

January 10, 2005

TO: Members of the MAG POPTAC Ad Hoc Subcommittee

FROM: Harry Higgins, Scottsdale, Chairman

SUBJECT: TRANSMITTAL OF MEETING NOTICE AND TENTATIVE AGENDA

Tuesday, January 18, 2005 - **8:30 a.m.**
MAG Office, Suite 200, Saguaro Room
302 North 1st Avenue, Phoenix

A meeting of the MAG Population Technical Advisory Committee (POPTAC) Ad Hoc Subcommittee will be held at the time and place noted above.

Members of the POPTAC may attend either in person, by telephone conference call or by videoconference. To videoconference to the meeting, prior arrangements need to be made with Heidi Pahl at MAG and or your site coordinator. Those attending by telephone conference call are requested to call 602-261-7510 between 8:25 a.m. and 8:30 a.m. After prompting, please enter the meeting ID number 767822 (POPTAC) on your telephone key pad followed by the pound sign. If you have a problem or require assistance, please dial 0 after calling the number above.

If you are driving, please park in the garage under the Compass Bank building. Bring your ticket to the meeting and parking will be validated. For those using transit, the RPTA will provide transit tickets for your trip. For those using bicycles, please lock your bicycle in the bike rack in the garage.

Pursuant to Title II of the Americans with Disabilities Act (ADA), MAG does not discriminate on the basis of disability in admissions to or participation in its public meetings. Persons with a disability may request a reasonable accommodation, such as a sign language interpreter, by contacting Harry Wolfe at the MAG office. Requests should be made as early as possible to allow time to arrange the accommodation.

Please be advised that under procedures approved by the MAG Regional Council on June 26, 1996, all MAG committees need to have a quorum to conduct business. A quorum is a simple majority of the membership or 13 people for the MAG POPTAC. If you are unable to attend the meeting, please make arrangements for a proxy from your jurisdiction to represent you. If you have any questions or need additional information, please contact Anubhav Bagley at (602) 254-6300.

TENTATIVE AGENDA

1. Call to Order

2. Call to the Audience

An opportunity will be provided to members of the public to address the MAG POPTAC on items not scheduled on the agenda that fall under the jurisdiction of MAG, or on items on the agenda for discussion but not for action. Members of the public will be requested not to exceed a three minutes for their comments. A total of 15 minutes will be provided for the Call to the Audience agenda item, unless the Chair of the POPTAC requests an exception to this limit. Please note that those wishing to comment on action agenda items will be given an opportunity at the time the item is heard.

3. Approval of Meeting Minutes of October 19, 2004

4a. Preparation of 2005 MAG Socioeconomic Projections

In June 2003 the MAG Regional Council approved MAG Interim Subregional Projections. These were interim because official updated DES projections were not available, and the Maricopa County projections used were based upon projections prepared on behalf of the Arizona Department of Commerce.

DES is developing draft 2005 county population projections. Once these County projections are approved and official, MAG will need to use them to prepare an official set of subregional projections. The time frame for preparing these projections is very tight because of the need to have them approved in time to be used for air quality conformity analysis.

County projections will need to be recommended by the MAG POPTAC in February and approved

COMMITTEE ACTION REQUESTED

2. For information.

3. For information, discussion and approval of the minutes of October 19, 2004.

4a. For information and discussion.

by the MAG Regional Council in March. Subregional projections will need to be recommended in April, and approved in May. Please see Attachment One.

4b. Review and Approval of Model Assumptions for 2005 MAG Socioeconomic Projections

The MAG Socioeconomic projections are based upon model assumptions. These assumptions pertain to the Floor Area Ratios, geography used, etc. etc. Attached is a set of model assumptions. These assumptions will be reviewed and the MAG POPTAC will be requested to approve them. Please see Attachment Two.

5. Adjournment

4b. For information, discussion and recommendation to the MAG POPTAC to approve the assumptions and methods to be used for preparing the 2005 MAG Socioeconomic Projections.

MINUTES OF THE
MARICOPA ASSOCIATION OF GOVERNMENTS
POPULATION TECHNICAL ADVISORY COMMITTEE ADHOC SUBCOMMITTEE

October 19, 2004
MAG Office, Suite 200, Saguaro Room
302 North 1st Avenue
Phoenix, Arizona

MEMBERS IN ATTENDANCE

Harry Higgins, Scottsdale, Chairman
Tim Tilton, Phoenix
David de la Torre, Chandler
Hector Tapia, Tempe
Adrian Williamson, Avondale

Kate Langford, Glendale
Cecilia Casillas, Youngtown
*Karen Flores, Peoria
*Matt Holm, Maricopa County
*Wahid Alam, Mesa

*Those members neither present nor represented by proxy.

** Participated via audioconference.

OTHERS IN ATTENDANCE

Max Enterline, Phoenix
Harry Wolfe, MAG
Rita Walton, MAG
Heidi Pahl, MAG

Elaine Trammell, MAG
Anubhav Bagley, MAG
Bruce Hernandez, Behavior Research
** Dennis Schwanz, Census Bureau, Denver
** Ronald Dopkowski, Census Bureau, Denver

1. Call to Order

Chairman Harry Higgins called the meeting to order at 8:30 a.m.

2. Call to the Audience

There were no requests to address the MAG POPTAC Ad Hoc Subcommittee.

3. Approval of Minutes of March 16, 2004

It was moved by David de la Torre, seconded by Tim Tilton and unanimously recommended to approve the meeting minutes of March 16, 2004.

4. Enhancements to the Population Estimates process

Harry Wolfe informed the Subcommittee that in the past months the DES POPTAC Methodology Subcommittee has been working on reviewing the Population Estimates process for the State and County Control totals. Mr. Wolfe explained that the DES POPTAC Methodology Subcommittee has recommended a procedure for applying the Composite Method. The Composite Method using this procedure would estimate non-group quarter

populations for 4 age-groups using a ratio derived from the Census. The data sets used include - births and deaths data for population less than 5 years; school enrolment for 6-18 years, registered drivers licenses for 19-64 years and Medicare recipients for 65 and over populations. During the review process, numerous errors in historic data sets were uncovered. DES POPTAC subcommittee has recommended that DES collect the best available data from the respective agencies and use it without making any adjustments to fit into a time series. This new method will be used in the 2004 Population Update process.

5. Preparation of Draft July 1, 2004 County and Municipality Resident Population Updates

Harry Wolfe informed the Subcommittee that the Arizona Department of Economic Security (DES) is preparing the July 1, 2004 resident population updates for each county in the state. When developed, the Maricopa County update will become the control from which the municipality updates will be developed. Because of the deadlines for approving the updates and the schedule of MAG Management Committee and Regional Council, MAG staff have developed a draft set of updates based on a preliminary control total of 3.5 million for Maricopa County. Mr. Wolfe said that since there may be changes to the State and county control totals by DES, POPTAC Ad Hoc Subcommittee is requested to recommend approval of these updates to MAG POPTAC Committee provided the County control total is within one percent of the final control total.

Rita Walton further explained that the 3,500,000 population number is based on the residential completions collected from MAG member agencies. It was adjusted similar to the adjustment needed to the 2003 population update resulting from the use of the Composite Method.

Hector Tapia inquired on the timing of the final population updates. Harry Wolfe informed the Subcommittee that the Population Updates need to be voted at the December DES POPTAC meeting. Mr. Tapia also asked about the method used to distribute any changes to the control totals. Mr. Wolfe explained that any changes to the control total would result in a proportional change of population growth for all member agencies.

It was moved by Kate Langford, seconded by Hector Tapia and unanimously approved to recommend to MAG POPTAC to recommend approval of the July 1, 2004 Maricopa County Update provided that it is within one percent of 3.5 million in the final update.

6. Census 2005 Sample Size

Harry Wolfe informed the Subcommittee that after the Census 2005 workshop on October 7, 2004 requests were received to further discuss survey issues including sample size with the Census Bureau. Mr. Schwanz and Mr. Dopkowski, from the Denver Census Bureau office gave a presentation on the methods used for deriving the sample size for the Survey. Mr. Schwanz in his presentation explained that a jurisdiction's sample size was derived based on its number of housing units, occupancy rates and persons per household.

The meeting adjourned at 9:30 a.m.

January 10, 2005

ATTACHMENT ONE

TO: Members of the MAG POPTAC

FROM: Harry P. Wolfe, Senior Project Manager

SUBJECT: OVERVIEW OF MAG SOCIOECONOMIC PROJECTIONS PROCESS

Executive Order 95-2 requires that official population projections be prepared once every five years subsequent to the preparation of a decennial or a special census. The Arizona Department of Economic Security DES is responsible for preparing state and county population projections, and MAG uses the Maricopa County projections as control totals for developing subregional projections.

The last set of official state and county population projections were prepared by DES in February 1997 using the 1995 Special Census as the base. MAG subsequently adopted subregional projections in June 1997.

Because MAG needed a new set of projections to develop its Regional Transportation Plan in 2003, and because DES had not provided an updated set of County projections based on Census 2000, MAG developed an interim set of projections in June 2003. These interim projections were based on unofficial county control totals developed by Arizona State University and the University of Arizona on behalf of the Arizona Department of Commerce. In June of 2003 the Regional Council approved these Interim Projections of population, housing and employment.

All assumptions, surveys and methodologies used to produce the interim projections were reviewed by MAG member agencies, revised based on input received and approved by the MAG Population Technical Advisory Committee (POPTAC). These interim projections reflected the vision of each jurisdiction's future land use plan.

DES staff is currently preparing draft population projections which will be available for review in early 2005. Once these projections are approved by MAG and by DES they will become the official projections and MAG will use them to produce official subregional projections.

There is a tight time frame for the approval of the projections because they need to be ready to be used for air quality conformity analysis in May 2005. In order to meet this schedule the following actions will need to be taken:

- January 2005 MAG POPTAC approves the model assumptions and data input
- February 2005 MAG POPTAC recommends approval of Maricopa County projections
- March 2005 Management Committee recommends approval and Regional Council approves Maricopa County projections.
- April 2005 MAG POPTAC recommends approval of subregional projections.
- May 2005 Management Committee recommends approval and Regional Council approves subregional projections.

A more detailed timeline and the basic assumptions for the timeline are attached.

MAG staff will facilitate the review and approval process by working closely with MAG member agencies and by making maximum use of the MAG ArcIMS website to convey draft projections. While the projections will be approved down to the RAZ level, POPTAC members will receive the projections by TAZ to assist in the review process.

