip, be it transit or otherwise, is not simple. Even an economic comparison between modes or combinations of modes on a total trip basis is not as straightforward as might be expected. This will be discussed in a later chapter. Additionally, the point will be made that economic analysis may not be extremely relevant to the characteristics that the individual transportation users are seeking. In an affluent society, the economic costs, either direct or total, of alternate transportation modes may be comparatively unimportant for most travelers compared to other factors. These other factors include frequency of service, the

need to change vehicles, the traffic flow characteristics, speed, convenience, comfort, distance, crowdedness, tension, a sense of freedom, challenge, safety, urgency, etc. When reviewing this or other lists of such factors, it is immediately evident that these are very qualitative and may vary for the individual and possibly for the individual trip. In addition, it is difficult to use quantitative measurements for comparisons, even within a given mode, much less in a modal comparison.

One method of analysis that is now being used in urban transportation planning is referred to as factor analysis. It has been used extensively in the area of psychology. One recent study substantiated some long-suspected consumer preferences with regard to the ideal transportation system.[12] First of all, it found that different trip purposes may not have a substantial effect on the way that the individual sees the advantages and disadvantages of a particular form of transportation. The study indicated that the primary concern was the reliablity [sic] of destination achievement. This probably reflects the individual's desire for minimum travel time and for adequate safety. This factor was more important for the work trip than for others, and was relatively more important for those with low incomes who were not owners of homes and automobiles (the transit users). As previously indicated, this uncertainty often occurs at the transfer point.

The second most important generic characteristic was comfort and convenience. This included the lack of waiting lines, the comfort and availability of seats, privacy, and other such items. As might be expected, this item was again relatively more important for the work trip, probably because of its length. The third most important item was travel time itself. Although travel time is considered

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12. Stanley Hille and Theodore J. Martin, "Consumer Preference in Transportation," *Highway Research Record,* 197, Washington, D.C.: Highway Research Board--National Academy of Sciences, 1967, pp. 36-41.

important for the work trip, it is relatively unimportant for other purposes. An additional interesting and important fact was that "it should be noticed that bus users placed greater importance on getting to their destinations in the shortest times and by the shortest distances than did the automobile users." This would indicate that the minimization of time and distance is probably not as important to the automobile user because of the increased comfort, convenience, and reliability. The fourth major item was cost. This study supported other studies (discussed later) which conclude that, generally, people do not know what it costs or reasonably should cost to travel within urban areas.

The next major item was independence of control, which would allow change in route, speed, or other characteristics of the trip during its conduct. This, of course, is an advantage of the automobile. The next consideration was traffic and congestion. It is interesting to note that relatively little importance was placed on traffic congestion when compared to convenience, reliability, etc. A previous study had indicated "it appears unlikely that inconvenience or distance to work would be a major deterent to future outward migration."[13] The most recent study added "it also appears unlikely that influence of traffic and congestion will impede the current preference for automobiles in the foreseeable future."[14] (pages 81-84)

From the preceding discussions it would seem that rapid transit is the real future for transit. In considering this type of operation, the use of rubber-tired vehicles on separate rights-of-way must be considered with the traditional steel-wheeled vehicles.

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13. John Lansing, "Residential Location and Urban Mobility," Ann Arbor: Survey Research Center, Institute for Social Research, University of Michigan, 1964.

14. Hille and Martin, op. cit.

Certainly the provision of separate freeway lanes for urban buses is one of the simplest ways of obtaining a system which has the flexibility of the automobile, as well as the potential for higher line-haul speeds because of a separate right-of-way. However, as will be indicated in the following chapter, almost all rapid transit systems require a relatively high demand along a specific corridor. The impact of this historically and its relationship to eastern cities has been thoroughly discussed. However, it must be realized that if rapid transit is to have a substantial rebirth, it must either have a significant improvement of its economic position, become much more attractive to the urban transport user, and be wedded to an urban land use configuration which will encourage and supply high-density transportation corridors.

Rapid transit systems should be studied and possibly major investments made in pilot projects where they show some possibility of success. Rapid transit historically and for some time in the future will probably be more applicable to urban areas which exceed 1-1/2 or 2 million people in total population, and which have at least 3/4 million people residing in the central city. More importantly, the densities of the central city should probably exceed 10,000 persons per square mile, and the central city should have a substantial central business district. It has been estimated that this type of central business district would generally have at least 150,000 destinations per square mile of CBD per day; 40,000 daily CBD destinations (one way) in each of the approach corridors; and a downtown employment with a minimum of 100,000 people.[15]

It is not necessary that all future forms of transit will require these characteristics, but they represent a good estimate of the current requirements for rapid transit.

15. Smith, *op. cit.*, p. viii.

Thus, as could probably be expected, an analysis of transit, the total transit trip, and speculation as to the future of transit in an urban area again reverts directly to the land use configuration and intensity of the metropolitan area involved. The basic policy questions involving the evaluation of what the urban area wants to be, how much it wants to control the development decisions of the individual, and the willingness to find new answers (both in the technological and social realms) for the provision of the urban mobility must be met. (pages 84-85)

...The common characteristic is that the urban transportation problem is a peak hour problem, with a total weekly duration of some where between ten and twenty hours per week. The vast majority of cities have no substantial problem either in a relative or absolute sense during the remaining 148 hours. Therefore the solution of the urban transportation requires a solution to the movement of traffic during a very small percentage of the total week. (pages 85-86)

In summary, this chapter has attempted to illustrate the fundamental characteristics of urban transportation and suggest at least a few possibilities for improvement of the situation including, but not limited to the alternative of providing more funds for fixed facilities. If any one point must be emphasized, it is that the urban metropolitan areas of today are vast interrelated systems, and that a fundamental subsystem is that of urban mobility or urban transportation. The solution to the urban transportation problem can only be structured once fundamental questions regarding the overall urban system are answered. (page 90)

The recent past has seen a rapid increase of interest in providing transit, especially rapid transit, to the large metropolitan areas. There has probably been as much or more conceptual development of novel and imaginative transit proposals than any

other form of urban transportation. The innovations in transit involve virtually every sector of the operating facility. These include the development of light-weight cars, the use of small individual vehicles operating en masse, interest in new propulsion systems including conventional electric traction, jets, linear motors, and others. This innovation has included methods of vehicle support. These include the monorail, the conventional two-rail system, rubber tires, enclosure in pneumatic tubes, and the use of thin air films and air cushions. The need for more attractive and comfortable transit vehicles has also been recognized. However, since none of these modern transit systems are currently in operation, it is impossible to evaluate rider acceptance of the improved systems. In addition, the cost of construction and operation of these systems is speculative. (pages 134-135)

The systems described represent a sampling of the type of transit systems currently under development. Many of the systems, especially the mini-transit systems, may have application to the metropolitan areas of Arizona in the near future. These systems perform collection and distribution functions for relatively low volumes of people over short distances. Thus they may have application to civic center developments, university campuses, major shopping centers, and other urban developments where the current necessary walking distance from fringe parking areas is approaching the maximum acceptable to the public. (page 140)

The preceding sections indicate some of the paradoxes involved in urban transportation planning. First of all, there is a tendency to credit mass transit with efficiencies and capacities far superior to those of the individual automotive unit. This may not be true to the degree that has been generally accepted. In addition, the individual mode of transportation has characteristics such as reliability, privacy, and flexibility of routing which are not present in most forms of mass transit. It is extremely interesting, however, that most

of the imaginative concepts making use of these characteristics have been applied to public transit, whereas very little thought and research has been devoted to increasing the efficiency of the form of transportation which inherently has these characteristics.

Secondly, considerable emphasis has been placed on the relative economics of the alternate modes of urban transportation. However, it is questionable whether the transportation user is as sensitive to differences in transportation costs as most of these studies would have one assume. In summary, it is admitted that many urban areas require and can financially support improved mass transportation systems. However, the growth in almost all metropolitan areas will require facilities that can handle more diverse patterns of transportation demand in the future. It is true that there are significant portions of the population who for one reason or another do not have access to automotive transportaion. This includes the poor, the young, the old, and the physically handicapped. Some means of low-cost transportation needs to be provided for this sector of the population. In many cases it has been automatically assumed that only public transportation can provide for this need. This is probably not the case and imaginative use of the automobile or other small automotive vehicle could probably be developed to meet the needs of such people. The existence of jitney-type cabs was common in this country a few decades ago and is still a common phenomenon in many foreign countries. The application of improved communications and ability to reroute and schedule on an instantaneous basis could probably be applied to a fleet of small vehicles at costs which could be competitive with other transportation modes.

A final point which must be reemphasized is that the solution to the urban transportation problem from a technological standpoint is dependent on the type of city that

the population wishes. There are indications that the style of living sought by the majority of urban dwellers is one that will lead to continued low density development and dispersion of cultural, industrial, commercial, and other urban activities. It is important to stress that major decisions concerning the configuration of the urban pattern will have significant impact on the demand for transportation and the transportation problems which develop.

Many of the current attitudes towards automotive transportation probably develop from the fact that there has not been enough attention to the non-highway effects of automotive transportation improvements. In other words, there has been inadequate coordination between highway and freeway development and its effects on adjoining land uses. In general, there has not been enough thought about the creation of a living environment incorporating the automobile. There is need for investigation of multiple uses of highway rights-of-way, and the willingness to expend greater sums for construction of elevated or underground facilities in order to minimize the effect on the environment. In high density areas it is not impossible to forsee [sic] the time when freeway facilities will actually be built across the tops of buildings with direct access ramps into sections of the buildings providing parking facilities. The other extreme is represented by the case where buildings could be built on the air rights over not only freeway facilities but also over arterial street systems. The combined use of rights-of-way for transit and the private automobile exists in some major cities and should be further developed. It is absolutely essential in all areas to think not in terms of one mode of transportation as opposed to another but in terms of the overall transportation system as a unit and more importantly as a subunit or subsystem of the entire urban environment. This is going to require substantial imagination and expenditure of research

funds. Many of the eastern communities are currently moving in this direction. Arizona's urban communities, which are unique in time and space, should initiate such activities independently rather than wait for solutions developed in urban complexes that are different in both age and configuration. (pages 145-147)

The following is excerpted from Mobility - Phoenix Style, A Summary Report on Transportation: Past, Present and Future.

Mobility - Phoenix Style, A Summary Report on Transportation: Past, Present and Future. Advance Transportation Planning Team, City of Phoenix, April, 1969.

This report is a brief digest of a great deal of data and many studies going back more than two decades. It reflects changing conditions building on what has gone before. The report summarizes the efforts of many people and several organizations and has an investment of several hundred thousand dollars of background study supporting it.

Each urban area has its own characteristics of topography, climate, history, culture, development patterns and density of people. The transportation system for each urban area must be designed in the frame of reference of the characteristics of the individual area. The system design must consider the habits, choice, and needs of the people it is to serve.

It is important to plan for the future. This report looks ahead about 20 years and develops a transportation plan to serve a population level of two million people in this urban area. This is our "horizon year". It is as far into the future as we can see clearly with today's knowledge, technology and concept of urban development. Technology may bring basic changes as may major economic or social change. As this happens, the plan must be changed to meet changing conditions. Thus the planning process is ever continuing and plans must be firm yet pliable to serve as a guide for the future. (Preface)

There is currently discussion, both nationally and locally of rail transit. A recent Report by the U. S. Department of Transportation to Congress says: "Five U.S. Cities now have rail transit systems in operation, a sixth has one under construction, and five others are seriously considering such systems for the future." "In four of the five urban areas considering rail rapid transit systems, estimates are that such systems would serve about 5 percent of the urban area's total daily person trips, and 10 percent of the area's peak-hour trips. (Estimates for the fifth area, Los Angeles, are about one-half of these values)."

The Phoenix urban area projected size, density and form would not support a rail transit system in the frame of present long range planning, through 1990. Rail rapid transit is primarily intended to serve centrally oriented commuter along dense travel corridors, a situation which is not foreseen for Phoenix. However, there should be periodic re-evaluation of the transportation system and its various modes with due consideration for the desires of the people. Further, as the urban area population approaches 2,000,000 the City should undertake a broad base mass transit study to explore the potentials of all transportation modes. Phoenix can take advantage of new technology and experience of other urban areas in the field of mass transit over the next decade. (page 15)

Older communities developed when the predominant mode of transportation was some form of steel wheel and rail facility, either street car, elevated, subway, or commuter railroad systems. The newer cities, especially those in the West, have essentially had their population growth in the automobile era. Thus they present a very different picture with regard to the urban land use pattern. Phoenix is one of the nation's prime examples of such a city, in that it possesses a very dispersed density land use pattern. This dispersion has allowed Phoenix to grow with fewer acute transportation problems than cities of comparable size, even though it lacks an adequate number of freeway miles open to traffic.

The rapid population growth of Arizona in the last decade and the increasing urbanization that has come with this growth has brought with it a rapidly developing need for adequate streets and highways. Streets, highways, and freeways touch every aspect of Phoenix's economy, development, recreation and tourism, and the daily life of our citizens. Historically, our Nation, our West, our State, County and our City have developed where there is adequate transportation.

NEVER HAS THE NEED FOR ADEQUATE STREETS AND FREEWAYS BEEN MORE ACUTE THAN IN OUR MODERN AFFLUENT SOCIETY WHICH DEMANDS SAFE, EFFICIENT, AND CONVENIENT MOBILITY..... MOBILITY--PHOENIX STYLE. (page 20)

The following portions of the Personalized Transit Study are quoted as follows:

History of Mass Transit and Travel Time studies for Automobile and Transit

History of Mass Transit and Travel Time Studies for Automobile and Transit, Personalized Transit Study, June, 1969.