Because of the in depth process that was used to develop the 2003 Interim Projections, these updated official projections will build upon and refine those projections using updated information from MAG member agencies. Once approved, these projections will be used as the input for the MAG transportation model, for air quality conformity and as the base for all MAG regional planning activities.

If you have any questions or need additional information, please contact me or Anubhav Bagley at 602-254-6300.

Socioeconomic Projections, 2005

Objective: To review and update MAG Socioeconomic Projections by May, 2005

Assumptions: No changes to TAZs or RAZs except where MPA has changed
Regional Transportation Plan networks and construction timings will be used

Adopted Geography

County
Municipal Planning Area
Regional Analysis Zone

Adopted Years (July 1)

2000
2005
2010
2015
2020
2025
2030

Reviewed Geography

County
Municipal Planning Area
Regional Analysis Zone
Transportation Analysis Zone

Reviewed Years (July 1)

2000
2004
2005
2010
2015
2020
2025
2030
<Net Capacity>
<Buildout>

Interpolated Years (July 1)

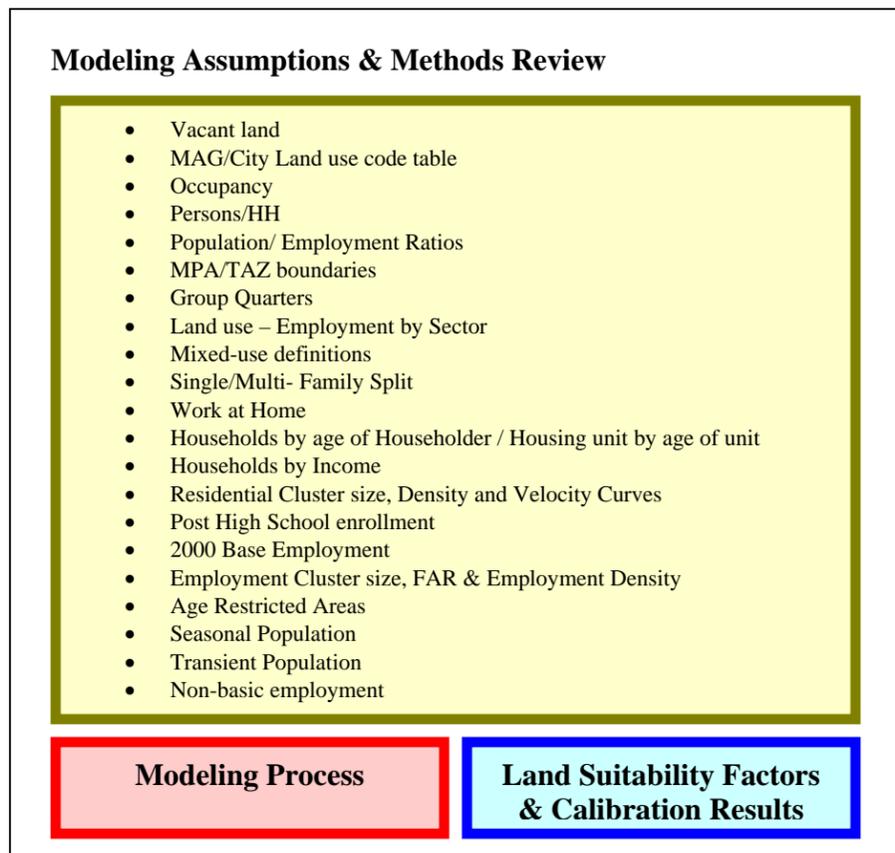
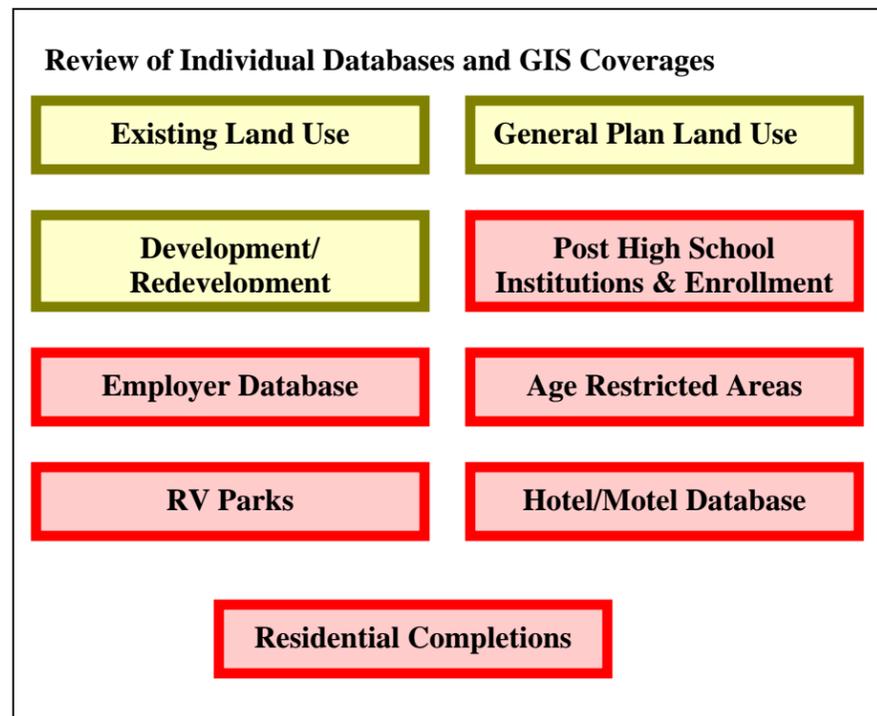
2006
2009
2016
2026

Socioeconomic Projections 2005 Anticipated Timeline

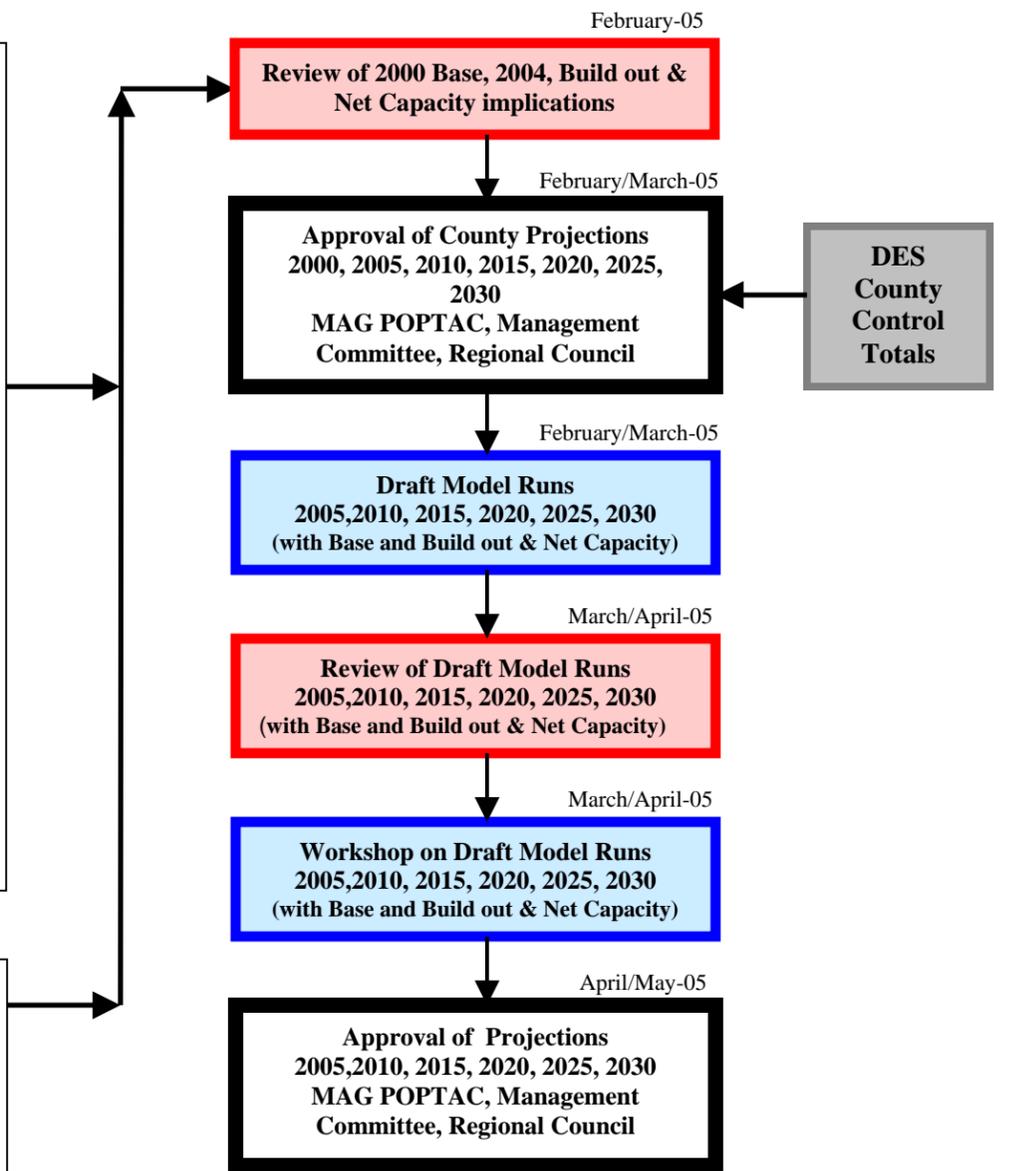
	January				February				March					April				May			
	1	2	3	4	1	2	3	4	1	2	3	4	5	1	2	3	4	1	2	3	4
POPTAC, MC, RC updates and approvals																					
MC update: what is coming					■	■															
POPTAC recommend approval of county projections						■	■														
MC recommend approval of county projections									■	■											
RC approve county projections												□									
MC update: progress to date																	■	■			
POPTAC recommend approval of RAZ projections																		■	■		
MC recommend approval of RAZ projections																			■	■	
RC approve RAZ projections																					□
POPTAC Activities																					
POPTAC update: what is coming			■	■																	
Review data inputs (general plan, existing, developments, future)			■	■																	
Review and approve model assumptions			■	■																	
Review residential completions to September 1, 2004			■	■																	
Update inventory databases							■	■													
Review and recommend approval of county projections							■	■													
Reviewed 2000, 2004 and buildout information by RAZ and TAZ							■	■													
Reviewed 2000, 2005 and buildout information by RAZ and TAZ											■	■									
Reviewed 2010, 2020 and 2030 information by RAZ and TAZ											■	■									
Reviewed all information by RAZ and TAZ																		■	■		
Recommend approval of RAZ projections																		■	■		
Key:																					
Regional Council approval									□												
Management Committee update/recommend approval									■												
POPTAC update/review/recommend approval									■												