This report describes the current situation and provides background information. The existing bus coverage, frequency of service, and routes tend to contribute to the downward trend in usage by the public which in turn causes cut backs in service and thus the declining cycle. While the present system provides service for the Inner City resident to the downtown area, the transit system is deficient in providing adequate means to jobs outside the downtown area.

It has been shown that there is a great difference in travel time between automobile and bus transportation and that some large employment centers cannot be reached by bus. From studying the current bus routes it can be concluded that by placing some bus routes on major streets, instead of winding in and out of many narrow residential streets, the following benefits would accrue: (a) more rapid passenger service, (b) more direct service, and (c) simplified routing and scheduling, particularly for the clarification of bus route information to the public.

Because this is just the first of several reports, we cannot conclude at this time that the transportation access problem is a prime cause of unemployment. However, it appears reasonable to conclude that improvements in accessibility to employment centers will be a necessary part of any program designed to relieve unemployment. The type of transport system - personalized to meet the needs and desires of the people - is yet to be developed. (page 22)

Identify Major Employment Centers

Identify Major Employment Centers, Personalized Transit Study, July, 1969.

This report is a factual analysis and inventory of where today's employment centers are located in the Phoenix metropolitan area and some of the job characteristics of the types of employment opportunities available at these centers. This report, along with the third report, (Potential Places of Employment for Retrained People), will provide the necessary information to help develop a "Personalized Transit System."

When the dominant industrial activities of the Phoenix area are analyzed and isolated from the full spectrum of local industrial endeavors, four significant employment patterns become discernible.

- First, Phoenix's dominant industries employ extensive numbers of females.

- Secondly, several of Phoenix's dominant industries employ extensive numbers of professionals.

- Third, dominant local manufacturing industries (electronic) utilize foreign (Mexican) plants for simpler assembly tasks that take a lot of unskilled labor.

- And fourth, of all the occupation studies, the problem of transportation is most critical for the service workers, particularly those who work in restaurants, hotels, motels, and resorts.

Our interviews with local employers developed two important points:

1. Transportation is not a primary problem in securing employees for a majority of the major employers.

2. Most large companies prefer that employees have their own car and discourage car pools.

While there is an obvious cluster in and around the downtown area, a significant number of these jobs are located some distance from the Inner City. This poses real and immediate transportation problems for the resident of this area who must use public transportation. (page 2)

Potential Places of Employment for Retrained People

Potential Places of Employment for Retrained People, Personalized Transit Study, August, 1969.

Determining potential places of employment for persons who have been retrained is contingent upon the basic philosophy of the programs involved. At the one extreme, if the generalized goal of a given program is "quantity," then resources would concentrate on trying to qualify as many unemployed persons as possible for only the more menial tasks of say the LABORER and SERVICE worker occupational categories. On the other side, training (or retraining) programs concerned with "quality" would undoubtedly address fewer persons and take longer to execute - but would motivate persons into such higher occupational categories as CRAFTSMEN, MANAGERS, and PROFESSIONALS. (page 2)

This Phase (III) of the Study assumes that some combination or variation of those two philosophies will continue to exist in local retraining programs. As such, employment projections for the full range of occupational (job) opportunities to the year 1975 are presented herein.

Considering the very dispersed geographic pattern of projected employers, resulting in vast numbers of potential "destinations," and the very low residential densities of

Phoenix (including the Inner City), resulting in infinite numbers of potential "origins," any immediate remedial measures to local transport deficiencies (employment related or not) will necessarily be rubber tire oriented in form.

The map in the Appendix depicts specific locations and magnitude of local employment growth by type between 1964 and 1975. Because it is now 1969, some of the growth has already occurred and some of it is in the process of occurring. Nevertheless, the locations are a reflection of: (1) all of the efforts of Phase I (Identifying Major Employment Centers) and Phase III (Potential Places of Employment

for People Retrained) of this study, as well as (2) all of the known developmental projects being planned for the greater Phoenix area as of the writing of this report.

Unless new ideas or improvements are made in our current transportation system, people from the Inner City may be precluded from new jobs that are being created. As noted in the text, the big growth in new job opportunities will be outside the Inner City. (page 2)

Two Transportation Programs at Work in Phoenix

Two Transportation Programs at Work in Phoenix,
Personalized Transit Study, September, 1969.

Part one of this report deals with an experimental program to furnish personal transportation to Concentrated Employment Program (CEP) enrollees. The study shows the positive and negative effects of a program designed to aid the underemployed by helping them to buy automobiles. The major problems were found to be that: 1) the $300 limitation placed on the purchase of an automobile did not always procure reliable transportation; 2) since the program was not authorized by CEP, it had no regular administrative staff; 3) repair work prior to purchase of the autos was dependent on voluntary cooperation by training schools and the maintenance was not always good; and 4) the program lacked provision for counseling the enrollees in personal financial management.

The following recommendations have been made for improvement of the program: 1) the allotment for purchase of the auto should be raised to $500 or $600; 2) the prospective auto should be taken to a diagnostic center for analysis and, if necessary, returned to the dealer for repair prior to purchase; 3) a program should be set up to help the enrollee with his personal finances; 4) provision for automobile insurance should be included; and 5) arrangements should be made for drivers training when necessary.

The second part of this study is a report on the Community Service Center Transportation Program, operated by Leadership and Education for the Advancement of Phoenix (LEAP). Following is a summary of the results of this portion of the study.

In an attempt to coordinate the services of the many non-profit, governmental, and private agencies working in the community, the City's poverty program developed the concept of a community service center. The Center houses 20 various agencies working together to provide a wide range of social services such as health care, family counseling, and financial and legal aid.

Because the service center responds to the needs in a 34 square mile area (Inner City), and the privately owned public transportation does not serve many areas very well, LEAP developed its own transportation component.

The transportation component consists of fifteen vehicles of various types to provide transportation from anywhere in the Inner City to the Service Center and for other poverty program activities.

This program in effect is a "Personalized Transit System" that services various needs on a limited basis. Without this transportation program, many of our "War on Poverty" efforts would be much more difficult. (page 8)

The following excerpts are taken from The Central Phoenix Plan.

Central Phoenix Plan, prepared by John Carl Warnecke & Associates, Robert Hart, Adam Kriratsy & William Stubee, Planning Consultants and Western Management Consultants for the City of Phoenix, November, 1969.

INTRODUCTION

THE PURPOSE OF THE PLAN

This is a plan for a new kind of city. Phoenix, Arizona grew up in response to the desires of thousands of people looking for a better way of urban life. It is a thoroughly Western, thoroughly 20th century city; even in its central business district, it is like other cities' suburbs -- spacious, convenient, relaxed. In the next decades Phoenix will change; it is going to become a very large city. The purpose of this plan is to guide that change in Central Phoenix so that the easy western way of life is not lost.

This plan is concerned with action. Its purpose is not to create visions of the future, but to prepare for the future. It is less a blueprint than a strategy. The proposals of the plan focus on what this city can do and can afford to do now. The proposals are simple. They can work because they are based on real things: the way people in Phoenix live and work; the way the real estate market operates; the investments that State and local governments will make whether there is a plan or not. In other words, this plan was made to be carried out; the means of implementation are implicit in every proposal.

Finally, the plan evolved from the ideas of literally hundreds of people. It is a distillation of the thinking of the people whose day-to-day decisions add up to the building of the *City*. It was prepared not so much *for* the people of Phoenix as *with* them.

THE PROTOTYPE 20TH CENTURY CITY

The physical form of Phoenix is a response to a preferred way of life. Its characteristics are: a low density decentralization of residences, employment, and commercial activity; an open, spacious environment; mobility; convenient access to work, recreation and open countryside. It is a varied living environment that requires the regular use of the automobile, and it has been the overwhelming choice of the people of Phoenix. With a few exceptions it is a city that works exceptionally well.

What will happen as Phoenix keeps growing? It does not have to look like or work like any of the country's other big cities. Most of those places grew up fifty years ago. They are burdened with the forms of the 19th century, and they are struggling to make their dense, congested central districts operate. The technology of the 19th century, however, has had little impact on the form of modern Phoenix. The railroad gave the old downtown and industrial districts their starting points; the agricultural section lines located major streets; but otherwise Phoenix was built for the mid-20th century.

If we can now avoid imposing imported images of the past, we can build in Phoenix a new kind of place, suited to the tastes and technology of our time.

That opportunity is the principal theme of this report.

SUMMARY OF THE PLAN

The foundation of this plan is a thorough economic analysis: *The Central Phoenix Plan: Economic Potential*. Its basic conclusions:

- The function of Central Phoenix is changing; it is becoming the administrative and service hub of a growing region.

- The potential for growth is tremendous.

- The challenge now facing Phoenix is managing the growth that economic expansion will inevitably bring.

The existing physical development pattern is the starting point for any plan. Future development will occur in small increments influenced by this framework.

- A major streets system that provides uniformly easy access.

- An emerging freeway system that reinforces the historic accessibility of the central area.

- The original downtown visibly declining due to decentralization of retail activity.

- The linear extension of office building clusters along North Central Avenue, in the direction of high income residential districts.

- Close-in, low density residential neighborhoods, some stable, others gradually being eroded by commercial expansion.

- The random pattern of institutions and open space left behind as the central business district has spilled into its former outskirts.

- Lines of commercial development on the City's busiest traffic corridors.

- Strong focal points of government and of visitor activity created by earlier decisive action of the City.

The Central Phoenix Plan is divided into three overlapping parts, reflecting the differing development processes and physical

conditions of the Central Business Corridor, the Downtown section of that corridor, and the Capitol Corridor. The major proposals are outlined below:

The Central Business Corridor, the heart of Central Phoenix, is now a workable, convenient, expanding regional business center and it can continue to develop that way: (1) if it remains linear, evenly distributed, without dense clusters; (2) if it remains the prestige business location: (3) and if it has free moving automobile circulation. Its long-term future hinges on avoiding overbuilding, so that automobile accessibility and amenities, which brought the Corridor into existence, are preserved.

This is what the City should do:

1. Continue to improve the street and highways system.

- Work for immediate construction of the Papago Freeway and early completion of the planned freeway grid.

- Take a very wide right-of-way for the Papago Freeway in order to provide new open space in Central Phoenix and buffer adjacent uses.

- Develop Third Street and Third Avenue, together with Fifth Street and Fifth Avenue south of the Papago Freeway, as major distributor routes along the Corridor; start acquiring increased rights-of-way immediately.

- Continue a regular program of upgrading the capacity of all major streets.

- Work with developers and landowners to make local improvements in traffic flow.

- Work with the transit operators to provide improved bus service for the people of Phoenix unable to drive.

2. Build up the prestige of Central Avenue. Make it a great boulevard through new zoning restrictions, an active landscaping program and other public improvements.

3. Protect the established residential neighborhoods by preventing commercial encroachment and minimizing through traffic.

4. Adopt new zoning that will encourage evenly distributed linear growth of new office towers, but will also limit development before the Corridor is overbuilt.

These proposals involve adopting a revised *Major Streets and Highway Plan*, amending the zoning ordinance, revising the zoning maps, continuing landscaping programs, and cooperating with developers who want to participate in carrying out the plan.

Downtown, the traditional crossroads of Phoenix and of Arizona, has only partially been able to adapt to the new functions of Central Phoenix. It has highly important concentrations of activity -- a financial center, government center, and soon, the "Civic Plaza." They can be supported and expanded if the declining retail district that separates them can be redeveloped, and if improved parking and an open spacious environment can be introduced in the central blocks.

Downtown can have a prosperous future as the anchor of the Central Business Corridor, but first the psychological quality must be improved. It also has a potential to again become the "Visitors' Phoenix", but first it must become a good convention city.

The Central Business Corridor proposals all affect downtown. In addition the City should take advantage of downtown's specific opportunities:

1. Provide centrally located parking by acquiring and developing three key blocks: (1) immediately west of Central and between Washington and Jefferson; (2) immediately west of Central, between Adams and Monroe; (3) east of Second Street between Washington and Jefferson.

2. Encourage and work with private groups in redeveloping the old retail areas as a new specialty shop-entertainment-service business center, extending along Adams, from the new Civic Plaza westward.

3. Reintroduce amenities downtown; create a network of pedestrian ways; open up and landscape public areas.

4. Take steps to set up a public downtown development corporation to carry out the parking and other public programs.

5. Take a strong lead and ask for help in downtown projects:

- Ask other governments for help in a Visitors Center.
- Ask civic organizations to help with specific improvement projects and with industrial redevelopment.
- Ask private groups to cooperate on unified development of downtown land.

The City has made a bold start downtown with the Governmental Mall and the Civic Plaza. Now an additional measure of bold public leadership is needed to reconfirm investors' confidence in downtown, and head its redevelopment in a prosperous direction.

The Capitol Corridor is a proposal to provide for the needs of government offices, one of the major growing users of land in Central Phoenix. Handsome and efficient government complexes have been started, and the very large future expansion requirements can be built into a workable, adaptable pattern, provided a linear form is maintained for easy automobile access and parking, and provided a spacious park-like setting appropriate to Arizona and to the dignity of government is created.

This is what the City should do:

1. Expand its own facilities along the Corridor and encourage the State and County to continue to do the same.

2. Start now on an agressive land acquisition program.

3. Make Washington and Jefferson into broad handsome boulevards through zoning and an active landscaping program.

4. Protect the park-like setting with zoning revisions.

The next step is to follow up the plan. Two kinds of work are involved:

1. The detailed technical studies needed to adopt new maps and legislative amendments and to undertake the capital improvements.

2. The education of the community at large about the opportunities and challenges of Central Phoenix.

BACKGROUND FOR THE PLAN

Central Phoenix is a product of its economic functions and specific, traditional ways of governing and doing business. Each of those in turn has its sources deep in the technology and history of our society. They require the most thoughtful consideration. "Plans" will not change them, on the contrary, a plan should try to create an environment that can adapt to them.

Accordingly, this plan is based on three comprehensive studies of how Central Phoenix operates and how it became what it is today. The first of those is a detailed analysis of economic conditions; the second is a broadly based study of the day-to-day business activity in Central Phoenix; the third is a study of the existing physical conditions.

Those studies of present conditions and trends led to the consideration of alternative plans. What are the options open to Phoenix? What forms could the City take and which are the most desirable? Analysis of the implications of the various alternatives led finally to the selection of specific plans.

Together, those three analyses and the study of alternatives form the background against which any proposals for Central Phoenix must be evaluated. They are summarized in the following sections.

ECONOMIC ANALYSIS

A city is in many ways, and perhaps fundamentally, an economic phenomenon. For that reason the basic foundation of this plan is a thorough economic analysis. The analysis is a companion volume to this one, entitled *The Central Phoenix Plan: Economic Potential*. The basic conclusions are:

1. The function of Central Phoenix is changing. As in other major cities, the Central Phoenix business district is becoming an important administrative and service hub for an increasingly broad geographical area. The nature of the national business community, together with the current technologies of communication and transportation are transforming Phoenix into a regional capital for industry, commerce, and finance.

2. The potential for growth is tremendous. The Valley area population explosion will continue, and in addition, the central place functions will require more and more space. The pressures for growth will result in a large volume of new construction in the Phoenix metropolitan area.

3. The challenge now facing Phoenix is managing the growth that economic expansion will inevitably bring. Now that Phoenix is an economic success, the important issues are no longer industrial promotion and growth.

PROJECTED DEMAND FOR SPACE IN CENTRAL PHOENIX

Activity	1967	When Maricopa County Population = 1.5 Million		When Maricopa County Population = 2.5 Million	
	Floor Area *	Floor Area *	Additional Acreage	Floor Area *	Additional Acreage
Retail Trade	3.1	3.7	5.8[1]	4.4	6.8[1]
Eating and Drinking Places	.5	.7		1.0	
Motor Vehicles	.3	.2		.2	
Limited Price Variety Stores	.3	.3		.3	
Furniture and Appliances	.3	.4		.4	
Department Stores	.3	.4		.5	
Apparel and Accessories	.3	.5		.6	
Food Stores	.2	.2		.3	
Gasoline Service Stations	.2	.2		.2	
Hardware, Lumber, etc.	.1	.1		.1	
Drug Stores	.1	.1		.1	
Miscellaneous Retail Stores	.5	.6		.7	
Industrial and Commercial	2.2	3.7	14.9[1]	5.2	15.7[1]
Manufacturing	.5	.5		.5	
Wholesale Trade	1.3	1.2		1.2	
Construction	.1	.2		.3	
Office Space, n. e. c.	.3	1.8		3.2	
Financial and Real Estate	1.9	3.1	5.8[2]	5.8	14.0[2]
Banks and Other Credit Institutions	.8	1.4		2.7	
Insurance Firms	.6	.7		1.4	
Brokers, Holding and Investment Firms	.3	.6		1.2	
Real Estate Firms		.3		.4	
Other, n.e.c.		.1		.1	
Government	1.8	4.1	11.9	7.8	18.6
Federal	.6	1.1		2.0	
State	.4	1.3		2.5	
County	.4	1.0		2.0	
City of Phoenix	.4	.7		1.3	
Business and Professional Services	1.4	2.3	4.4[2]	4.6	11.3[2]
Medical and Health Services	.4	.4		.6	
Legal Services	.4	.6		1.2	
Business Services	.3	.8		1.8	
Other Professional Services	.3	.5		1.0	
Personal and Repair Services	1.0	1.3	2.4[1]	1.6	2.8[1]
Motor Vehicle Repair	.3	.3		.3	
Personal Services	.5	.7		1.0	
Indoor Recreation and Amusement	.2	.3		.3	
Transportation, Communications and Utilities	.7	.8	.2	.9	.5
Communications and Public Utilities	.4	.5		.6	
Transportation, except railroads	.3	.3		.3	
Total	12.2	19.0		30.3	
** In Millions of Square Feet*					
[1] Based on 100,000 sq. ft. per acre					
[2] Based on 200,000 sq. ft. per acre					
Residential (Multi-Family)	6,778*	11,000	decrease	14,000*	decrease
Hotels and Motels	3,820**	5,600	10.0	7,600**	10.0
Cultural and Quasi-Public	106.5***	142.4	35.9	168***	25.6
Health Facilities	36.7	41.0		51.6	
Cultural Facilities	12.3	37.4		41.4	
Non-Profit Organization	12.2	21.0		35.0	
Churches and Religious Facilities	45.33	43.0		40.0	
Parking — ****			214.0		289.0

** No. of living units: the number of units is expected to increase although the acreage will decrease due to the replacement of single family houses with apartments*

*** No. of rooms*

**** No. of acres*

***** Parking acreage based on all surface parking, an unlikely situation, but included for comparative purposes.*

Table I

PROJECTED DEMAND FOR SPACE IN CENTRAL PHOENIX

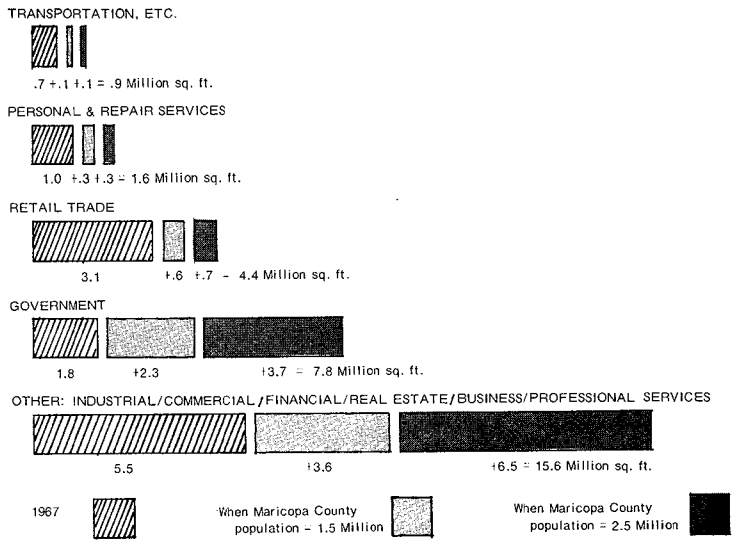


Table II

The Economic Potential report summarizes the situation: "Central Phoenix has the potential to become one of the most attractive and one of the most convenient central business districts in the country," provided (a) accessibility and convenience are maintained; (b) the necessary catalysts and amenities are created; and (c) the unique advantages are exploited.

The Central Phoenix Plan is based on those three conclusions. The regional business and government center functions give the plan its form; the growth projections provide the dimensions; the proposals of the plan are designed to aid government and private groups to create the conditions of continued economic prosperity and to convert them into real economic and personal gains for the community.

The costs of unmanaged growth are well known: congestion and inefficiency; rapid obsolescence; personal frustration and hardships. The original downtown of Phoenix is a clear, dramatic example of what can happen -- what this plan is designed to prevent and correct.

The economic studies also set the time scale for this plan. There are two "planning periods": the first ending when the Valley population reaches 1.5 million in the early 1980's, the second ending when the Valley population reaches 2.5 million about the turn of the century.

BUSINESS ACTIVITY IN CENTRAL PHOENIX

The functions of an administrative and government center are the functions of leadership, judgment, negotiation, and the trading of goods, ideas, and services -- transactions involving confidence, equity, persuasion and inspiration. They require that many people come together, face-to-face, frequently and efficiently. The need for face-to-face contact -- for the handshake and the quality of "presence" -- may be more habitual or pleasurable than essential; nonetheless it is a major force behind the pressure to build in Central Phoenix.

The need for personal contact is in turn a need for accessibility: easy movement from home to work and proximity to customers, clients and service. In order to learn the dimensions of accessibility and its significance, two kinds of studies were made in Central Phoenix. First, dozens of individuals in business and government were contacted and their ways of doing business discussed. Second, a questionnaire was used to determine locational preferences and the pattern of trips in the Central Business Corridor. The principal finding was that the entire five miles of the downtown-midtown corridor operates as a single business district. The reason: automobiles are so easy to use that they are substituted for many walking trips. Certain kinds of services are demanded within a few minutes walk, but a fifteen minute drive takes one anywhere in Central Phoenix and there is convenient parking usually when you arrive. It still operates with the convenience of a small town.

Automobiles have made possible, and at the same time required dispersal of activity. Yet Central Phoenix, dispersed as it is, has a compact form. It is dispersed only in relation to our 19th century city images. The central district functions are virtually all within two blocks of Central Avenue. Again the surveys suggest the reason: proximity to customers and clients -- or at least a sense of proximity -- is the prime factor in deciding to locate in Central Phoenix. In selecting a place to work, as in selecting a place to live, "associations" -- prestige, image, the place one would expect to be found -- are often as important as cost and convenience. Throughout the country that type of association, as much as physical proximity, is one of the constants in shaping urban growth. In Phoenix it seems to have been largely responsible for keeping the expansion pressure linear along North Central.

What about the future? Consideration was given to the probable influence on Central Phoenix business of the developing technologies of communications, transportation and

data processing. They are difficult to analyze. They have been expected to have a decentralizing effect, but so far their impact does not seem to have decreased the need -- or desire -- for personal contact. Some mechanical business and government records activities are decentralizing, but finance, marketing, administration, law and politics resist depersonalization. All across the country, in a setting allowing maximum choice and in the face of extraordinary land values, administrative and government centers are becoming high-rise office building clusters. More and more people are being concentrated in the busiest places.

Consideration was also given to the potential influence of other means of transportation, particularly mass transit on special rights-of-way. The introduction of such a system, however, would require dense concentrations of population -- the very concentrations that many people came here to avoid. Furthermore, the building and road construction of the next fifteen years -- the initial time period covered in this plan -- will have to work without a new transit system. In any case, transit is a supplement to, not a substitute for, private cars. Commuter service might be increased and shuttle bus experiments might be tried, but neither would have a measurable effect on the ways of doing business in Phoenix or on its dependence on automobiles. The life style and the working arrangements of the people using Central Phoenix are based on automobiles. They are needed for access to the home environment; they must also be accommodatd at the other end of the trip, at work.

In summary, then, for the next fifteen years at least, it appears that we will be dealing with the pressure to build high-rise office clusters in prestige locations. Our biggest planning problem will be how to move people and automobiles efficiently between them.

PHYSICAL DEVELOPMENT OF CENTRAL PHOENIX

The boundaries of Central Phoenix were derived from a consensus of the City Council, Planning Commission, City Staff, and the consultants. It is the area that clearly serves as the "administrative and service hub" of the Phoenix metropolitan region and, in many ways, of Arizona. There are two geographical areas. The first, the Central Business Corridor, is bounded by 7th Street and 7th Avenue, Grant-Lincoln on the south and the proposed Paradise Parkway on the north. The second is the Capitol Corridor, which extends west to 19th Avenue and is defined by Jackson Street on the south and Van Buren on the north. In order to take into account all of the regional center activities of Central Phoenix, the impact of the other nearby, clearly regional services were included in the studies. Those education, health, recreation and visitor facilities are indicated on the map.

As a first step in making specific plans, the important characteristics of the area were mapped. The existing patterns of major streets, public facilities, and concentrated activity, are together the structural framework of Central Phoenix. Whatever future developments may be visualized, hoped for or planned, all new construction will happen as small increments added to that skeleton by a public or private builder. The framework includes:

- A major streets system that provides uniformly easy access.
- An emerging freeway system that reinforces the historic accessibility of the central area.
- The original downtown visibly declining due to decentralization of retail activity.
- The linear extension of office building clusters along North Central Avenue, in the direction of high-income residential districts.

- Close-in, low density residential neighborhoods, readily redevelopable, which are gradually being eroded by commercial expansion.

- A random pattern of institutions and open space left behind as the central business district has spilled into its former outskirts.

- Lines of commercial development on the City's busiest traffic corridors.

- Strong focal points of government and of visitor activity created by earlier decisive action of the City.

Today the sum total of those conditions is a remarkably workable central business district. The process that formed it is an instructive one. When the post-war boom started in Phoenix, there was ample open land on the edge of town, and in the prestige sector, and there was an adaptable pattern of highways. In a single decade the central business district leapt two, and then four miles north. The next wave of growth will seek the same conditions; accessibility and open land at an established address. To create those conditions is to plan Central Phoenix.

Downtown, however, has not been so adaptable to the standards of a new life style. Sites were too small, land coverage too high, amenities too few, and perhaps outlooks too limited. No small "increments" of change can compensate for those handicaps. Downtown will continue its present trends unless the City can follow up a plan with some bold action. The City has taken two bold steps: the construction of the Governmental Mall and the location of the new Civic Plaza. A plan for downtown must spell out a third: a redevelopment and reorientation of the old retail core, with the City taking a strong lead.