Preparation for Socioeconomic Modeling (December 2004 – February 2005)

Socioeconomic Modeling (January 2005 – May 2005)



CENSUS 2000



KEY



January 10, 2005

SOCIOECONOMIC DATA & MODELING REVIEW PROCESS
FOR PREPARATION OF SCOCIOECONOMIC PROJECTIONS BY THE MARICOPA ASSOCIATION OF GOVERNMENTS

**ASSUMPTIONS & METHODS
POPULATION PROJECTIONS 2005**

1. MAG Geography

- Maricopa County is subdivided into 28 Municipal Planning Areas (MPAs), 146 Regional Analysis Zones (RAZs), 1858 Traffic Analysis Zones (TAZs) and 1864 Socioeconomic Analysis Zones (SAZs).
- Transportation Analysis Zones (TAZs) are required for transportation planning and are set by the MAG Street Committee with input from the MAG POPTAC. The TAZ is only within the transportation modeling area and its numbering system is sequential.
- Socioeconomic Analysis Zones (SAZs) are used for socioeconomic planning. The geography is consistent with TAZs, but the numbering system remains constant from one projection series to another, and it covers the entire Maricopa County.
- TAZs are modified as expected growth in a 30-year horizon expands geographically or densities in existing TAZs warrant TAZ splits.
- Each municipality has its own Municipal Planning Area (MPA), which delineates the area of planning concern for each jurisdiction. Traffic Analysis Zones (TAZs) and Regional Analysis Zones (RAZs) fall completely within only one MPA, as TAZs add up to RAZs, and RAZs add up to MPAs.
- TAZs used for the 2005 projections will be identified as TAZ2005.

2. Base July 1, 2000 and July 1, 2004 Population and Housing Variables

- The MAG socioeconomic models require a base population, housing and households from which to begin its modeling process.
- A census in 2000 for April 1, 2000 population and housing determines the base at that time.
- Additional housing units, households, and population in households are derived from the Residential Completions submitted by each member agency. Residential Completions for April 1, 2000 to June 30, 2000 are extracted from the file to create the base July 1, 2000 numbers.
- Residential Completions for July 1, 2000 to June 30, 2004 are extracted from the file to create the base July 1, 2004 numbers.
- These counts are then cumulated to TAZ2005.

POPTAC Recommendation Requested:

- Use the method as described above for cumulating base July 1, 2000 and July 1, 2004 population and housing data to TAZ2005.

3. Base July 1, 2000 and July 1, 2004 Employment by Sector

- The MAG transportation models require employment projections by 5 land use types, namely, Retail, Office, Public, Industrial, and Other, and 2 non-land use types, Work at Home and Construction.
- For effective transportation modeling, the employment by sector must be identified by land use sector and not by SIC categories. Thus, if an office is in a retail center, and the underlying land use is “Retail,” then the office employees are in a Retail sector. Care must thus be taken to ensure proper interpretation of the results.
- The MAG socioeconomic models, therefore, require a base July 1, 2000 employment by the same 5 land use types, namely, Retail, Office, Public, Industrial, and Other, and 2 non-land use types, Work at Home and Construction, from which to begin its modeling process.
- For the July 1, 2000 employment base, a database of employment of 5 or more employees at any one site was collected by MAG/MAG consultants and reviewed by each MAG member agency. This database included, among other items, the name, address, SIC code and number of employees at the site. The information was collected from various private and public sources and enhanced by phone interviews. Changes were made to the database as identified by the member agencies.
- A database of employment of 3 or more employees at any one site was collected by MAG and reviewed by each MAG member agency in 2004. This database updated with the 2005 Maricopa County Trip Reduction data and reviewed by MAG member agencies will be used to create the base July 1, 2005 employment by sector.
- A coverage of existing land use as of July 1, 2004 was collected by MAG and will be reviewed by each MAG member agency. This coverage was based on land use categories approved by POPTAC prior to beginning the creation of the coverage. Changes will be made to the coverage as identified by the member agencies.
- The employment locations will be address matched, compared to a database of employment-based buildings, and assigned to the underlying land use sector as identified in the existing land use database.
- Where employment appears in incompatible land use sectors, such as residential, the land use code as derived from the SIC or NAICS code will be used. This will account for possible issues with small parcels of employment-based land use not identified on the existing land use database.
- Where employment appeared in a multiple use land use sector, such as Business Park, the underlying base employment will be derived from the SIC or NAICS code.
- After all of the known employment is allocated, the residual employment will be assumed to be the employees per site that were not collected by MAG. This employment will be allocated to the employment-based land use sectors identified on the existing land use coverage with limited or no employment. The database of employment-based buildings will also be used. This employment uses Floor Area Ratios and Employment Density factors in order to allocate the remaining employment at the appropriate densities.
- The majority of construction employment is not located at the corporate offices of the company, but at construction sites across the region. Therefore, construction

employment in any sector using the above methodology will not be assigned to the employment location. Construction employment will be assigned spatially to where new construction was identified in the prior years, using both the Residential Completions database and the Development database. This employment is considered to be in the Other Sector. That component of construction employment continues to follow new construction.

- Work-at-Home employment was derived separately using the algorithm identified in 13 below.
- Non-Basic employment was derived separately as identified in 5 below.

POPTAC Recommendation Requested:

- Use the method as described above for cumulating base July 1, 2000 and July 1, 2004 employment by sector to TAZ2005.

4. Population and Employment Control Totals for Socioeconomic Projections

- MAG develops its resident population projections to be consistent with population control totals for Maricopa County developed by the Arizona Department of Economic Security.
- MAG has acquired a county-level projections model, REMI (Regional Economic Models Inc.) to provide input to the Maricopa County resident population control totals developed by DES and to prepare Maricopa County socioeconomic variables that are currently not available, but have important planning applications.
- The REMI projection model produces county-level population and employment projections for Maricopa County to 2035.

POPTAC Recommendation Requested:

- Use the population control totals for Maricopa County developed by the Arizona Department of Economic Security.
- Use employment projections from REMI, ensuring consistency with the population projections from DES.

5. Basic/Non-Basic Employment

- The MAG Socioeconomic model assigns employment to areas based on land use designations in MAG Member Agency General Plans.
- Since the General Plans are general in nature, many large tracts of residential land use will have some non-basic retail, public and other employment associated with them and should have some retail, public and other employment assigned to them as population growth occurs.

POPTAC Recommendation Requested:

- In the current MAG model, hold back 10% of retail employment, 5% of public employment and 10% of other employment for non-basic employment and assign it to the Traffic Analysis Zones where large tracts of residential development exist and where population growth has occurred.

6. Build Out Population and Housing Variables

- The MAG socioeconomic models require a build out population, housing and households to identify the population and housing potential in an area for its modeling process.
- The build out analysis was performed for minimum, target and maximum densities as described in the accompanying paper (Paper 1), “Build Out Procedure for Population and Housing Variables.”

See also, attached paper (Paper 1) on Build Out Procedure for Population and Housing Variables

POPTAC Recommendation Requested:

- Use the method for projecting and cumulating build out population and housing data to TAZ2005 as identified in the accompanying paper (Paper 1), “Build Out Procedure for Population and Housing Variables” for target population and housing.

7. Build Out Employment Variables

- The MAG socioeconomic models require a build out employment by land use sector to identify the employment potential in an area for its modeling process.
- The build out analysis was performed for minimum, target and maximum densities as described in the accompanying paper (Paper 2), “Build Out Procedure for Employment Variables.”

See also, attached paper (Paper 2) on Build Out Procedure for Employment Variables

POPTAC Recommendation Requested:

- Use the method for projecting and cumulating build out employment data to TAZ2005 as identified in the accompanying paper (Paper 2), “Build Out Procedure for Employment Variables” for target employment.

8. Build Out and Net Capacity Definitions for Households and Housing Units

- The MAG socioeconomic model uses General Plans and known developments to determine a maximum number of housing units that may be built in an area.

- Build out has been defined as the potential of the area. This potential assumes that all houses are occupied, and therefore the occupancy rate is 100%. This is the gross build out.
- POPTAC members have indicated that this potential is very unlikely to occur in any year, and that an occupancy rate should be applied to build out units to derive households and population for the net capacity. This net capacity is more indicative of the maximum for socioeconomic modeling.

POPTAC Recommendation Requested:

- The gross build out will assume that all houses are occupied, and therefore the occupancy rate is 100%.
- The net capacity will assume that not all houses are occupied, and therefore the occupancy rate is less than 100%. This **net capacity** will be used in all socioeconomic modeling.
- Net capacity occupancy rates may be modified by member agencies.

9. Vacancy and Occupancy Rates

- Occupancy rates will be derived from the 2000 Census by dividing the total number of occupied housing units (by unit type single family or multi-family) by the total number of housing units (by unit type).
- Total housing units (by unit type) and total occupied housing units (by unit type) by block will be allocated to Traffic Analysis Zones, which in turn will be summed to Regional Analysis Zones and Municipal Planning Areas.
- When there is not enough information at the TAZ zone level for projecting occupancy rates, the next level of geography (RAZ) is used.
- When there is not enough information at the RAZ zone level for projecting occupancy rates, the next level of geography (MPA) is used.
- MAG member agencies will be asked for input to identify areas where changes in occupancy rates are expected over time.

POPTAC Recommendation Requested:

- Use 2000 occupancy rates for single family and multi-family units from the 2000 Census by TAZ utilizing the method described above.
- Maintain the derived occupancy rates over time with necessary modifications, as identified by MAG member agencies.

10. Persons per Household

- Persons per household will be derived from the 2000 Census by dividing the total population in households (by unit type single family or multi-family) by the total number of occupied housing units (by unit type).
- Population in households (by unit type) and total occupied housing units (by unit type) by block will be allocated to Traffic Analysis Zones, which in turn will be summed to Regional Analysis Zones and Municipal Planning Areas.

- When there is not enough information at the TAZ zone level for projecting persons per household, the next level of geography (RAZ) is used.
- When there is not enough information at the RAZ zone level for projecting persons per household, the next level of geography (MPA) is used.
- MAG member agencies will be asked for input to identify areas where changes in persons per household are expected over time.

POPTAC Recommendation Requested:

- Use year 2000 persons per household rates for single family and multi-family units from the 2000 Census by TAZ utilizing the method described above.
- Maintain the derived persons per household rates over time with necessary modifications, as identified by MAG member agencies.