The corridor of land extending from the City-County government complex to the

State Capitol, is adapting and can continue to do so, through cooperative planning by all levels of government. It is a place where good planning can have immediate and positive effects.

Another part of Central Phoenix is adapting in a very different way and will require different treatment. The south end of Central Phoenix is a part of the "Inner City" of aging buildings and poor residents. Except for sections of the industrial area, it is not functionally a part of the rest of Central Phoenix. The issues there are far beyond the scope of this study. A comprehensive plan is needed for the Inner City, involving education, employment, housing, welfare, transportation and public facilities for the residents.

ALTERNATIVES

Where does Central Phoenix go from here? There are alternatives open and important choices to be made.

Centralization vs. decentralization is the basic issue. Can and should more development be guided into the central area, or should outlying business districts be encouraged? The alternatives considered are outlined below:

Radical dispersion. This would be one possible continuation of present trends towards dispersal. With the present dispersion of resident population, a further dispersion of places of employment would tend to balance directional traffic movements and reduce one-directional peaks during rush hours. In one sense it would improve the performance of the local street system, although total automobile travel would increase.

Before radical dispersion of traditional business district activities would take place, however, fundamental changes in the way of doing business would be required. Telecommunications would have to be substituted for face-to-face contact as the

dominant method of carrying out business transactions. The survey of the business community shows that despite the decentralization which has occurre there is still a strong preference on the part of certain key business men for physical proximity to the major components of the business district.

Furthermore, the effect of radical dispersion would probably be land speculation and rapid obsolescence over large areas. It would not be in the City's interest.

Outlying Centers. This could be a promising alternative, but not until after the end of the second planning period. Premature development of prestige areas outside of Central Phoenix would undermine existing investment in the Central Business Corridor and discourage redevelopment downtown. When the Corridor becomes overcrowded, relief could be provided by rezoning selected outlying areas. Until that time, however, any substantial rezoning would create conditions of instability and widespread duplications of public capital improvements. It would be very costly.

The total floor area in any of the outlying centers would have to be limited, following some overall plan, or traffic congestion will result from overloads on the local street system. Assuming that the problem of overconcentration of floor area and trip generation in any one center could be controlled, it is possible to imagine the development of outlying office clusters that would be within a fifteen minute drive of all destinations within the Central Phoenix Corridor.

Extension of the Central Corridor to the north. This would also be a workable long-range pattern, but a short-range mistake. At the point in time when capacity of the local street system limits further development within the present Central Phoenix study area, extension northward would be the least radical, most "natural" evolution. If the Squaw Peak Freeway and Paradise Parkway were constructed by

that time, access could be provided from both the Black Canyon and Squaw Peak Freeways. This would provide the most continuity with the presently evolving efficient form of the business district.

At the present time, however, it would be preferable to protect the fine residential areas farther along North Central and to limit business development to commercial districts where ample space is available and adequate access is provided already.

Two Clusters. The present clusters of office buildings downtown and uptown, between Osborn and Indian School Roads, suggests that each of these might be further developed as a very high density core surrounded by parking garages and served by freeway extensions or mass transit. Analysis of this alternative indicated that it would be difficult to control and, more important, that large dense multi-block clusters are extremely difficult to serve with automobiles. Any time large numbers of automobiles must converge, congestion results.

Mass Transit. Subways, monorails, trains and buses are frequently offered as a solution to traffic congestion to prevent the decline in central areas. Except for improved bus service, they were all ruled out as feasible alternatives for Central Phoenix. There were three fundamental reasons:

1. The pattern of development. To work well, short-haul mass transportation systems need dense concentrations of origins and destinations at the stations. They work best in older cities where streetcar and train lines were once a major influence on the city's original growth, and where a pattern of commuting is already established.

2. Costs. Construction requires a huge capital outlay and operations in most cities lose money and require subsidies. Until a program comparable to the Federal Interstate Highway program or some other financing is available, transit would cost

Phoenix far more than the street and freeway proposals of this plan.

3. Life style. If mass transit were to have a significant effect in Phoenix, thousands of people would have to change their way of life to a more urban pattern. That is the kind of change that occurs over a generation or two.

Because of those conditions the transit technology that our generation has available has little to offer Central Phoenix. The buses are an exception. A special study should be made to design a bus system that will serve the young, the disabled, and the poor who cannot drive where they need to go.

Freeways and parking megastructures. Another transportation alternative, which would be within the framework of the dominant life style, would consist of extensions to the proposed freeway system leading to parking megastructures along the Central Corridor. Probably this would require that freeway extensions be brought off of the Black Canyon and Squaw Peak Freeway at perhaps one mile intervals. These extensions would be connected to large parking structures located near 7th Street and 7th Avenue. Shuttle buses would then carry passengers from the parking structures to North Central Avenue destinations. Other shuttle buses would carry passengers in north and south directions within Central Phoenix. If the parking structures were near Third Street and Third Avenue many destinations might be within walking distance.

This arrangement would require a high investment in structures for both freeways and parking but would make possible building up a dense business corridor. Whether the benefits of such a form would outweigh the cost of its maintenance appears dubious. In any case, it would require a massive step by a public agency at some point, in order to change the present patterns. For

example, it would require the kind of urban reconstruction effort recently seen in Boston or Philadelphia.

In view of the magnitude of growth expected, the relatively low land values, and the availability of land, this alternative was not developed.

Other detailed alternatives were studied. An investigation was made of the bridging of streets, building over air rights and related multi-level concepts. Application of these ideas requires some basic restructuring of a city, and with current Phoenix land values they do not appear to be feasible; in fact they only have a few specialized applications in the dense compacted eastern cities for which they were conceived.

The idea of closing streets to create superblocks was studied. Several places can be found where traffic patterns would make street closings feasible. In order to justify and then exploit a superblock, however, three conditions are needed: large land holdings or cooperative development agreements; a substantial amount of new construction; and large volumes of pedestrian traffic. Those conditions are met in the government center and Civic Plaza, but few other places where the City could take the lead. On the other hand, whenever those conditions are created by private enterprise, the City should offer full cooperation in closing streets provided suitable traffic flow is still maintained.

Completing the Corridor. The City of Phoenix will derive the greatest advantage at this time from a policy of "completing" the Central Business Corridor. This alternative include the ideas of redeveloping downtown, making full use of existing public investments, and stablizing [sic] existing residential neighborhoods. The reasoning behind those policies and their detailed implications are spelled out in the following chapters.

THE CENTRAL PHOENIX PLAN

PLANNING PROCEDURE

The development of Central Phoenix is the product of thousands of day-to-day decisions made by a multitude of private businessmen and public officials. Behind each business decision to locate, to invest or to build a building was a delicately balanced calculation of economic or personal gain. Weighing heavily in each calculation were elements under the control of government: codes, taxes, streets and public investment. Through its decisions and policies on these matters the City government has played a major role in shaping Phoenix as it is today.

As the City faces the pressures of new growth, new decisions with far-reaching effects will be made. The Central Phoenix Plan is an attempt to anticipate the decisions, and to provide a consistent, interrelated, carefully thought out set of policies to guide the decisions that the City will make.

What should those policies be? The following procedure is recommended to work out the answer:

First, the objectives of the City were analyzed: what are the conditions the City is trying to create in Central Phoenix?

Second, the existing conditions were analyzed and the specific problems and opportunities were identified: where is action by the City needed and why?

Third, the activities of businesses, developers, and in the Capitol Corridor, the government, were studied: what kinds of location and business investment decisions are being made and how can the City influence them to achieve its objectives?

Fourth, the ability and desirability of action by the City was weighed: what can be done within the limits of its legal, political and financial resources?

The procedure is described in more detail below.

OBJECTIVES

What are the objectives for Central Phoenix? In general terms, they are identical with the city-wide objectives: economic opportunity for citizens and businesses; better ways of life; prosperity for the City. More specifically, in the central business district, the City's objectives are the characteristics of an economically healthy city:

1. *Stability and predictability: the conditions needed to insure continued new investment and improvement.* Included are the prevention of rapid obsolescence and the protection of investments. In the sense used here, stability and growth are compatible. The objective is to maintain over a long period of time the conditions -- accessibility and amenities -- that brought the growth of Central Phoenix in the first place. It is a matter of confidence in the future.

2. *Flexibility of the physical form: the the capability to absorb growth and to adapt to changing functions.* The original downtown area, for example, was not adaptable to the new scale of development of the 1950's. High traffic capacities, space to expand, and selective specialization are the kind of qualities that allow flexibility. Overbuilding, high land coverage and low development standards work in the opposite direction.

3. *Low costs in relation to benefits,* including: (a) long-term capital costs and operating costs for the City government; (b) improvement and operating costs for private investors; and (c) social costs, the intangible losses to residents whose neighborhoods decline or to commuters stalled in traffic. Although they can rarely be measured precisely, all of the costs of any proposal must be explicit.

EXISTING CONDITIONS

The study of Central Phoenix indicated that three distinctly different development processes were at work. Accordingly three overlapping areas were defined:

- The Central Business Corridor -- the entire central business district, from 7th Street to 7th Avenue, and from the proposed Paradise Parkway south to about Madison Street.

- The Downtown -- the traditional "square mile," bounded by Roosevelt, 7th Avenue, the Railroad, and 7th Street; it is also one end of the Central Business Corridor.

- The Capitol Corridor -- the four-block wide corridor between Van Buren and Jackson, from Central Avenue to 19th Avenue. In some respects the Corridor extends east to include the new Civic Plaza, and its eastern end overlaps with Downtown.

Although the boundaries are not firm or rigid, each area requires a different approach and has its own plan and policies. They are all tied together and interrelated through the traffic and transportation proposals.

INFLUENCING DEVELOPMENT DECISIONS

Central Phoenix will be built largely by private enterprise. The future depends on what private businessmen decide to do. The calculations behind the decisions of a developer, a lender, a landowner, or any other businessman, are enormously complex. Only the major elements that can be affected by public policy can be identified in a plan of this type, but they must be identified if any effective city planning is to be done.

For each of the three areas described above, the major locational determinants of central area functions were considered. The study then concentrated on factors the City can influence.

In making recommendations for city policies, it was also recognized that development decisions are based on evaluations of the sum total of existing conditions. Each new building is seen not as a piece of a distant plan, but as a self-supporting project added to what is already in place. To achieve an overall long-range plan, each step along the way must be seen as economically sound by the participants.

THE CENTRAL BUSINESS CORRIDOR POLICIES: THE LONG-RANGE PLAN

Phoenix can work toward its objectives in the Central Business Corridor if it adopts the policies outlined below and uses them as a guide to future decisions. The policies and the principles they embody are illustrated in the accompanying drawings. Details are spelled out in the section on "Recommended Action."

1. *Maintain convenient automobile access all along the Corridor through street and highway improvements.*

A. The Papago Freeway. The Phoenix freeway system should be built as soon as possible and under the guidance of the City government so that it is integrated into the City street system and the adjoining community.

1) Early completion. The City should actively promote the earliest possible completion of the Papago Freeway and its connection to the Squaw Peak Freeway as the key to keeping Central Phoenix accessible and the east-west streets open.

High priority should be given to aggressive promotion of the entire Phoenix freeway network at State and Federal levels. The City should lead and/or cooperate with others in obtaining legislation and funds that permit advance designation, reservation and acquisition of rights-of-way.

2) Interchanges. The Papago Freeway should have full, high capacity interchanges with a) Third and Fifth Streets and Third and Fifth Avenues, the streets that lead uninterrupted to the major destinations south of Freeway, and with b) Third Street and Third Avenue redesigned to feed the linear development to the north. Seventh Street and Seventh Avenue should have "half" interchanges, so

that they will continue their present function without overloads from freeway-bound traffic. Central Avenue should have no interchange; its function should be intercommunication along the Central Business Corridor.

3) Open Space. The Papago Freeway land acquisition should be expanded to include a broad right-of-way that will introduce much needed open space, and an adequate buffer for the adjacent neighborhoods.

4) Point of Entry. The Papago interchanges will become major points-of-entry into Central Phoenix. Together with their connections they should be designed for that role. For that reason the City should enter actively into the design process.

B. The City Street System. Central Phoenix is favored with an excellent traffic system. Circulation can be improved by increased specialization of street functions and some advance right-of-way acquisitions. Some modifications are needed to protect North Central access.

1) South of the Papago Freeway. Third and Fifth Streets and Avenues should be engineered as high capacity one-way "major streets." They will supplement Central and Seventh Street and Seventh Avenue as the major north-south routes designed for through traffic -- people who want to *go* somewhere. Second, Fourth and Sixth Streets and Avenues, should be two-way streets designed for those who want to *stop* somewhere. First Street and First Avenue should be made into a one-way pair relieving Central Avenue in the area where it is most congested.

Similarly, Washington, Jefferson, Van Buren, and all east-west mile streets, should be the major "*go*"

streets, with the intermediate streets serving destinations as local "*stop*" streets. The half-mile and other streets noted on the map should be the "collector" streets.

2) North of the Papago Freeway. North of the Papago, where Fifth Street and Fifth Avenue are both interrupted, Third Street and Third Avenue should become high capacity two-way distributor streets. They will be the major feeders for the northern part of the Central Business Corridor and their continued operation at top capacity should be given high priority by the City. The new rights-of-way should include landscaped buffer areas to protect residential neighborhoods.

3) Cooperating with Developers. The map shows other minor projects and ways that the City could cooperate with developers to assist them in carrying out their plans, and encourage conformity with the City's land use plans. The City should cooperate on street changes and/or land exchanges to provide uniformly good local access.

C. Mass Transportation. Although Phoenix is almost totally an automobile-oriented city, about one-half of the population cannot drive -- the young, the very old, the people who cannot afford a car. For them the City should attempt to develop and maintain a convenient transit system. The City should join with the transit operators to make a detailed study of origins and destinations and find economically feasible service and routes.

Mass transportation for business use in the Central Business Corridor may be feasible, but it is no substitute for the improvements proposed in this plan. The possibilities of success of minibuses or related services -- for the next few years at least -- indicate that City policy should be to avoid spending leadership or money resources in this direction. If some private group wants to experiment, the City should, of course, cooperate.

The following is excerpted from The Comprehensive Plan 1990.

The Comprehensive Plan 1990, prepared by City of Phoenix Planning Department for the City of Phoenix, November, 1969.

The objective of transportation is the safe, efficient, and convenient movement of people and goods. It enables people to carry on life's many endeavors at separate sites selected for these purposes. Transportation ties together all the vibrant parts of the urban area linking together neighborhoods, regions, and states.

Many people have come to Phoenix seeking a new way of life--a life with a freedom from constraint that is not available in older metropolitan areas. This is reflected by the spread-out development of the area, the low population density, a low building profile, and the great distance between centers of activity. Further, this is amplified by the desire of the people for a personalized type of mobility which has given use to rubber-tired oriented transportation. Thus, in the Phoenix Urban Area, the predominate method of travel for people is by automobile--now and in the forseeable [sic] future.

The development of an adequate transportation system is vital to the continued economic growth of the Phoenix Area. The great population growth of the 1950's generated many of the transportation problems of today; for this growth accelerated the needs beyond the ability to finance improvements.

The City of Phoenix has had the benefit of continuous transportation planning over the past several decades, and the entire urban area has benefited from a Major Street and Highway Plan that was adopted in 1960 and 1961 by the Arizona State Highway Commission, Maricopa County Board of Supervisors, and the City Councils of Phoenix, Glendale, Avondale, Mesa, Buckeye and Tempe. In 1965, the Valley Area Traffic and Transportation Study (VATTS) was established as an on-going transportation planning program for metropolitan Phoenix. (page 152)

GOALS

The basic goal is the development of a transportation system that will foster, support and serve the economic, cultural, environmental, and social development of the community as well as provide for the safe, efficient and economical movement of people and goods. Included within this goal are:

- To provide a high quality of service by reducing travel time and promoting the convenience and safety of the users commensurate with available revenues.

- To maintain a continued balance between the travel requirements generated by the land use and the capacity of the transportation system serving these requirements.

- To periodically re-appraise the total transportation needs and the available financial resources.

The following objectives are essential to the implementation of these goals:

- Coordinate transportation planning with general land use planning.

- Develop a balanced transportation system of streets and freeways based on a functional classification - access and mobility.

- Provide a street system that considers the neighborhood as the basic planning unit.

- Plan for adequate terminal facilities to serve the transport systems - ground, rail and air.

- Continue the comprehensive, cooperative transportation planning process.

- Periodically re-evaluate the transportation system and its various modes with due consideration for the desires of the people.

The end product of these goals is the construction of facilities to serve the public.

Transportation Planning and Land Use

The existing and projected land use pattern for the entire urban area must be the major consideration reflected in transportation planning. The essence of transportation planning is concerned with the safe, efficient, economical, and convenient transport of people and goods from one place to another. The transportation system should be so designed as to accommodate the future patterns of human activity work, shopping, leisure time, school, recreation, and personal. Therefore, the location and functioning elements which comprise the transportation system, i.e., freeways; major, collector, and local streets; air, rail, and ground terminals; must be mutually complementary if the Phoenix area is to remain healthy. Developing a balanced, integrated transportation system is a key objective of the plan.

Following the proposed general land use plan for the area is of the utmost importance; for, if this basic plan is not adhered to and other types of land use are allowed to develop, i.e., a large regional shopping center instead of a low-density residential development, the transportation plan could be seriously affected. Further, if the means of ingress to adjacent developments are allowed, the efficiency of a street can be affected and, at the same time, cause intolerable congestion. Traffic congestion contributes to the blighting of adjacent areas and can result in costly widening and often destroys the productive use of the land for which the transportation system is intended to serve.

Therefore, the success of the Major Street and Highway Plan and the entire Transportation Plan depends on how well the general land use plan is adhered to.

Aesthetics

In the development of future streets and highways, great care should be exercised to preserve the scenic qualities of Phoenix.

Many possibilities exist in relating highway design with the natural and man-made landscape in order to create a more pleasant environment. Both the view of the street or freeway and the view from the street or freeway should be carefully developed.

Many of our major streets and highways have been designated as parkways. Several have been landscaped already and others will be in the future. A total design study is now underway for the proposed East Papago Freeway; and it concerned with the effect on the area that it will pass through.

Elements of the Transportation System

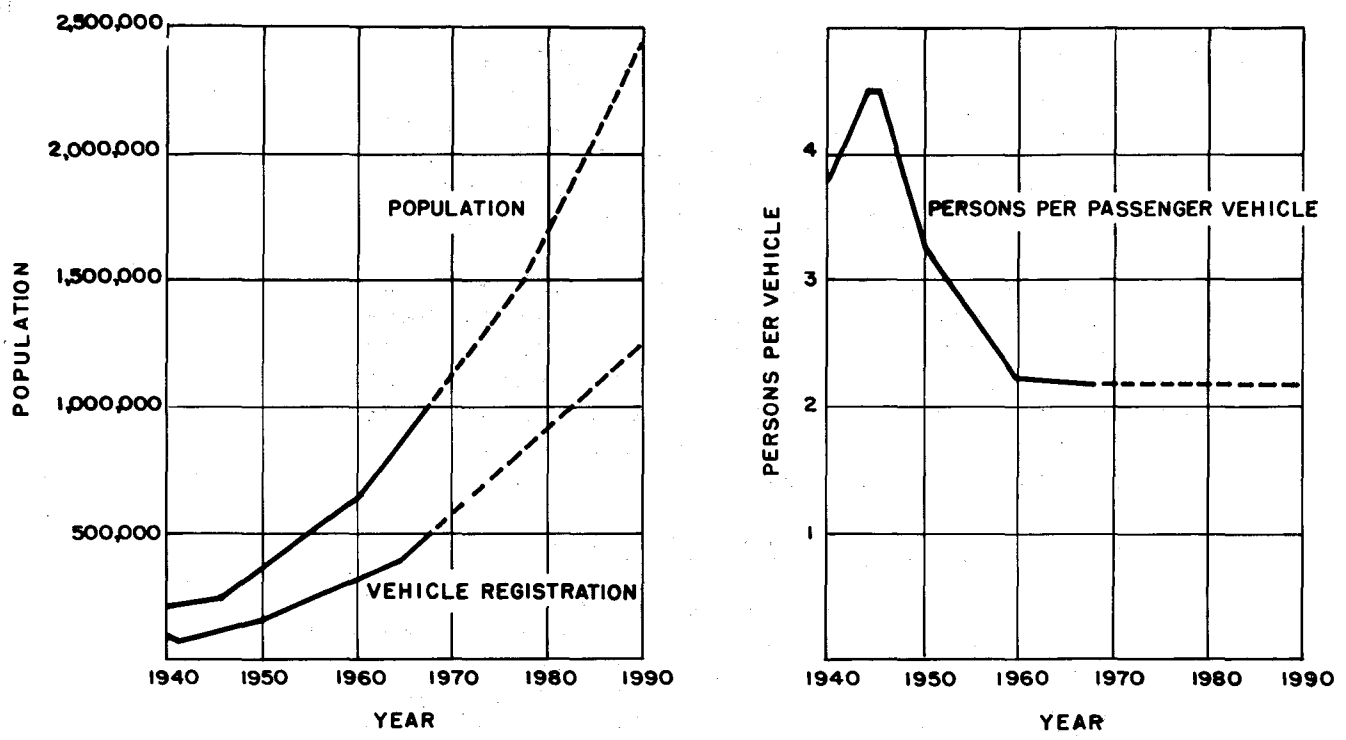
Within the total transportation system, six basic elements were studied; the major street and highway system, public transit, air transportation, railroads, pipelines, and parking and terminal facilities. These elements together form the transport system today and form the foundation of the future.

Major Street and Highway System

Figure 60 portrays the dynamic growth of the Phoenix area in terms of population and automobile ownership. The chart shows the projected growth for which the transportation plan is intended to serve. Not only has the number of vehicles increased, but the usage has also grown. Origin-destination studies of the Phoenix area demonstrate this growth through an increase in total daily person trips from 675,000 to 859,000 in the decade 1947-57 (a 49% increase). The 1980 forecast is for 4,000,000 person trips in the average day.

The network of major streets and highways now serving Phoenix is a basic grid system, with a major street designated along almost every one-mile section line. The Major Street and Highway Plan has been developed from the foundation that was established by the Maricopa County Board of Supervisors in 1892. Merged with these major streets is the developing freeway system.

AUTOMOBILE OWNERSHIP & USE PHOENIX METROPOLITAN AREA



SOURCE: A Major Street and Highway Plan For The Phoenix Urban Area. Wilbur Smith and Associates. 1960 ; Traffic Study , 1958 , Phoenix - Maricopa County Traffic Study.

FIGURE 60

LEVEL OF TRAFFIC SERVICE
PHOENIX

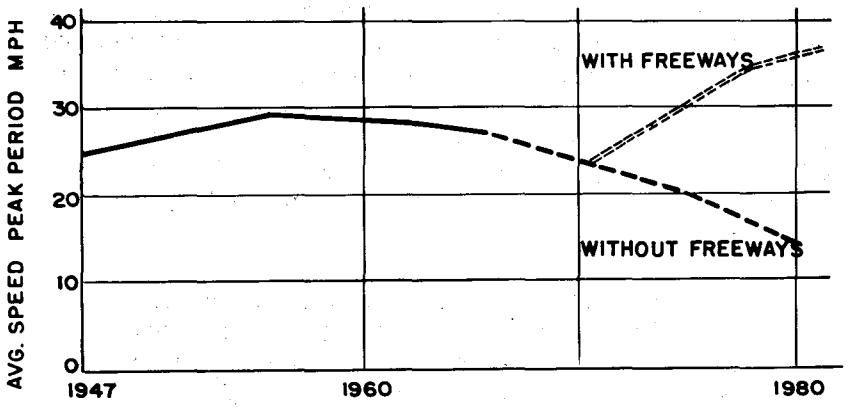


FIGURE 61

The functional classification of the physical elements making up the streets and highways system is the foundation for administrative and design policies essential for effective implementation of the plan.

The following table summarizes the functional role and general characteristics of these streets and highways.

Table 25

CLASSIFICATION OF STREET AND FREEWAY SYSTEMS

CHARACTERISTIC	FREEWAY	MAJOR STREET	COLLECTOR STREET	LOCAL STREET
BASIC FUNCTION				
Traffic Movement	Sole	Primary	Partial	Incidental
Land Access	Controlled	Secondary	Partial	Basic
PLANNED SERVICE				
Area Served (Linkage)	Regional & State	Community	Neighborhood	Individual Properties
Speed	55-70 MPH	30-45 MPH	25-30 MPH	Under 25
Trip Length	Over 3 miles	Over 1 mile	Under 1 mile	Under 1/2
No. of Lanes	4 - 8	2 - 6	2 - 4	2
Parking	None	Limited	Permitted	Permitted
FUNDING RESPONSIBILITY	State & Federal Gov't.	Local Gov't.	Property Owner & Local Gov't.	Property Owner

The geometrics of any given street classification may vary and will often change with growth, but the basic function of that street will remain.

Quality of Service

One of the most easily understood measures of the level of service, or quality of flow, on the street system, is the average speed that vehicles operate on the system. Figure 61 shows the average vehicle speed on major streets since 1947 and projected into the future. There has been a great effort in the past to increase the efficiency of freeways and major streets through improved

design standards, traffic control, and accelerated construction programs. Yet with this in mind, many of our major streets are still operating at, or above, their desired capacity and the level of service will continue on a downward trend unless the development of a modern urban major street and freeway system is accelerated.

Freeway System

The development of the modern freeway, a controlled access, multi-laned attractive major highway has been a great advance in the safe, convenient movement of people and goods. Freeways are an essential element to the development of the total transportation system. The freeway system is superimposed on the major street system to function as the prime mover of traffic. The great advantage of freeways can be summed up by one statement - one lane of a freeway will carry three times as much traffic at twice the speed and three to five times safer than one lane of a major street.

The lack of freeways has put an excessive amount of traffic on the major street system. This overloading of major streets is not only detrimental to them and abuting property, but also to the collector streets and, in some cases, local streets; because as the major streets become congested, motorists seek other routes, thus forcing undesirable through-traffic into residential neighborhoods.

Freeways, if properly designed and properly planned, can add much to the quality of urban community life. By planning for the sociological impact as well as the aesthetic characteristics when merging a freeway system into the physical fabric of a community, many economic and developmental benefits can be realized. The lack of an adequate freeway system can be expected to have an effect upon economic development and orderly urban growth.