11. Multiple Use Definitions by Geographic Location

- The MAG projections are consistent with member agency General Plans and Planned Area Developments.
- Many of these plans, however, have areas defined as multiple use areas that can generate various types and densities of housing or employment.
- In order to use these designations in socioeconomic modeling, the multiple use categories must ultimately be converted to one or more of the standard land use categories.
- The MAG socioeconomic models have been enhanced to accommodate such multiple use categories. The models are flexible enough to allow for each individual area to have different proportions of standard land use categories.
- Default categories are consistent with past local multiple use development but can be modified, area by area, by the member agencies.
- The default categories and areas are defined in the accompanying papers: Paper 1, “Build Out Procedure for Population and Housing Variables” and Paper 2, “Build Out Procedure for Employment Variables.”

See also, attached Paper 1 on Build Out Procedure for Population and Housing Variables and Paper 2 on Build Out Procedure for Employment Variables.

POPTAC Recommendation Requested:

- Accept default land use proportions by area category, which may be modified by individual member agencies.
- Accept default land use proportions by MPA, which may be modified by individual member agencies.
- Maintain all land use proportions over time, unless modified by individual member agencies.

12. Single Family / Multi-family Split for Maricopa County by Time

- The MAG projections are consistent with member agency General Plans and Planned Area Developments.

- The data is then used in MAG transportation models to project future transportation behavior.
- The latest version of the model requires long-term projections of the distribution of future housing units into single family and multifamily types.
- MAG socioeconomic models can determine the distribution of housing provided a county-wide control total is known.
- Current inventory and census data give good unit type information for the Base.
- General Plans give good future projections of land for single family and multi-family units.
- A split between single family and multi-family units over time at the county level should be identified.

See also, attached paper (Paper 3) on Single Family / Multi-family Split.

POPTAC Recommendation Requested:

- Use single family/multi-family split over time as identified in the accompanying paper (Paper 3), “Single Family / Multi-family Split.”

13. Work at Home Employment Methodologies

- The number of workers in the work at home category is increasing, and constitutes an important variable in transportation models.
- The demographic characteristics of the work at home population from an extensive literature review can be directly incorporated as independent variables in the regression analyses used in the methodology described. Key characteristics include: workers over age 45, households with above average income levels, people with a college degree or higher level of education, people in “white collar” occupations – professional specialty or executive/managerial, service industry workers, and agricultural industry workers.
- The projections of work at home employment for Maricopa County will be those people who work at home 3 or more days per week. These projections may not be comparable to sources other than the Census.
- Work at home employment projections at the County level are distributed to TAZ zone by prorating on residential growth in the County.

See also, attached paper (Paper 4) on Work at Home Employment Methodologies

POPTAC Recommendation Requested:

- Accept county level methodology for projecting work at home employment as outlined in the in the accompanying paper (Paper 4), “Work at Home Employment Methodologies.”
- Accept TAZ level methodology for projecting work at home employment as outlined above.

14. Cluster Size, Floor Area Ratios (FAR) and Employment Density

- The MAG transportation models require employment projections by 5 land use types, namely, Retail, Office, Public, Industrial, and Other.
- Cluster Size represents the average parcel size of employment land use.
- FAR represents the ratio of the square footage of the building to the square footage of the parcel of land.
- Employment Density represents the floor space required by employees. This is calculated as Employees per 1000 square feet of floor space.
- The MAG models convert a parcel of land to the square feet of employment space and then to the number of employees on that parcel. This requires an understanding of average employment areas.
- Cluster Size, FAR and Employment Density differ for each non-residential land use type.
- It is likely that Cluster Size, FAR and Employment Density will not change appreciably over time.
- There appear to be no adequate surveys and methods for projecting Cluster Size for Employment over time.

See also, attached paper (Paper 5) on Cluster Size, FAR and Employment Density

POPTAC Recommendation Requested:

- Accept the Cluster Size, FAR and Employment Density values by land use type as identified in Table 1 of the accompanying paper (Paper 5), “Cluster Size, FAR and Employment Density.”
- Maintain Cluster Size, FAR and Employment Density values over time for the employment projections.

15. Residential Development Density, Cluster size and Velocity Curves

- In developing TAZ population projections, the MAG socioeconomic models project residential dwelling units from parcels zoned for residential uses in the General Plans or areas anticipated to be residential in the Development database. Households and Population by TAZ are subsequently calculated from the dwelling unit projections.
- Three General Plan Residential Density figures (dwelling units/acre) have been collected from the member agencies. These include the minimum, maximum and target residential density anticipated for each residential land use type in the General Plan. The models use Target Density as the base for new residential growth. The Maximum density set by the MPA caps the residential density. These densities may be changed, polygon-by-polygon by the member agencies if desired.
- Areas covered by the Development database have the number of dwelling units being built/planned and thus do not need to use the densities identified in the General Plan.
- Cluster Size represents the average parcel size of residential land use.
- Residential Density and Cluster Size differ for each residential land use type.

- It is likely that Residential Density and Cluster Size will not change appreciably over time.
- There appear to be no adequate surveys or methods for projecting Density and Cluster Size for Residential uses over time.
- Development Velocity Curves represent the life cycle of residential development projects. These are used to estimate the development trends of residential units coming into the market.
- The Development Velocity curves are based upon an analysis of the life cycles of projects over the 1979 to 1999 time period.
- The size of the development project (total number of units to be built) decides the development Velocity Curve to be used for the particular project. The percent of built units constructed is used as an indicator of the stage the development project is on the Velocity Curve. The total number of units built during a five-year time period shall not exceed the number indicated by the velocity curve by more than 10%.

See also, attached papers (Papers 6 & 7) on Residential Cluster Size and Residential Velocity Curves

POPTAC Recommendation Requested:

- Accept the Residential density methodology as identified above.
- Accept the Cluster Size and Development Velocity Curves as identified in Table 1 of the accompanying paper (Paper 6), “Residential Cluster Sizes” and Figure 1 of the accompanying paper (Paper 7), “Residential Development Velocity Curves” respectively.
- Maintain the Residential Density, Cluster Size and Velocity Curve values over time for population projections.

16. Households by Age of Householder and Housing Units by Age of Unit

- The MAG transportation models require projections for the age of the head of householder by TAZ.
- If such data is not available, the MAG transportation models require projections for the number of housing units in each TAZ by four categories of housing unit age (less than 10, 10 to 19, 20 to 29, and 30 or more years old).
- A survey of the large-population Metropolitan Planning Organizations revealed that forecasts of the age of head of householder are not common. Projection methods for age of head of householder will be developed in the next update of MAG socioeconomic models.
- The current MAG methodology for calculating housing unit age ages the existing housing stock, adds new residential construction projected by SAM-IM, and assumes that demolitions occur among the oldest housing units. The building age for demolition was identified using an analysis of building age data from Maricopa County Assessors Residential Master database.

POPTAC Recommendation Requested:

- Prepare projections of housing units by age of unit as has been done previously. Use Census 2000 data as the base for the projections.

- Use the current MAG methodology for housing unit age. The current method ages the existing housing stock, adds new residential construction projected by SAM-IM, and assumes that demolitions occur among the oldest housing units.

17. Households by Income

- The MAG transportation models require projections for the number of households in each TAZ by five income quintiles.
- This data for 2000 was collected as part of the Census long form and was aggregated to RAZs as the base dataset for households by income group.
- The current MAG methodology projects households by income groups by RAZ using Metropilus, the new version of DRAM/EMPAL. The projected change in income distribution is assigned to each TAZ within the RAZ using SAM-IM.

POPTAC Recommendation Requested:

- Use the Census 2000 data as the base for the projections.
- Continue to use the current MAG methodology for households by income group. The current MAG methodology projects households by income group by RAZ using Metropilus, the new version of DRAM/EMPAL. The projected change in income distribution is assigned to each TAZ within the RAZ using SAM-IM.

18. Seasonal Population

- Seasonal Population is defined as residents of the area for two weeks to six months and is a part of the socioeconomic projections required by MAG transportation models.
- As part of the MAG GIS and Database Enhancement Project, an inventory of Mobile Home parks and RV parks was created to gather information on location and characteristics of the parks, as well as the number and types of residents during peak and low seasons.
- Seasonal units and population for 2000 are estimated by TAZ using the inventory for population in RV and Mobile Homes parks from surveys conducted in January and July 2000, and Census 2000 information for the component of Seasonal Population residing in housing units.
- Seasonal residents are divided into two categories for projections, namely those residing in RV and Mobile Home parks and those residing in permanent housing units.
- The RV and Mobile Home parks component of Seasonal Population projection should remain constant at 2000 levels since expansions of existing facilities are not anticipated. The allocation of these to TAZs will thus also remain constant in the future.
- A ratio of 2000 “non-park mobile home” seasonal housing units by TAZ (calculated by subtracting the number of seasonal housing units in mobile home parks from the park survey from the total number of seasonally vacant units from Census 2000) to the 2000 total housing units (adjusted by deleting the seasonal units in mobile home parks) is used for projecting the seasonal population residing in other units.

- This ratio is not modified over time since no evidence is available on which to quantify any systematic change.
- Seasonal population is projected by multiplying the seasonal units with the 2000 estimate of seasonal persons per household. This estimate of seasonal persons per households is held constant over time.
- The Seasonal Population used for MAG Transportation models is the average of the High Season and the Low Season projections.
- When there is not enough information at the TAZ zone level for projecting Other Seasonal Population, the next level of geography (RAZ) is used.
- When there is not enough information at the RAZ zone level for projecting Other Seasonal Population, the next level of geography (MPA) is used.

POPTAC Recommendation Requested:

- Accept the seasonal population projection methodology as identified above.

19. Transient Population

- Transient population, defined as residents of the area for two weeks or less, is a part of the socioeconomic projections required by MAG transportation models.
- As part of the MAG GIS and Database Enhancement Project, an inventory of hotels, motels, and resorts was created to gather information on their location and to estimate transient population.
- Transient population numbers for 2000 winter and summer seasons by TAZ were derived from the inventory and other data collected.
- Transient Population projections are based upon methodologies developed by MAG Consultants as part of the MAG GIS and Database Enhancement Project.
- Separate methodologies were developed to produce projections of the transient population traveling to the Phoenix area for business reasons and the transient population coming for non-business reasons. Projections of the hotel/motel/resort component and the other transient population component are derived from the total figures.
- Transient Population projections at the County level are distributed to TAZ zone level using the existing Hotel/Motel room share by TAZ, augmented by known future plans.
- The Transient Population used for MAG Transportation models is the average of the High and Low Transient Population Projections.