Greater emphasis should be placed on freeway right-of-way acquisition in advance of development. In this way, substantial public savings can be realized, and other land planning benefits accrue when highway rights-of-way acquisition precedes, stimulates and gives guidance to development. This early acquisition avoids the need to tear down relatively new buildings and uproot neighborhood patterns and businesses.

Major Street System

The function of major streets is primarily to move traffic and secondarily to provide access to abutting properties. The major street system is of great importance and is designated on the Major Street and Highway Plan.

The City of Phoenix, recognizing the important role major streets play in the building of a modern city, has made progress toward the development of an adequate major street and highway system. Since 1960, 40.9 miles of major streets have been constructed or are under construction at a total cost of 22.3 million dollars. The present six year program provides for the improvement of 33.5 miles of modern major streets, at an estimated cost of $23.0 million.

Major street construction plus traffic engineering improvements are the two programs which have kept traffic problems from becoming intolerable.

However, we are investing less than half as much each year as is needed to bring our major streets up to adequate standards within the next twenty years.

Local and Collector Street System

The relationship of local and collector streets to the residential areas and major street and highway system is depicted on Figure 62. The functions of these streets are to directly serve the basic planning unit - the neighborhood. These streets move people from their homes to major streets as well as providing circulation within the neighborhood.

The local and collector street deficiencies in the already established areas of the city are being eliminated through the Local Street Improvement District Program. A new approach to this program is the neighborhood concept, i.e., where all the unimproved streets within a square mile or so are improved as one district. Not only are streets improved, but water lines, alleys, traffic signs, street trees and other general improvements are completed by the city as each neighborhood project proceeds.

The city policies and procedures, along with FHA requirements and competent subdividers, have resulted in development of streets built to proper standards as new areas are subdivided and developed. The subdividers have the initial responsibility to develop the street layouts with review and approval by the city staff.

Public Transit

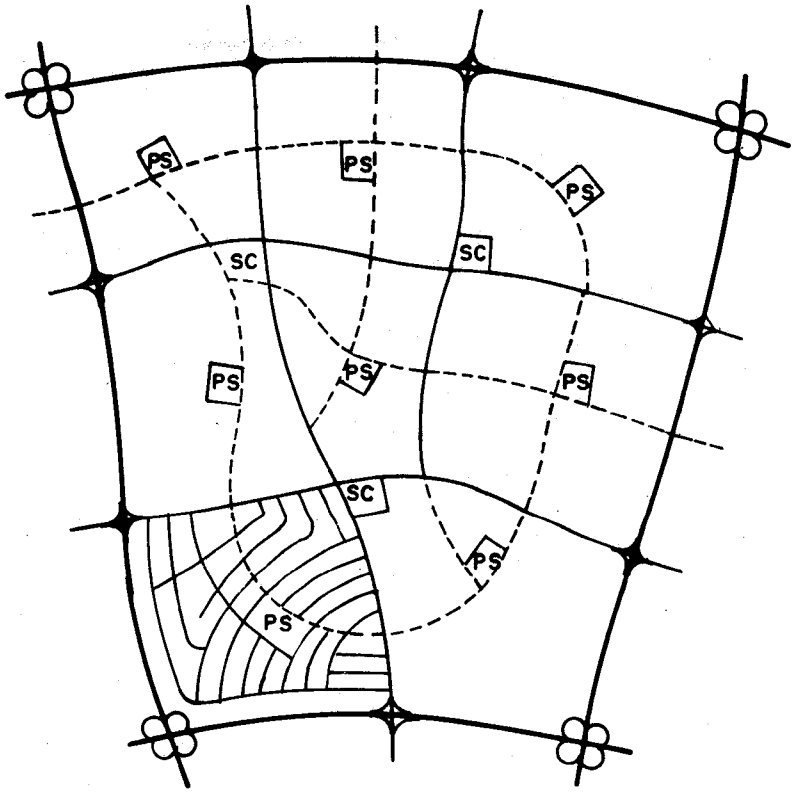
The existing public transit system in Phoenix consists of a privately owned bus company. There are about 16,000 average daily transit trips accounting for about one percent of the total person trips in the urban area (Figure 63). Buses provide transportation for people who cannot afford a private automobile, who are unable to drive, and who choose transit as an alternate means of travel.

The existing and projected low densities of land use development, anticipated high levels of automobile ownership and present trends in transit use do not suggest a greatly expanded role for public transit in the Phoenix Urban Area. In the future, as population densities increase, a higher demand for public transit may develop to serve the urban area. It should be noted that public transit and automobile transportation cannot be considered as simple alternatives, for each has its appropriate role in serving the travel requirements of the urban area.

There is currently discussion, both nationally and locally, on rail transit. A recent report by the U. S. Department of Transportation to Congress says: "Five U. S. cities now have rail transit systems in operation, a sixth has

MODEL NEIGHBORHOOD STREET SYSTEM

FIGURE 62



LEGEND:

SC Shopping Center

PS Park – School

FUNCTIONAL CLASSIFICATION SYSTEMS

Freeway or Expressway

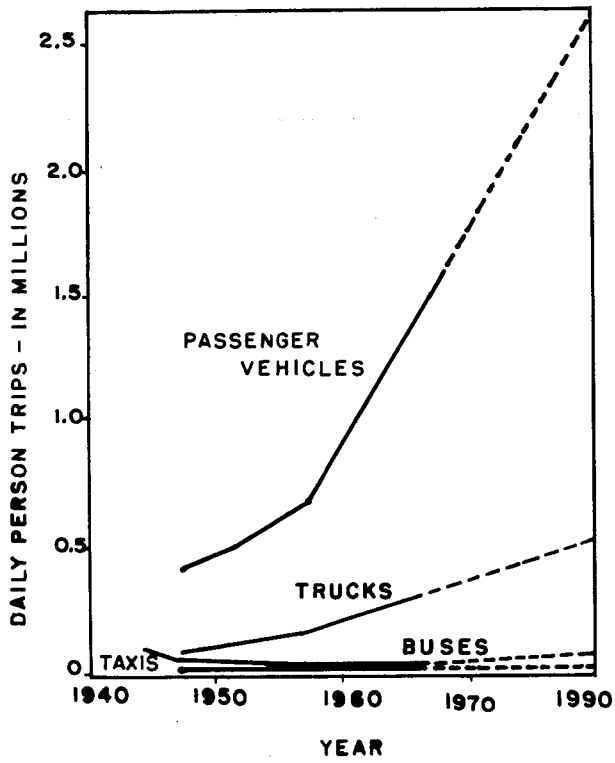
Major Street or Highway

Collector Street

Local Street

TRENDS IN PERSON TRIPS BY VARIOUS MODES

FIGURE 63



one under construction, and five others are seriously considering such systems for the future. In four of the five urban areas considering rail rapid transit systems, estimates are that such systems would serve about five percent of the urban area's total daily person trips, and ten percent of the area's peak-hour trips. (Estimates for the fifth area, Los Angeles, are about one-hlaf of these values)."

The Phoenix Urban Area projected size, density and form would not support a rail transit system in the frame of present long range planning, through 1990. Rail rapid transit is primarily intended to serve centrally oriented commuter trips along dense travel corridors, a situation which is not foreseen for Phoenix. However, there should be periodic re-evaluation of the transportation system and its various modes with due consideration for the desires of the people. In the future, if it appears that citizens attitudes change in favor of increasing density of living or as we approach 2,000,000 people, a broad base mass transit study to explore the potentials of all transportation modes should be undertaken. Thus Phoenix can take advantage of new technology and experience of other urban areas in the field of mass transit over the next decade.

To continue from the D. O. T. Report - "Bus transit is and probably will continue to be the only form of mass transit in nine-tenths of our urban areas of over 50,000 population...." For these areas, which will include Phoenix under our present plan, improved transit will depend considerably on an improved street and freeway system and public acceptance of buses. The basic need is for an area-wide balanced urban freeway and major street system. Of equal importance, however, is a periodic re-evaluation of the transportation system and its various modes with due consideration for the desires of the people and the new technology that may be developed.

Air Transportation

Sky Harbor Airport is very centrally located to the Phoenix urban area, only four miles from the Phoenix Central Business District. This ideal location is expected to provide rapid and convenient access to the entire region now and in the future. It is vitally important that the air-oriented, terminal and transfer, and ground-oriented facilities be designed as a complete transportation system.

The growth and usage of enplaning and deplaning passengers at Sky Harbor Airport has been phenomenal, averaging 18% per year, as compared to the average national growth of 11% per year. The following table illustrates past and expected growth in enplaning and deplaning passengers.

Table 26

Fiscal Year	Total Enplaning and Deplaning Passengers
1950-51	209,702
1960-61	863,717
1966-67	2,073,643
1969-70	3,000,000
1974-75	5,000,000
1979-80	7,000,000
1989-90	13,000,000

Much of this increased passenger traffic will be carried by the new "air bus" jets, which will carry 400 or more passengers each. The impact of increased passenger use will strain the facilities at Sky Harbor. Future planning will have to cope with the myriad of scheduling, baggage, parking and street use problems inherent with increased passenger loads.

More important, a total system design concept must be implemented to insure that all phases of aircraft and airport operations,

runway characteristics, terminal facilities and ground transportation are considered. Helicopter and VTOL type aircraft may become an important function in channeling passengers to and from major buildings, hotels and conventions facilities in the metropolitan area.

General aviation usage of Sky Harbor may have to be curtailed and increased use of satellite airposts encouraged. Already, the city has taken the first step in this program with the acquisition of the Phoenix Litchfield Park Municipal Airport as a satellite airport.

The rapid growth in the number of commercial airline passengers will put great additional loads on our street and highway system serving Sky Harbor Airport. The proposed east access which will connect the airport with the HoHoKam Freeway, should serve about thirty-five percent of the airport users. This will help relieve some of the traffic load on the existing west access. Eventually, it may be necessary to construct a direct freeway ramp from the Squaw Peak Freeway to the airport serving the north and west.

Railroads

Freight service to nearby markets is offered by two transcontinental railroads. Although Phoenix is not on the main line of either railroad, it is not anticipated that Phoenix will suffer in the future because of a lack of fast through service, as both lines presently offer adequate service.

It can be expected that, in the years ahead, the railroads will still continue to be the major mover of freight on a ton mile basis. Passenger use of railroads into Phoenix has decreased to the point where one railroad recently requested discontinuance of passenger service which was established in 1894 through Phoenix. The railroads now find they have been challenged by truck and, to a lesser extent, by air freight as the top frieght carriers. However, the volume of freight handled by railroads is on the increase.

Growth of industrial activities in the Phoenix Planning Area will be enhanced by the fact that adequate rail spurs can be developed easily, especially in the Southwest Industrial Reserve and along the Grand Avenue industrial corridor.

Pipelines

Pipelines are an important part of transportation as a mover of goods - liquids and gas. Pipelines transport all of the natural gas used in the Phoenix Urban Area. Pipelines have become a major source of petroleum products. The complex domestic water distribution system and canal system for irrigation can also be considered a mover of goods.

Parking and Terminal Facilities

Phoenix obtained most of its growth in the last 15 years during a period when the automobile was recognized as the primary means of transportation. Providing adequate off-street parking as an integral part of all types of development, from shopping center, to high-rise, to single-family residences is absolutely necessary. City ordinances require adequate off-street parking except in the core area. Progressive developers in some cases have even exceeded these requirements. In the downtown area, the parking demand has decreased considerably due to the decentralization that has taken place.

Future parking demands will be important where a change in transportation mode is involved. For example, at Sky Harbor Airport, it will be necessary to expand greatly the parking facilities to take care of the exceptionally high increase in airline passengers which is anticipated. Constructing parking lots next to freeway interchanges in conjunction with express bus service on freeways may be needed. Continued development of off-street parking

to adequately serve the land use is absolutely essential as part of the total transportation system.

Conclusion

Older communities developed when the predominant mode of transportation was some form of steel wheel and rail facility, either street car, elevated, subway, or commuter railroad systems. The newer cities, especially those in the West, have essentially had their population growth in the automobile era. Thus, they present a very different picture with regard to the urban land use pattern. Phoenix is one of the nation's prime examples of such a city, in that it possesses a very dispersed density land use pattern. This dispersal has allowed Phoenix to grow with fewer acute street and highway problems than cities of comparable size, even though it lacks an adequate number of freeway miles open to traffic.

The rapid population growth of Arizona in the last decade and the increasing urbanization that has come with this growth has brought with it a rapidly developing need for adequate streets and highways. Streets, highways and freeways touch every aspect of Phoenix's economy, development, recreation and tourism, and the daily life of our citizens. Historically, our Nation, our West, our State, County and our City have developed where there is adequate transportation.

NEVER HAS THE NEED FOR AN ADEQUATE STREET AND FREEWAY SYSTEM, WITH RELATED TERMINAL FACILITIES, BEEN MORE ACUTE THAN IN OUR MODERN, AFFLUENT SOCIETY WHICH DEMANDS SAFE, EFFICIENT, AND CONVENIENT MOBILITY..... MOBILITY - PHOENIX STYLE.

The following additional portions of the Personalized Transit Study are excerpted as follows:

The Design and Evaluation of a Personalized Transit System

The Design and Evaluation of a Personalized Transit System, Personalized Transit Study, January, 1970.

Based on information developed to date, we can not conclude that the transportation access problem is a prime cause of unemployment. However, it appears reasonable to conclude that improvements in accessibility to employment centers is a necessary part of any program designed to relieve unemployment. A hypotetical [sic] type of transport system - personalized to meet the needs and desires of the people - is developed and analyzed in this report. This evaluation supplies the necessary information on which to start to draw conclusions and final recommendations.

This report contains information regarding:

A) Existing "Home-to-Work" travel patterns
B) Results of home interviews on employment status, present ways people get to work (modal split), time of travel, etc.
C) Evaluation of the economics of alternate personalized transit systems
D) Discussion of modal splits and the equipment necessary for various transport systems
E) The economic analysis of future trends and patterns, and needs of the Inner City residents

Most of the burden for preparing this report has fallen to the Advance Transporation Planning Team of the City of Phoenix. The Team provides a multi-discipline approach and brings together the key elements of planning, traffic engineering, engineering design, economics and coordination to solve transportation problems.

The major assignment of the Advance Transportation Planning Team was to design a transport system, if proven needed, to meet the needs of the Inner City residents and to evaluate the economics and practicability of such a system. All available facts were used in the evaluation including: the home interviews; traffic projections supplied

by VATTS (Valley Area Traffic and Transportation Study); City of Phoenix Planning Studies and consultant reports.

The following are five specific points concluded by the Team in their effort to design and evaluate some type of "Dial-A-System" approach to "Home-to-Work" problems in the Inner City.

- Of the three proposed alternates for the "Dial-A-System", Alternate Number II (multiple origin, single destination) is the most feasible approach, but still very costly per person served.
- The cost involved in a test system for 1/4 of the Inner City is prohibitive in view of the relatively small, yet important, number of people served. During the peak hour, in the test area, Alternate II would serve a maximum of 324 people (based on an optimistic modal split of 26%) during a 24-hour period the most optimistic estimate of people that would be served is 1,153.
- The number of vehicles required for this small test area would be 25 (six large buses, two mini-buses, six limousines, and eleven automobiles.)
- It is estimated that it would cost initially $430,000 for the vehicles and radio equipment and approximately $417,000 per year for the drivers with two shifts, operating costs, depreciation costs, and administration and overhead.
- Based on the results of the pilot area study, a similar program for the entire Inner City could cost well over $1,000,000 for the first year and still serve relatively few people.

The staff has come up with constructive ideas for improvement in the "Home-to-Work" problems of Inner City residents such as the "Buy-A-Car Assistance" Program (described in Report #4) and the establishment of a "Job Wagon" (which will be described in the final report). Also, a number of specific suggestions to improve the service of the existing privately operating transit system will be included in the final report. (pages 7-9)

A Summary Report to the City Council

A Summary Report to the City Council,
Personalized Transit Study, May, 1970.

Based on a year and a half of study we have developed conclusions that most likely apply to many cities in the western United States. First, transportation is not a prime cause of unemployment. However, improvements in the accessibility to employment centers is a necessary part of any program designed to relieve unemployment. Unemployment results from the intraction [sic] of many complex individual and social variables.

Second, the solutions needed to provide home-to-work transportation for the unemployed are not dependent on some new transportation technology. Rather, improvements in existing public transit are needed along with greater innovation in the use of rubber-tired vehicles for providing public transportation.

Examples of innovative uses of existing rubber-tired vehicles are found in the "Buy-A-Car Assistance" program and the "Job Wagon" concept. Specific recommendations for improving the existing bus service are also given.
Certainly a basic solution is to locate new industry - jobs - in the Inner City. This effort will minimize transportation needs and maximize job opportunities for the residents of the Inner City.

The above programs can not be completely effective without an adequate street and freeway system. Without such an adequate transportation system economic growth and new industrial development will be retarded, thereby making it harder to bring industry into the Inner City.

As the major street and freeway system is improved so that travel times are shortened, the Inner City resident will be able to travel greater distances in the same amount of travel time, additional employment areas will be open to him. Since many new employment centers are expected to be located out

of the Inner City, ability to travel out of the Inner City is very important.

This total transportation system must be designed to serve the travel requirements of the people of the Phoenix urban area, both now and in the horizon year. (page 5)

Despite the fact that unemployment, both nationally and in metropolitan Phoenix has been at an all time low during this study, and although job vacancies exist, particularly at the upper end of the occupational scale, there is nevertheless serious unemployment in the Phoenix Inner City. This study endeavored to assess the availability of reliable transportation - both public and private - to job sites. Adequate transportation is widely held to be a significant requirement in achieving full employment in the Inner City. Transportation that will provide greater job accessibility will also lead to improvements in recreational, cultural, and other opportunities. These, like good jobs and the income they bring, lead to a general upgrading of the quality of life of the people living in the Inner City.

The basic portion of the study was approached without preconceived answers and with an imaginative effort to research the problem and to try to design a system that could truly be called a "Personalized Transit System" and then to evaluate the forecast use and economics of such a system.

In outlining our specific recommendations, it is recognized that transportation improvements will not, of themselves, significantly or immediately reduce unemployment and underemployment for Inner City residents. However, without some improvements in transportation, some of the residents of the Phoenix Inner City can not participate fully in the expanding employment, cultural, recreational, and other activities which most metropolitan residents enjoy.

The low density dispersed development in the Phoenix urban area presents an even more difficult problem than would the design

of a transit system for an older, more dense and concentrated urban area. The urban form, population density and patterns of industrial and commercial development in the Phoenix urban area contributes most significantly to the fact that the existing privately operating transit system presently serves only about 18,000 paid rides per day out of an estimated 2.5 million person trips of all types and purposes in the average day; this is less than 1% of the total daily trips by all modes of transportation.

When all of the work and study was completed, additional significant patterns become discernible:

- During the next ten years the 16 Neighborhood Council areas will develop slowly as far as single-family and multi-family dwelling units are concerned.

- The Inner City, which includes the 16 Neighborhood Council areas, will lose population during the next ten years as a percentage of the entire metropolitan area, but will gain in absolute numbers.

- More "new" jobs will be created outside the Inner City rather than within and thus there will remain a need for transportation improvements for Inner City people so that they will obtain the maximum potential from the new jobs being created.

- Transit usage in large cities, including Phoenix, has declined rapidly within the last ten years. In Phoenix the results are a decrease from 6.8% to less than 1% of the total person trips in the average day. The major point is that transit usage of 18,000 trips per day in the Phoenix area is a very small portion of the total of approximately 2.5 million person trips per day for all trip purposes.

- Work trips from the Inner City area by transit are considerably higher than the City as a whole and amount to 10% of the total work trips.

- The desire line maps indicate that there is a wide dispersion of work trips from the 16 Neighborhood Councils which makes normal bus operation difficult, but which is more suitable to a "Personalized Transportation System."

- Some type of transportation system and program is needed for those people who can not drive their own vehicle or do not have a vehicle.

- There are many ways to improve the existing privately operated system.

- Phoenix is a relatively young city, designed around the automobile, and is spread out and has low density development, and lacks well defined concentrated travel corridors which are essential ingredients for good transit patronage.

(page 19-20)

The following is quoted from Transit and the Phoenix Metropolitan Area, VATTS Report No. 10.

Transit and the Phoenix Metropolitan Area, VATTS Report No. 10, prepared by Mathew J. Betz, Ph.D., & Eugene M. Wilson, for Valley Area Traffic and Transportation Study, Phoenix Urban Area of Maricopa County, Arizona, a Standing Committee of the Maricopa Association of Governments, in cooperation with U. S. Department of Transportation, Federal Highway Administration, December, 1970.

The purpose of this document has been to present the basic factors concerning urban transit, demand, technology, and usage. The object was not to solve a specific problem or evaluate a specific proposal or system. It is hoped that it will give the reader a better understanding of urban transportation. Why it occurs, how it may be modified, and, to some degree, how it is viewed by the individual citizen. (page V)

Rapid transit (that operating on exclusive right-of-way) is the only form of public transportation which has not had either a rapid growth or decline in patronage. It

exists in only a limited number of cities and there have been no major systems completed since the end of World War II. Cleveland, Philadelphia, and San Francisco will be major tests in determining the future of this form of transportation. Cleveland has just completed an $18 million, four-mile line connecting the airport and the city's center. This is the first rail line in the United States connecting a major city with its airport.[10] San Francisco's 75-mile Bay Area Rapid Transit will be discussed, in detail, in Chapter 3. However, several important generalizations concerning large scale, new rapid transit systems can be made here. Rapid transit cannot be financed out of operating revenue. BART's plan is for operating revenue to offset only the cost of the rolling stock and yearly operating and maintenance costs.[11] Unlike San Francisco, general obligation bonds to help finance rapid transit have been defeated by the voters in Atlanta, Seattle, and Los Angeles.[12] Secondly, it is a long time before a rapid transit system begins operation. In San Francisco, it will take in excess of 15 years of considerable planning, persuasive action, and construction.

As previously indicated, transit has a major peak-hour problem. Transit, today, has very little weekend and night utilization. The peak-hour volume has ranged as high as 22 percent of total daily usage in Cleveland.[13] These high transit peaks require additional rolling stock which otherwise would not be needed if transit usage were more evenly distributed throughout the day. It is estimated that the peak-hour volume requires about four times as much equipment as can be operated productively at other times of the day.

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10. A. Q. Mowbray, *Road to Ruin*, (New York: J. B. Lippincott Co., 1969), p. 208.

11. Bay Area Rapid Transit District, *Official Statement Relating to: $70,000,000 San Francisco Bay Area Rapid Transit District - General Obligation Bonds Series J*, 1968, p. 24.

12. Mowbray, *op. cit.*, pp. 208, 213.

13. Wilbur Smith and Associates, *Future Highways and Urban Growth*, (New Haven: February, 1961), p. 125.

These disadvantages of transit should not lead to an automatic rejection of new public transportation. Today, there are an estimated 15 to 18 million people who are dependent on its service. The main advantage of most transit operations is its potential capacity. However, any new system must compete with the automobile for patronage. (page 28-29)

This chapter has not tried to describe all of the various systems being proposed. The main intent was to present the range of concepts currently being demonstrated or researched. These new urban transit modes attempt to combine many of the positive aspects of both private autos and conventional public transit within their systems. A brief listing of the positive attributes of private automobile service include: 1) comfort in all weather, 2) convenience, 3) dependability, 4) privacy, 5) flexibility of use, 6) speed of travel, 7) status, and 8) adaptable for the entire trip. The positive attributes associated with public transit are: 1) compact movement of passengers, 2) high capacity capabilities, 3) low space requirements, 4) high safety rating, and 5) provision for non-car users. No system proposed to date approaches fulfilling both sets of characteristics, but they present an improvement in transit over that which exists today. (page 42)

This chapter has presented some of the rationales used by the individual as he makes his decision regarding his use of urban transportation. In review, it is, probably, a rational decision based on economics, time, comfort, and convenience criteria. The user is quite sensitive to, and also, quite sophisticated in, his individual analysis or reaction to many of these. It points out the important fact that equal time or equal costs for different alternatives are not viewed as being equal by the user. Some costs and some expenditure of time are much more offensive than others. The more that is learned

about urban transportation, the more it is necessary to analyze the entire trip and analyze it both in its relative and absolute terms. In the decisions concerning future transport investment, these facts must be incorporated, and the system should be designed so as to minimize the distasteful factors. Typical of the guidelines which might be established would be the following:

1. Minimize time and distance.

2. Keep delays and waiting periods at a minimum.

3. Decrease the uncertainty either by established schedules or by frequent service.

4. Provide a small, basic compartment or unit for privacy.

5. Provide the individual with the greatest amount of control over his environment including ventilation, temperature, smoking, etc.

6. Minimize small recurring delays.

7. Minimize the number of transfers.

8. Minimize the requirements for the user to move from one unit to another.

9. Maximize safety and freedom from breakdown.

10. Avoid repeated direct charges for service.

(page 51)

In conclusion, it seems important that the community identify its problems, realize the magnitude of financing transport alternatives, and realize that this problem, like that of air pollution, is one that cannot be solved by a small geographic area. The communities may be called upon to give some tax relief or subsidy to existing systems, and this is often justified. However, they should remember that the subsidy will have to be provided

by some other sector. If this sector cannot be found, or cannot stand the financial responsibility, then it will probably be up to the taxing powers of the general urban base to provide the funds--the funds which are most critically needed, however, and those which are almost non-existent: the funds can be used to try new systems, new techniques, and new management concepts. (page 59-60)

In conclusion, the basic issues of tomorrow's transportation problems in urban areas resolve themselves into questions of dispersion versus centralization and of density--in other words, questions of land use. This chapter has tried to identify some of the questions regarding the Phoenix metropolitan area. Once these questions are answered, many of the decisions regarding specific mode will be answered. One thing seems certain, and that is for the planning period under consideration, 25 to 35 years, ground transportation will retain its dominance as far as urban transport is concerned and that all ground transportation requires right-of-way. Therefore, the reservation of corridors of land for transportation facilities must rank high on the list of transportation priorities. (page 83)

Following is a Summary of the De Leuw, Cather Report, obtained from the City of Phoenix, dated August 4, 1971.

SUMMARY OF PHOENIX URBAN AREA PUBLIC TRANSPORTATION STUDY

De Leuw, Cather and Company, internationally known consultants on transportation, was hired by the City of Phoenix acting as agent for the Maricopa Association of Governments, to conduct a study of the public transportation in the Phoenix Urban Area. This study is jointly funded by the cities, Maricopa County and an Urban Mass Transportation Administration Grant of the federal Department of Transportation.