See also, attached paper (Paper 8) on Transient Population

POPTAC Recommendation Requested:

- Accept the transient population projection methodology as described above and in the accompanying paper (Paper 8), “Transient Population projection methodology.”

20. Group Quarters

- All residents not living in households are classified as living in Group Quarters. Population in Group Quarters is a part of the socioeconomic projections required by MAG transportation models.
- Methods for projecting the different components of population in Group Quarters (military quarters, prisons and jails, college dormitories, nursing homes, and other group quarters) have been identified by MAG Consultants as part of the GIS and Database Enhancement Project.
- The Group Quarter Population by TAZ shall be based upon a 2000 share by Group Quarter type.
- The Group Quarter Population may be modified by MAG member agencies using the Group Quarter inventory being prepared for the full count of Group Quarters for the 2005 Census Survey.
- The group quarters projections are calculated as follows:
 - i. Military quarters = 927 (held constant at the current population of Luke Air Force base).
 - ii. Prisons and jails = 1.128 percent of the Maricopa County population age 20 through 44.
 - iii. College dormitories = 8.951 percent of the Maricopa County population age 18 to 19.
 - iv. Nursing homes = 5.433 percent of the Maricopa County population age 75 or older.
 - v. Other group quarters = 0.417 percent of the entire Maricopa County population.

POPTAC Recommendation Requested:

- Use the methodology for Group Quarter Population as identified above.

21. Age Restricted Communities

- MAG transportation models require TAZs to have identifiers for Age Restricted Areas.
- A survey of the existing Age Restricted Communities was conducted and a GIS coverage of the communities was created.
- New developments since July 2000 were reviewed with member agencies to identify additional Age Restricted Communities.

POPTAC Recommendation Requested:

- Continue to use the current MAG methodology for Age Restricted flags. TAZs with fifty percent or more of the total land area under communities with deed restrictions on age of residents are flagged as Retirement Areas.

PAPER 1

BUILD OUT PROCEDURE FOR POPULATION AND HOUSING VARIABLES

PURPOSE

To prepare minimum, target and maximum build out numbers by Traffic Analysis Zone for population and housing variables to be used to evaluate the population and housing potential for the next set of socioeconomic projections.

BASE DATA

- Population: Census 2000 SF1 data
- Residential Completions: April 1, 2000 to June 30, 2004, submitted and reviewed by MAG member agencies
- Existing Land use: Year 2004 land use current as of Jan. 2004, reviewed by MAG POPTAC
- Future Plans: Future Plans current as of Dec. 2004 or later, reviewed by MAG POPTAC
- Development Data: Year 2004 data current as of June 2004, reviewed by MAG POPTAC
- TAZ system: TAZ2005

MODEL

SAM-IM version 3.1 was used for this build out analysis. The analysis was conducted with a Grid Cell size of 220 feet on each side.

ASSUMPTIONS

Minimum, Target and Maximum Densities: In developing TAZ build out projections, the MAG socioeconomic models project residential dwelling units from parcels identified as residential in the General Plans or areas anticipated to be residential in the Development database. Households and Population by TAZ are subsequently calculated from the dwelling unit projections.

As part of the GIS and Database Enhancement Project, three General Plan Residential Density figures (dwelling units/acre) have been collected from the member agencies, the minimum, maximum and target residential density anticipated for each residential land use type in the General Plan. Thus, three build out scenarios have been generated for the Minimum, Target, and Maximum densities. These densities may be changed, polygon-by-polygon by the member agencies if desired.

Those areas covered by the Development database that have the number of dwelling units being built/planned and thus do not need to use the densities identified in the General Plan.

Net Density: The density figures mentioned above for the residential areas in the General Plans have been assumed to be indicating the Gross residential density. As part of the MAG GIS and Database Enhancement Project, Arizona State University collected information on the gross

acres and net acres of different land use types. This build out analysis uses the net residential density for General Plan residential areas. Net density adjustment is not required in areas covered by the development areas since the total number of units is known. Table 1 indicates the gross and net acres by land use type used in the build out analysis.

TABLE 1

LUCODE	Land Use	Description	Gross Acres	Net Acres
110	Rural Residential	<= 1/5 du per acre	50	50
120	Estate Residential	1/5 du per acre to 1 du per acre	46	46
130	Large Lot Residential (SF)	1 du per acre to 2 du per acre	45	45
140	Medium Lot Residential (SF)	2-4 du per acre	25	19
150	Small Lot Residential (SF)	4-6 du per acre	20	15
160	Very Small Lot Residential (SF)	>6 du per acre (includes mobile home parks)	20	15
170	Medium Density Residential (MF)	5-10 du per acre	26	20
180	High Density Residential (MF)	10-15 du per acre	17	14
190	Very High Density Residential (MF)	> 15 du per acre	18	13

NET RESIDENTIAL DENSITY

Source: Arizona State University, 2001
MAG GIS and Database Enhancement Project

Persons per Household: Persons per household was derived from the 2000 Census by dividing the population in households by the number of occupied housing units. Total housing units, total occupied housing units and population in households was identified by Census block. These variables were then be allocated to Traffic Analysis Zones, which in turn was summed to Regional Analysis Zones and Municipal Planning Areas.

MAG derives persons per household at the lowest level of geography possible. For each Decennial Census year, this is the Census Block. For deriving a projection data set for the transportation models, MAG cumulates information to the Traffic Analysis Zone (TAZ). For this purpose, persons per household are refined as follows:

- For TAZs where the existing development in 2000 is less than fifty percent of build out, persons per household from the Regional Analysis Zone (RAZ) level will be utilized. This is essential since figures resulting from a sparsely developed TAZ may not adequately reflect future trends in the TAZ.
- Similarly, for RAZs where the existing development in 2000 is less than fifty percent of build out, persons per household from the Municipal Planning Area (MPA) will be used.
- A maximum persons per household at build out will be set at 5.0 persons per household.

It is important to note that the Census Bureau defines population as those people who are residents of the jurisdiction. If the individual reports himself/herself as usually housed elsewhere, the Census Bureau will not count the population at that unit and will designate the unit as a vacant unit even though people reside in the unit. These individuals would be included in the MAG nonresident population projections.

Occupancy Rate: This build out analysis assumes a 100% occupancy rate.

Mixed Use : This build out analysis is consistent with member agency General Plans and Planned Area Developments. Many of these plans, however, have areas defined as multiple use areas that can generate various types and densities of housing or employment. In order to use these designations in socioeconomic modeling, the multiple use categories must ultimately be converted to one or more of the standard land use categories. The MAG socioeconomic models have been enhanced to accommodate such multiple use categories. The MAG GIS and Database Enhancement Project has identified default categories for member agencies to use that are consistent with past local multiple use development.

Some of the factors found to have the strongest influence on the type of development were regional planning issues/factors that are not adequately delineated by MPA boundaries. For these areas, a set of recommended land use proportions were developed based on the proximity of a property to urban core areas (downtowns), railroads, freeways and airports. The criteria used for these assignments were: location within a developed downtown area (currently Phoenix, Mesa, Tempe, and Scottsdale); location within approximately one mile of a freeway; location within approximately one mile of a rail line; location within approximately two miles of a commercial airport. Table 2 indicates the mixed-use proportions used for the four areas in order of dominance.

A priority system is used for areas that fell within more than one of the location types. The location types were therefore evaluated in the following order:

- 1 - Downtown
- 2 - Proximity to Railroad Corridors
- 3 - Proximity to Airports
- 4 - Proximity to Freeways

For those areas that did not fall within one of the defined special areas, the recommended land use proportions by MPA and General Plan land use category were used. These recommendations were derived from base data from field surveys, discussions with city planners, and further modifications to improve reasonableness for areas with a lack of data. These recommendations were then reviewed and modified by MAG POPTAC. Table 3 indicates the results of this analysis.

TABLE 2
LAND USE PROPORTIONS BY AREA CATEGORY

Area Category	Structure Code	Land Use	Acres	Percent of Area
Downtown Area	AP	Multifamily	3	18%
	OF	Office	7	43%
	RH	Resort/Hotel	1	6%
	RT	Retail	5	33%
			16	100%
Freeway Area	AP	Multifamily	114	7%
	IN	Industrial	873	54%
	OF	Office	257	16%
	PB	Public buildings	6	0%
	RH	Resort/Hotel	44	3%
	RT	Retail	309	19%
			1,602	100%
Airport Area	AP	Multifamily	9	1%
	IN	Industrial	466	46%
	OF	Office	452	45%
	RH	Resort/Hotel	15	1%
	RT	Retail	72	7%
			1,014	100%
Railroad Area	IN	Industrial	1,332	97%
	OF	Office	17	1%
	PB	Public buildings	20	1%
	RH	Resort/Hotel	1	0%
	RT	Retail	9	1%
			1,379	100%

Source: Applied Economics, 2001.

**TABLE 3
LAND USE PROPORTIONS BY MPA**

MPA	Generic Category	General Plan Category	Land Use	Percentage
<u>Avondale</u>	Business Park	Business Park	Retail	10
			Office	20
			Industrial	70
	Mixed Use	Mixed Use	Multifamily	30
			Retail	35
			Office	35
<u>Buckeye</u>	Business Park	Business Park	Retail	10
			Office	10
			Industrial	80
	Mixed Use	Mixed Use	Multifamily	30
			Retail	35
			Office	35
<u>Carefree</u>	Business Park	Business Park	Retail	10
			Office	30
			Industrial	60
	Mixed Use	Mixed Use	Multifamily	20
			Retail	35
			Office	45
<u>Cave Creek</u>	Business Park	Business Park	Retail	10
			Office	30
			Industrial	60
	Mixed Use	Mixed Use	Multifamily	20
			Retail	35
			Office	45
<u>Chandler</u>	Business Park	Commercial/Office/ Business Park	Retail	10
			Office	20
			Industrial	70
	Mixed Use	Employment	Multifamily	10
			Retail	5
			Office	20
			Industrial	65
<u>El Mirage</u>	Business Park	Business Park	Retail	10
			Office	20
			Industrial	70
	Mixed Use	Mixed Use	Multifamily	30
			Retail	35
			Office	35
<u>Fountain Hills</u>	Business Park	Business Park	Retail	10
			Office	20
			Industrial	70
	Mixed Use	Mixed Use	Multifamily	30
			Retail	35
			Office	35
<u>Gila Bend</u>	Business Park	Business Park	Retail	10
			Office	10
			Industrial	80
	Mixed Use	Mixed Use	Multifamily	30
			Retail	35
			Office	35