During the course of the study, the consultant met with a large number of civic and business organizations and groups and with key government officials. The input from all of these was an important community input to the consultant.

The objective of the study was to present alternate levels of service and a Capital Improvement Program and finally to recommend a public transit service program for the five-year period following the study. The study area encompasses approximately 1,200 square miles in Maricopa County and coincides with the planning area of the Valley Area Traffic and Transportation Study, which is the transportation planning program of the Maricopa Association of Governments.

The conclusions of the consultant evolved from a recognition that the residential density in the Phoenix Urban Area is low compared to most urban areas of similar size. The widely spread pattern of employment and retail establishment results in a similarly dispersed trip-making pattern which lacks a strong focal point. Transit service is effective, the report stresses, when large numbers of persons can be transported along one route, preferably from origins to destinations within walking distance of the route. The consultant observed that the absence of heavy traffic corridors in the Phoenix Urban Area severely limits the opportunities for attractive transit service.

The major findings and conclusions include the following:

1. Public transportation in the Phoenix urban area is patronized by a relatively small segment of the population. However, transit represents a vital service to persons who cannot or do not want to drive and to high school students in the Phoenix Union High School District.

2. Expenses of operating a transit system will continue higher than possible increases from revenue received regardless of the level of service. Service

cuts and fare increases will not improve the financial status of the transit system.

3. The spread between revenues and operating costs increases as the level of service is increased and therefore transit must be considered a public service and not a profit-making enterprise. Some general public finanacial support for transit is necessary.

4. It is not practical to consolidate under one management all transportation services, including the regularly scheduled routes, other bus service charters, school services, taxicabs, airport limousines and other specialized services. Such consolidation would not result in a profitable operation.

5. Improvements in the route system and service standard over the present public transportation system need to be made.

6. Conventional bus transit service utilizing full scale buses is the only form of transit applicable on an area-wide basis. On-call transit service may be applicable in small areas. Jitneys, operation of small buses, rail and other forms of public transportation are not applicable.

Recommendation

1. The consultant recommended that the level of service be improved. This would include:

   A. Adding 70 miles to the existing route pattern.

   B. Changing the route structure in some detail.

   C. Retaining existing base fare but increasing the size of the base fare zone which in effect reduces

the fare of long trips. Also that transfer charges be eliminated.

D. Improving the frequency of service to 30 minute peak and hourly off peak.

E. Increasing the time the buses are operated, to being at 5:30 a.m. and end at 8:30 p.m.

2. A Transit Authority should be adopted that would encompass the entire urban area. The consultant points out that the recent State Supreme Court Ruling makes it essential that the State enbling legislation be rewritten to overcome the various difficulties that now exist in the law.

   The consultant also discusses a number of alternate forms of organization. For example - a group of cities can band together as was done in the 5-City Sewer Joint Powers Agreement or the City of Phoenix could continue to operate the system under a Management Contract with a private concern, such as is presently being done.

3. The consultant recommends immediate acquisition of 40 new buses to replace some of the older equipment and 15 new buses to implement the increased level of service he is recommending. The consultant's recommended capital improvement outlay for the first year would amount to slightly over $2 million and, assuming a federal grant of two-thirds, the local share would be approximately $650,000 to $700,000. Other approaches might reduce this by balancing the amount of new equipment purchased annually over the five-year period rather than purchasing 55 buses at the outset.

4. The consultant points out that the annual operating deficit of the transit system at the recommended level of service would be approximately $1,220,000

in 1972 and slightly over $2 million in 1976. This would be in addition to the fare box, charters and all other revenue from the system.

5. Every effort should be made to make bus riding as attractive and convenient as possible and to reverse its negative public image.

6. The consultant concluded that the bus stop downtown should remain in its present location.

7. The City of Phoenix should continue to operate the bus system under a management contract until a determination is made on the best organizational approach and State enabling legislation for a Transit Authority is revised.

These and other recommendations plus extensive background material are contained in the report prepared by De Leuw, Cather and Company.

RESOLUTION NO. 12034

A RESOLUTION SUPPORTING THE RELOCATION TO THE PAPAGO FREEWAY LINE OF THE INTERSTATE ROUTE (I-10) GOING WEST FROM THE BLACK CANYON FREEWAY (I-17); AND DECLARING AN EMERGENCY

WHEREAS, the Arizona Highway Commission has recommended that the Interstate route going west from the Black Canyon Freeway (I-17) be located along the Papago Freeway line generally a quarter of a mile south of McDowell Road, and

WHEREAS, the Papago Freeway is the most urgently needed single transportation facility in the Phoenix urban area, and

WHEREAS, the Papago location will serve several times as much traffic in the design year as the route along the Salt River and thus will provide relief to crowded surface streets, and

WHEREAS, the Papago line will far better serve the industrial development as well as the residential growth pattern to the west and northwest of Phoenix, and

WHEREAS, the economic return to the motorist will be approximately five (5) times as great from the Papago line compared to the Salt River location, and

WHEREAS, the Papago location is four (4) miles closer to Luke Air Force Base and the SAGE installation than the southern location, and

WHEREAS, the Papago location makes efficient use of limited funds inasmuch as it better serves both interstate and urban traffic, and

WHEREAS, great savings can be realized if the right of way for the Papago Freeway can be secured prior to the more intense development of the land that is expected on the northerly line as contrasted to the Salt River location,

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF PHOENIX as follows:

SECTION 1. That the shift of the interstate route (I-10) going west from Black Canyon Freeway to the Papago line just south of McDowell Road is most strongly supported and urgently requested.

SECTION 2. That, because of the increased traffic service that the freeway would provide through the industrial, commercial, and residential areas to be served by the Papago location, adequate interchanges be provided at least at the following locations:

a. Full interchanges--35th Avenue, 43rd Avenue, 51st Avenue, 59th Avenue, and 67th Avenue.

b. Partial interchange--27th Avenue with service to and from the west.

c. Structure with right of way for future interchanges at major arterials west of 67th Avenue where no interchange is provided in the initial construction.

SECTION 3. That the Arizona Highway Department be commended for its efforts to provide this most-needed facility and urged to proceed as rapidly as possible with the acquisition of right of way and the construction of Interstate 10 along the Papago Freeway line west from the Black Canyon Freeway.

SECTION 4. WHEREAS, the immediate operation of the provisions of this resolution is necessary for the preservation of the public peace, health, and safety, an EMERGENCY is hereby declared to exist, and this resolution shall be in full force and effect from and after its passage by the Council, approval by the Mayor, and publication and posting as required by law and is hereby exempted from the referendum clause of the City Charter.

PASSED by the Council of the City of Phoenix this 4 day of May, 1965.

APPROVED by the Mayor this 4 day of May, 1965.

Milton H. Graham MAYOR

ATTEST:

Stanton S. Von Grabill City Clerk

APPROVED AS TO FORM:

Merle L. Hanson City Attorney

REVIEWED BY:

Robert Coop City Manager

CITY OF PHOENIX

PRESENTATION ON PAPAGO EAST FREEWAY
at the
Public Hearing Held by the Arizona
Highway Department
on
Thursday, January 23, 1969
by
Mayor Milton H. Graham

Introduction

In my recent annual report I emphasized that 1968 was indeed a year of progress in the area of street and highway transportation. The high point of the year was the announcement by the Department of Transportation that the Papago Freeway innerloop had been designated as part of the Interstate and Defense Highway System from the additional 1500 miles authorized by the 1968 Federal Aid Highway Act. Although these miles are presently unfunded, it is certainly our hope that the citizens of the Phoenix Urban Area will be driving on this key segment of the freeway system by the mid 1970's.

Long Standing Policy Effort

The City of Phoenix has actively worked to secure the Papago Freeway for many years because of an early recognition of its many benefits to the community. In October of 1960, the City Council of the City of Phoenix, along with the Arizona Highway Commission, Maricopa County Board of Supervisors and later five other cities and towns in this urban area, adopted the same Major Street and Highway Plan. This master plan included the Papago Freeway as a major part of the transportation system designed to serve this urban area. Because of the great importance of the Papago Freeway,

joint efforts by the City of Phoenix and the Arizona Highway Commission led to the relocation of the Interstate Highway to the west (Interstate 10) to the Papago line in 1965. All through these eight years the joint efforts by the Highway Commission, Maricopa County and the City of Phoenix have been directed towards the earliest possible development of the Papago Freeway with prime emphasis on the segment which would go from the interchange of the Black Canyon Freeway (Interstate 17) and the Papago West (Interstate 10) to join the Squaw Peak Freeway (Interstate 510) at Van Buren Street thus completing the inner-loop of freeways - the missing link.

The location of the Papago through the City of Phoenix has been carefully determined by joint action of the City and State Highway Department. Extensive studies by the Advanced Transportation Planning Team of the City of Phoenix supported by the Planning Department, Public Works Department, Divisions of Engineering and Traffic Engineering and Water and Sewer Department led to the location through the heart land of the City of Phoenix. This location was reviewed by the Planning Commission and was adopted at a joint meeting of the Arizona Highway Commission and the City Council on January 7, 1964.

Certainly the action of the Arizona Highway Department to secure a multi-discipline study under the able direction of Johannessen and Girand was another notable forward step in developing a facility that would best blend into the community and serve it from the traffic standpoint as well as from the long range land planning and development and community value and economic viewpoints. We feel that this total team concept by both the State and the City has set the stage for a great urban transportation facility - the Papago Parkway.

Basic Concepts

The City of Phoenix endorses the elevated concept for the entire length of Papago Freeway from Black Canyon to the McDowell Road Pass in Papago Park. This inspired

concept of a high structure crossing Central Avenue and the creation of a park under it is exciting. It can provide a focal point for Phoenix and the entire Valley of the Sun. Not only will it serve traffic but it will be the tie that binds our community together both north - south and east - west and also important interstate traffic. Further we foresee substantial economic development and urban redevelopment taking place within the area of influence of this great modern transportation facility. The City of Phoenix Planning Commission has adopted a resolution endorsing the elevated concept of the Papago Freeway throughout its entire length. This resolution will be presented by Mr. Fred Riggins, Chairman of our Planning Commission.

Further, the City Streets Advisory Committee has been a strong supporter of the Papago Freeway for many years. The committee has studied this project carefully as it has developed. This citizens committee endorses the elevated concept of the Papago Freeway as presented in the Johannessen and Girand Report and urges that it be constructed and opened to traffic at the earliest possible date.

Specific Requests

Based on city staff studies, five basic specific requests are presented:

1. It is important to our endorsement of the elevated concept that the park-like characteristics under the freeway as presented in the consultant's report are implemented as part of the construction of the freeway by the Arizona Highway Department. It is our understanding that the cost estimates do include landscaping of all the right of way area. The City will work with the Arizona Highway Department in the development of joint use of rights of way as specific proposals develop in the future. We are impressed with the main line freeway structural design and careful attention in quality of environment that has been developed by Dean Elmore and his associate as part of this design team concept and urge this also be implemented.

2. It is of real importance that the relocation of the people and business affected by this freeway be done with the utmost care. We would urge that the Arizona Highway Department develop a careful Public Information Program that would insure that all the individual property owners are kept informed as this project proceeds.

3. The basic purpose of this facility is urban traffic service. We recognize that many details and designs must be worked out. The City concurs with a development of full interchanges connecting to the one way pairs of Third - Fifth Streets and Third - Fifth Avenues. However, it is emphasized that we feel it is of equal importance that some sort of full or partial traffic connection be provided at 7th Street and 7th Avenue. This is essential in order to utilize the full traffic carrying potential of the north and south streets in the central corridor of the city - 7th Avenue to 7th Street. We urge that high priority consideration be given in working out a final design that would utilize all these major north - south surface street routes. A Planning Consultant's study being completed for the City of Phoenix reemphasized the great importance of maximizing the traffic service north and south in the central corridor through the use of 7th Street and 7th Avenue as well as the two one way pairs.

The City recognizes that it has a responsibility to construct an adequate major street system to connect to the freeway as part of the total transportation system.

4. It is the understanding of the City of Phoenix that all costs related to the relocation of city water and sewer utilities as well as adequate provision for storm water drainage made necessary by the freeway are included in the total cost of construction and will be paid by the Arizona Highway Department.

5. We recognize that a great many detail designs and much study leading to the final construction plan lies ahead. The city staff is most anxious to remain

helpfully active in this development. Therefore, it is requested that the State Highway Department work most closely with appropriate city departments and divisions as final designs are developed. Certainly traffic engineering both from construction detour and system operation and related geometric design points of view is a key consideration to the city. Furthermore, the utility problems - water, sewer and storm water require the closest coordination.

Conclusion

The City of Phoenix enthusiastically supports the elevated high structure concept developed by the total design team approach sponsored by the Arizona Highway Department. This work combined with the extensive staff work by the City of Phoenix and its Advanced Transportation Planning Team over the last eight years has led to a potentially truly great concept for the Papago East Freeway and its innerloop parkway.

The Papago Freeway will enable our citizens to move across town in half the time and at least three times as safely as they can on existing major streets. Further it will foster economic and community development and provide easy access to the City for interstate travelers and tourists.

Let me close by urging that we get on with the job of constructing this urgently needed facility at the earliest possible time.

It is now my pleasure to introduce Mr. Fred Riggins, Chairman of the City Planning Commission to present a resolution from that body.