**TABLE 3
LAND USE PROPORTIONS BY MPA**

MPA	Generic Category	General Plan Category	Land Use	Percentage
<u>Gila River</u>	Business Park	Business Park	Retail	10
			Office	10
			Industrial	80
	Mixed Use	Mixed Use	Multifamily	30
			Retail	35
			Office	35
<u>Gilbert</u>	Business Park	Business Park	Retail	10
			Office	20
			Industrial	70
	Business Park	Regional Commercial	Hotel	5
			Retail	80
			Office	15
	Mixed Use	Village Center	Multifamily	15
			Hotel	10
			Retail	35
			Office	40
<u>Glendale</u>	Business Park	Business Park	Retail	5
			Office	15
			Industrial	80
	Mixed Use	Mixed Use	Multifamily	20
			Retail	35
			Office	45
<u>Goodyear</u>	Business Park	Business Park	Retail	10
			Office	20
			Industrial	70
	Mixed Use	Mixed Use	Multifamily	20
			Retail	35
			Office	45
<u>Guadalupe</u>	Business Park	Commercial Mixed Use	Office	15
			Industrial	80
			Public	5
	Mixed Use	Mixed Use	Multifamily	35
			Retail	40
			Office	25
<u>Litchfield Park</u>	Business Park	Business Park	Retail	10
			Office	20
			Industrial	70
	Mixed Use	Mixed Use	Multifamily	20
			Retail	35
			Office	45
<u>Maricopa County</u>	Business Park	Business Park	Retail	10
			Office	20
			Industrial	70
	Mixed Use	Mixed Use	Multifamily	25
			Retail	35
			Office	40

**TABLE 3
LAND USE PROPORTIONS BY MPA**

MPA	Generic Category	General Plan Category	Land Use	Percentage
<u>Mesa</u>	Business Park	Business Park	Retail	10
			Office	20
			Industrial	70
	Mixed Use	Mixed Use/Employment	Multifamily	20
			Retail	25
			Office	30
			Industrial	25
<u>Paradise Valley</u>	Business Park	Business Park	Retail	10
			Office	70
			Industrial	20
	Mixed Use	Mixed Use	Multifamily	10
			Retail	40
			Office	50
<u>Peoria</u>	Business Park	Business Park	Retail	10
			Office	15
			Industrial	75
	Mixed Use	Mixed Use	Multifamily	20
			Retail	35
			Office	45
<u>Phoenix</u>	Business Park	Commerce Park	Retail	25
			Office	25
			Industrial	50
	Mixed Use	Mixed Use	Multifamily	20
			Retail	35
			Office	45
<u>Queen Creek</u>	Business Park	Employment - Type B	Office	20
			Industrial	80
	Mixed Use	Town Center	Multifamily	15
			Retail	35
			Office	40
			Public	10
<u>Scottsdale</u>	Business Park	General Employment (34)	Office	25
			Industrial	75
	Business Park	Minor Employment (33)	Office	20
			Industrial	80
	Mixed Use	Mixed Use	Multifamily	30
			Retail	35
			Office	35

**TABLE 3
LAND USE PROPORTIONS BY MPA**

MPA	Generic Category	General Plan Category	Land Use	Percentage
<u>Surprise</u>	Business Park	Employment	Office	50
			Manufacturing	38
			Hotel	12
	Mixed Use	Mixed Use Gateway	Single Family	5
			Townhouse	5
			Multifamily	20
			Retail	30
			Office	25
			Industrial	5
			Public	10
	Mixed Use	Surprise Center	Single Family	5
			Townhouse	5
			Multifamily	10
			Retail	30
			Office	40
			Public	10
<u>Tempe</u>	Business Park	Business Park	Retail	10
			Office	20
			Industrial	70
	Mixed Use	Mixed Use	Multifamily	35
			Retail	35
			Office	30
<u>Tolleson</u>	Business Park	Business Park	Retail	10
			Office	10
			Industrial	80
	Mixed Use	Mixed Use	Multifamily	35
			Retail	35
			Office	30
<u>Wickenburg</u>	Business Park	Business Park	Retail	10
			Office	10
			Industrial	80
	Mixed Use	Mixed Use	Mixed Use	30
			Retail	45
			Office	25
<u>Youngtown</u>	Business Park	Business Park	Retail	10
			Office	20
			Industrial	70
	Mixed Use	Mixed Use	Multifamily	35
			Retail	40
			Office	25

Source: Applied Economics, 2001.

Maricopa Association of Governments GIS and Database Enhancement Project

METHOD

1. Use the TAZ allocation of housing units and population for July 1, 2004 (from the 2000 Census and residential completions April 1, 2000 to June 30, 2004) as the base (existing) data.
2. If the land is not identified as a Planned Area Development, determine additional housing units and population from the General Plan. Calculate developable residential acres by land use category (*land use codes 100 – 199, 820 and 830*) by TAZ. For this scenario, acreage is considered developable residential if it meets all of the following criteria:
 - a) The 2004 land use was either agriculture or vacant.
 - b) The land use was not in a flood plain as defined by the MAG Desert Spaces Plan.
 - c) The General Plan land use was residential or mixed use - land use codes 100-199, 820 and 820. In the case of mixed use, apply the percentages identified previously.

Calculate additional housing units by land use category as developable residential acres * net density (minimum/target/maximum) for the residential category. Sum categorized residential housing units to obtain total additional housing units by TAZ.

3. If the area is identified as a Planned Area Development, then allocate the new residential units from the development database to the parcel. Apply the mixed-use proportions in cases where the development is mixed use. Sum categorized residential housing units to obtain total additional housing units by TAZ.
4. Using TAZ persons per occupied housing unit from the 2000 Census, calculate additional population by TAZ as total additional housing units * TAZ occupancy rate * TAZ persons per occupied unit.
5. Add additional housing units and population to the 2004 base housing units and population to obtain total build out figures.
6. Although control totals for Group Quarter population will be generated for projection years, it is not possible to generate Group Quarter population control totals for build out. Build out population in Group Quarters by TAZ was determined by keeping the 2000 proportion of Group Quarter population to the Population resident in households constant by TAZ except for:
 - a) Military: The population was held constant at 2000 levels based upon recommendations from Arizona State University as part of the MAG GIS and Database Enhancement Project.
 - b) Prisons: The total Group Quarter population in prisons was determined by keeping the proportion of the prison population in 2000 to the total population in households constant by TAZ.

PAPER 2

BUILD OUT PROCEDURE FOR EMPLOYMENT VARIABLES

PURPOSE

To prepare minimum, target and maximum build out numbers by Traffic Analysis Zone for employment variables to be used to evaluate the employment potential for the next set of socioeconomic projections.

BASE DATA

- Employment: Employment July 1, 2004 Base
- Existing Land use: Year 2004 land use current as of Jan. 2004, reviewed by MAG POPTAC
- Future Plans: Future Plans current as of Dec. 2004 or later, reviewed by MAG POPTAC
- Development Data: Year 2004 data current as of June 2004, reviewed by MAG POPTAC
- TAZ system: TAZ2005

MODEL

SAM-IM version 3.1 was used for this build out analysis. The analysis was conducted with a Grid Cell size of 220 feet on each side.

ASSUMPTIONS

Employment Densities: In developing TAZ build out projections, the MAG socioeconomic models project employment from parcels identified as employment-based in the General Plans or areas anticipated to be non-residential in the Development database.

As part of the GIS and Database Enhancement Project, Floor Area Ratios (FAR) and Employment Density (employees per 1000 square feet) factors were developed by Arizona State University (Table 1). Thus:

Total square feet of employment space = FAR * Area of polygon in square feet

Number of employees = Total square feet of employment space * Employees per 1000 square feet

Generally, areas covered by the Development database have the square feet of employment areas being built or planned. Thus to derive the employment only the Employees per 1000 square feet value need to be used. In cases where the planned square footage was not available, the FAR factors for the particular land use is used.

TABLE 1
FLOOR AREA RATIOS AND EMPLOYEES PER 1000 SQUARE FEET
2000

DESCRIPTION	FAR	EMPLOYEES/1000 SQFT
RETAIL		
Neighborhood	0.23	1.18
Community	0.23	.72
Regional	0.27	1.24
Strip	0.25	1.30
OFFICE		
Small	0.78	3.13
Large	3.36	3.08
INDUSTRIAL		
Warehouse	0.37	2.54
Manufacturing	0.34	2.82
PUBLIC		
Schools	0.21	1.21
Government	0.33	3.98
HOTEL/MOTEL/RESORT		
Hotel/motel	0.70	0.68
Resorts	0.62	0.45

Net Acres: The figures mentioned above for the employment areas indicate the gross density. In order to determine employment, a net density figure must be derived. This is due to the fact that the MAG existing land use database includes non-buildable land, such as roadways and right-of-ways. Therefore, an analysis was conducted to account for the percentage of the land use that is likely not to be developed in the future. The target future densities assumed this percentage continues in the future. The minimum densities assume the percentage is 25% higher in future development, and the maximum densities assume the percentage is only that area necessary for transportation needs. These results are shown in Table 2, which identifies net acres as a percentage of total acres for each of the major land use categories.

**TABLE 2
NET ACRES AS PERCENT OF TOTAL ACRES
FOR MINIMUM, TARGET AND MAXIMUM EMPLOYMENT BUILDOUT**

Code	Definition	Minimum	Target	Maximum
200s	Commercial	50%	60%	90%
300s	Industrial	50%	60%	90%
400s	Office	50%	60%	90%
500s	General & Public	60%	70%	95%

Spatial Multiplier Factor: To understand the variation of employment density spatially, an analysis was conducted on the existing employment and land uses in the entire metro area, as well as the following:

- a. Downtowns – Phoenix, Tempe, Scottsdale, Mesa
- b. Freeway corridors – 1 mile buffer around the freeways
- c. Airports – 2 mile buffer around the airports
- d. Rail roads – 1 mile buffer around the railroads
- e. None of the above (all other areas)

Table 3 summarizes the findings of the analysis. It was found that more than 70% of the total employment is located within these identified areas. Also the density variation indicates that the employment density on Retail, Office and Public land uses in downtown areas is generally double than other areas.

**TABLE 3
SPATIAL MULTIPLIER FACTORS
FOR EMPLOYMENT SECTORS**

Sector	Metro	Downtown	Freeway	Airport	Railroad	Other
Retail	1.0	2.0	1.0	1.0	1.0	1.0
Office	1.0	2.0	1.0	0.5	0.75	1.0
Industrial	1.0	1.0	1.0	1.0	1.0	0.5
Public	1.0	2.0	1.0	0.5	0.75	1.0
Other	1.0	2.0	2.0	1.5	1.5	0.5

Mixed Use: This build out analysis is consistent with member agency General Plans and Planned Area Developments. Many of these plans, however, have areas defined as multiple use areas that can generate various types and densities of housing or employment. In order to use these designations in socioeconomic modeling, the multiple use categories must ultimately be converted to one or more of the standard land use categories. The MAG socioeconomic models have been enhanced to accommodate such multiple use categories. The MAG GIS and Database Enhancement Project has identified default categories for member agencies to use that are consistent with past local multiple use development.

Some of the factors found to have the strongest influence on the type of development were regional planning issues/factors that are not adequately delineated by MPA boundaries. For these areas, a set of recommended land use proportions were developed based on the proximity of a property to urban core areas (downtowns), railroads, freeways and airports. The criteria used for these assignments were: location within a developed downtown area (currently Phoenix, Mesa, Tempe, and Scottsdale); location within approximately one mile of a freeway; location within approximately one mile of a rail line; location within approximately two miles of a commercial airport. Table 4 indicates the mixed-use proportions used for the four areas in order of dominance.

A priority system is used for areas that fell within more than one of the location types. The location types were therefore evaluated in the following order:

- 1 - Downtown
- 2 - Proximity to Railroad Corridors
- 3 - Proximity to Airports
- 4 - Proximity to Freeways

For those areas that did not fall within one of the defined special areas, the recommended land use proportions by MPA and General Plan land use category were used. These recommendations were derived from base data from field surveys, discussions with city planners, and further modifications to improve reasonableness for areas with a lack of data. Table 5 indicates the results of this analysis.

TABLE 4
LAND USE PROPORTIONS BY AREA CATEGORY

Area Category	Structure Code	Land Use	Acres	Percent of Area
Downtown Area	AP	Multifamily	3	18%
	OF	Office	7	43%
	RH	Resort/Hotel	1	6%
	RT	Retail	5	33%
			16	100%
Freeway Area	AP	Multifamily	114	7%
	IN	Industrial	873	54%
	OF	Office	257	16%
	PB	Public buildings	6	0%
	RH	Resort/Hotel	44	3%
	RT	Retail	309	19%
			1,602	100%
Airport Area	AP	Multifamily	9	1%
	IN	Industrial	466	46%
	OF	Office	452	45%
	RH	Resort/Hotel	15	1%
	RT	Retail	72	7%
			1,014	100%
Railroad Area	IN	Industrial	1,332	97%
	OF	Office	17	1%
	PB	Public buildings	20	1%
	RH	Resort/Hotel	1	0%
	RT	Retail	9	1%
			1,379	100%

Source: Applied Economics, 2001.

**TABLE 5
LAND USE PROPORTIONS BY MPA**

MPA	Generic Category	General Plan Category	Land Use	Percentage
<u>Avondale</u>	Business Park	Business Park	Retail	10
			Office	20
			Industrial	70
	Mixed Use	Mixed Use	Multifamily	30
			Retail	35
			Office	35
<u>Buckeye</u>	Business Park	Business Park	Retail	10
			Office	10
			Industrial	80
	Mixed Use	Mixed Use	Multifamily	30
			Retail	35
			Office	35
<u>Carefree</u>	Business Park	Business Park	Retail	10
			Office	30
			Industrial	60
	Mixed Use	Mixed Use	Multifamily	20
			Retail	35
			Office	45
<u>Cave Creek</u>	Business Park	Business Park	Retail	10
			Office	30
			Industrial	60
	Mixed Use	Mixed Use	Multifamily	20
			Retail	35
			Office	45
<u>Chandler</u>	Business Park	Commercial/Office/ Business Park	Retail	10
			Office	20
			Industrial	70
	Mixed Use	Employment	Multifamily	10
			Retail	5
			Office	20
			Industrial	65
<u>El Mirage</u>	Business Park	Business Park	Retail	10
			Office	20
			Industrial	70
	Mixed Use	Mixed Use	Multifamily	30
			Retail	35
			Office	35
<u>Fountain Hills</u>	Business Park	Business Park	Retail	10
			Office	20
			Industrial	70
	Mixed Use	Mixed Use	Multifamily	30
			Retail	35
			Office	35

**TABLE 5
LAND USE PROPORTIONS BY MPA**

MPA	Generic Category	General Plan Category	Land Use	Percentage
<u>Gila River</u>	Business Park	Business Park	Retail	10
			Office	10
			Industrial	80
	Mixed Use	Mixed Use	Multifamily	30
			Retail	35
			Office	35
<u>Gilbert</u>	Business Park	Business Park	Retail	10
			Office	20
			Industrial	70
	Business Park	Regional Commercial	Hotel	5
			Retail	80
			Office	15
	Mixed Use	Village Center	Multifamily	15
			Hotel	10
			Retail	35
			Office	40
<u>Glendale</u>	Business Park	Business Park	Retail	5
			Office	15
			Industrial	80
	Mixed Use	Mixed Use	Multifamily	20
			Retail	35
			Office	45
<u>Goodyear</u>	Business Park	Business Park	Retail	10
			Office	20
			Industrial	70
	Mixed Use	Mixed Use	Multifamily	20
			Retail	35
			Office	45
<u>Guadalupe</u>	Business Park	Commercial Mixed Use	Office	15
			Industrial	80
			Public	5
	Mixed Use	Mixed Use	Multifamily	35
			Retail	40
			Office	25
<u>Litchfield Park</u>	Business Park	Business Park	Retail	10
			Office	20
			Industrial	70
	Mixed Use	Mixed Use	Multifamily	20
			Retail	35
			Office	45
<u>Maricopa County</u>	Business Park	Business Park	Retail	10
			Office	20
			Industrial	70

**TABLE 5
LAND USE PROPORTIONS BY MPA**

MPA	Generic Category	General Plan Category	Land Use	Percentage
<u>Mesa</u>	Business Park	Business Park	Retail	10
			Office	20
			Industrial	70
	Mixed Use	Mixed Use/Employment	Multifamily	20
			Retail	25
			Office	30
			Industrial	25
<u>Paradise Valley</u>	Business Park	Business Park	Retail	10
			Office	70
			Industrial	20
	Mixed Use	Mixed Use	Multifamily	10
			Retail	40
			Office	50
<u>Peoria</u>	Business Park	Business Park	Retail	10
			Office	15
			Industrial	75
	Mixed Use	Mixed Use	Multifamily	20
			Retail	35
			Office	45
<u>Phoenix</u>	Business Park	Commerce Park	Retail	25
			Office	25
			Industrial	50
	Mixed Use	Mixed Use	Multifamily	20
			Retail	35
			Office	45
<u>Queen Creek</u>	Business Park	Employment - Type B	Office	20
			Industrial	80
	Mixed Use	Town Center	Multifamily	15
			Retail	35
			Office	40
			Public	10
<u>Scottsdale</u>	Business Park	General Employment (34)	Office	25
			Industrial	75
	Business Park	Minor Employment (33)	Office	20
			Industrial	80
	Mixed Use	Mixed Use	Multifamily	30
			Retail	35
			Office	35

**TABLE 5
LAND USE PROPORTIONS BY MPA**

MPA	Generic Category	General Plan Category	Land Use	Percentage
<u>Surprise</u>	Business Park	Employment	Office	50
			Manufacturing	38
			Hotel	12
	Mixed Use	Mixed Use Gateway	Single Family	5
			Townhouse	5
			Multifamily	20
			Retail	30
			Office	25
			Industrial	5
			Public	10
	Mixed Use	Surprise Center	Single Family	5
			Townhouse	5
			Multifamily	10
			Retail	30
			Office	40
			Public	10
<u>Tempe</u>	Business Park	Business Park	Retail	10
			Office	20
			Industrial	70
	Mixed Use	Mixed Use	Multifamily	35
			Retail	35
			Office	30
<u>Tolleson</u>	Business Park	Business Park	Retail	10
			Office	10
			Industrial	80
	Mixed Use	Mixed Use	Multifamily	35
			Retail	35
			Office	30
<u>Wickenburg</u>	Business Park	Business Park	Retail	10
			Office	10
			Industrial	80
	Mixed Use	Mixed Use	Mixed Use	30
			Retail	45
			Office	25
<u>Youngtown</u>	Business Park	Business Park	Retail	10
			Office	20
			Industrial	70
	Mixed Use	Mixed Use	Multifamily	35
			Retail	40
			Office	25

Source: Applied Economics, 2001.

Maricopa Association of Governments GIS and Database Enhancement Project

METHOD

1. Use the TAZ allocation of July 1, 2004 employment by land use sector as the base (existing) data.
2. Determine additional employment from the General Plan and Development database. Calculate developable employment-based acres by land use category (*land use codes 200 - 830*) by TAZ. For these scenarios, acreage is considered developable for employment if it meets all of the following criteria:
 - c) The 2004 land use was either agriculture or vacant.
 - d) The land use was not in a flood plain as defined by the MAG Desert Spaces Plan.
 - e) The General Plan land use was employment use or mixed use - land use codes 200 – 830. In the case of mixed use, apply the percentages identified previously.

Calculate additional employment by land use category as developable employment use acres * net density factors (identified above) * Floor Area Ratio * Employment per 1000 square feet for the appropriate employment land use. Sum employment by sector by TAZ.

3. Add additional employment by sector to the 2004 base employment by sector to obtain total build out figures.

PAPER 3

SINGLE FAMILY / MULTI-FAMILY SPLIT

The MAG projections are consistent with member agency General Plans and Planned Area Developments. The data is then used in MAG transportation models to project future transportation behavior. The latest version of the model requires long-term projections of the distribution of future housing units into single family and multifamily types. MAG socioeconomic models can determine the distribution of housing provided a county-wide control total is known. This paper recommends a split between single family and multi-family units over time.

Before beginning to explore how residential units may be split between single family and multifamily types in the future, it is useful to understand how this distribution has changed in the relatively recent past. In order to analyze past trends, housing inventory information from several previous Censuses were compiled, along with estimates for 2000.

The results of the data collection for the historic inventory breakdown by unit type are shown in Table 1, below. Over the past thirty years the total housing inventory in Maricopa County has increased by 281 percent, from about 317,000 housing units in 1970 to more than 1.2 million units in 2000. Despite this incredible increase in housing inventory, the overall change in the breakdown of housing units by type has changed relatively little. In 1970 nearly 80 percent of the inventory was comprised of single family units, compared with about 73 percent in 2000. While these figures reflect a modest decrease in the single family share of housing inventory, the decline has been relatively small compared with the amount of urbanization that has taken place.

TABLE 1
RESIDENTIAL INVENTORY BY UNIT TYPE
MARICOPA COUNTY: 1970 – 2000

Year	Units		Single Family Share	
	Single Family	Multi-family	Percent of Total	Percent of Change
2000	883,380	325,122	73.10%	78.48%
1995	733,366	283,976	72.09%	97.37%
1990	669,781	282,260	70.35%	60.60%
1985	549,917	204,344	72.91%	64.27%
1980	450,591	149,135	75.13%	69.74%
1970	253,428	63,580	79.94%	

Sources:

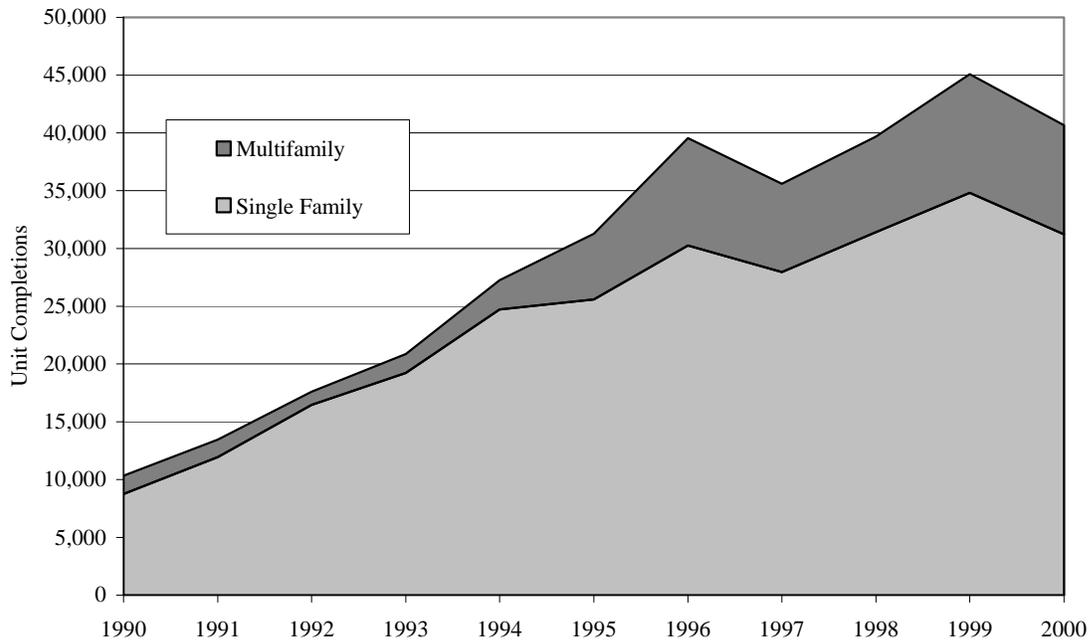
1970, 1980, 1990, 1995: U.S. Bureau of the Census.

1985: Estimate based on occupied units by type.

2000: Estimate based on 1995 Census plus building completions.

The current year estimate of housing units by type was based on 1995 Census inventory data, supplemented with MAG Building Permit Completion data for 1995 through 1999. The Building Permit Completion data supplied by MAG provided individual records of new single family and multifamily units, from 1990 through 2000. The total number of units by type by year is shown in Figure 1 below.

**FIGURE 1
UNIT TYPE BREAKDOWN OF RECENT HOUSING ADDITIONS**



Source: Maricopa Association of Governments, Building Permit Completions Database.

The housing unit completion information is added to the 1995 Census baseline housing unit information to estimate year 2000 housing inventory. This resulted in 733,366 single family units in 1995, representing 72.1% of the housing stock, 150,014 new units from 1995 to 1999, representing 78.5%, for a total of 883,380 units, or 73.1% of the total housing stock.

Based on the consistency of the 1995 Census unit-type split data with estimates developed based on existing land use data, and the reasonable and consistent share of single family units in the general plan land use data, it is reasonable to construct a time-series for the breakdown of units by type by interpolating between the current (2000) and future (general plan) levels. Table 2 shows the County-level results of performing this interpolation. Under that scenario, the single family share of housing inventory would fall from 73.1 percent currently, to 70.6 percent at 2050, a change of only 2.5 percent.

TABLE 2
SINGLE FAMILY SHARE OF INVENTORY BY
MARICOPA COUNTY: 1995 - 2050

Year	Single Family Share of Inventory
1995	72.1%
2000	73.1%
2005	72.8%
2010	72.6%
2015	72.3%
2020	72.1%
2025	71.8%
2030	71.6%
2035	71.3%
2040	71.1%
2045	70.8%
2050	70.6%
Build-out	70.6%

Sources:

1995: U.S. Bureau of the Census.

2000: Estimate based on 1995 Census plus building completions.

2005 - 2050: Projection based on General Plan Land Use interpolation.

PAPER 4

WORK AT HOME EMPLOYMENT METHODOLOGY

Introduction

The number of workers in the work at home category is increasing. The Census reported a 56 percent increase in work at home employment from 1980 to 1990. All newer estimates of the various work at home groups indicate continued increases during the 1990's.

The definitions of work at home employment range from people who telecommute, or who moonlight on a second job from home 1 or more days a month, to the much more limited Census definition of people who work at home 3 or more days per week. Of the 21.4 million people who reported at least one day per month of work at home time in the 1997 Bureau of Labor Statistics (BLS) Survey, only about 6.5 million (30 percent) were self-employed. An additional 17 percent were telecommuters, or wage and salary workers who were paid for work at home. The remaining 53 percent were wage and salary workers who were not paid for time worked at home, such as teachers preparing lesson plans at home in the evening.

Self-employed people who work at home would be included in the work-at-home methodology presented here. Only a portion of the telecommuters captured in the BLS survey would be included because some of these people may be working at telecenters rather than at home, and most telecommute less than 3 days a week. The remaining unpaid workers would be excluded from the work at home estimates for Maricopa County since they also commute to a regular job site during the day, and would be counted at their primary place of work.

The demographic characteristics of the work at home population from an extensive literature review can be directly incorporated as independent variables in the regression analyses used in the methodology described. Key characteristics include:

- Workers over age 45,
- Households with above average income levels,
- People with a college degree or higher level of education,
- People in "white collar" occupations – professional specialty or executive/managerial,
- Service industry workers, and
- Agricultural industry workers.

The projections of work at home employment for Maricopa County that will be used in this methodological approach will be those people who work at home 3 or more days per week. It will be important to keep in mind that these projections are most likely not comparable to sources other than the Census. The Census definition was adopted for this study because it is the only source for dependent variable data, on the share of people on a sub-county level who are working at home. It is also more consistent with the needs of the MAG transportation models.

Methodology

The methodology described here will produce estimates of work at home employment for 2000 through 2055. The methodology specifies a multi-variable regression equation to project the

level of work at home employment. These projections will be for the county as a whole, and for each TAZ in Maricopa County. The approach is similar for both geographies, but the general form of the equations varies in terms of the independent variables. Information from the literature review on the demographic and economic characteristics of people who work at home was incorporated into the regression analysis. However, the final results are limited by the availability of projections for the independent variables at both the county and TAZ levels

Maricopa County Work At Home Estimates

The regression analysis for county level work at home estimates uses cross-sectional data for all counties in the United States (3,141 observations) to determine the factors that significantly influence the level of work at home employment. All cross-sectional data (data for multiple areas in the same time period) was abstracted from the 1990 Census.

The dependent variable in the equation is the percent of workers 16 and over who work at home. This percentage can be applied to county-level employment projections to produce the total number of people working at home.

The final results for the county level work at home regression are presented in the table below, where:

- **Older Workers** - Percent of population 45 to 65 divided by population 16 to 65
- **Agricultural Workers** – Percent of workers in the agriculture, fishing and forestry industry
- **Service/Information Workers** – Percent of workers in the finance, insurance, real estate, business and other service industries
- **Income Level** – Ratio of median household income in each county to national median household income

REGRESSION RESULTS COUNTY DATA

Variables	Coefficient
Constant	-0.0483
Older	0.0663***
Agricultural Industry	0.4165***
Service Industry	0.0507***
Income Ratio	0.0221***

*** Indicates significance at the 1 percent level

PAPER 5

CLUSTER SIZE, FLOOR AREA RATIOS, AND EMPLOYMENT DENSITY

The MAG transportation models require projections of the number of employees in 5 different land use categories. The MAG socioeconomic models are land-use based and identify development by acres. It is therefore necessary to identify the number of acres in a typical development parcel (cluster size); the size of typical building on the parcel of land (floor area ratio) and the number of employees generated from the typical building (employees per 1000 square feet of building, or employment density). Table 1 presents the results of the most recent survey on cluster size, floor area ratio, employment density and compares the results to the previous survey in 1989.

Cluster Size: Cluster sizes are estimated in Table 1. Most cluster sizes have expanded due to larger buildings being built, especially in the retail sector. In the office sector, the cluster size grew more due to the concept of the phasing of new buildings. Phasing would allow the developer to buy a large parcel and build one building with a plan to add others as the market allows. The cluster size for the hotel/motel sector has declined because most of the present development has focused on the smaller motel with no amenities such as restaurants and conference centers. Thus, the buildings are smaller and the land need is less.

Floor Area Ratio (FAR): This concept represents the relationship between the structure and the land. Acquiring the land accounts for one of the largest costs associated with commercial development, frequently representing 25 to 30 percent of the final cost. Although the ratio measures the relation of the building to the land with a fairly typical ratio being around 25 percent, the building is not the only improvement on the land. The FAR does not include such land uses as the parking lot, landscaping, land use regulations creating open space between structures, and outlying structures such as PADs and parking structures in the determination of building square feet.

Table 1 indicates the Floor Area Ratios (FAR) for the various land use types and compares it to 1989 surveys. The greatest change was in large offices, which moved from 0.75 to 3.36. Some of this change is due to the fact that the larger buildings are frequently built on parking garages. But also, many of the sites examined for 1989 have added new buildings with no additional land. For example, there are now four buildings on the Esplanade site, not just two. The average FAR for a 1-story building is 0.40, .77 for 2-story building and 7.03 for 10 or more stories. Changing FARs represent differing intensity of land usage, which can be dictated by a wide-range of factors including market conditions, tenant requirements, land use regulations and market characteristics of the area.

Employment Density: In a very competitive economic environment, most companies are trying to improve the “bottom-line” by increasing the productivity of employees and space utilization. In order to enhance employee productivity, there is a greater use of technology and work scheduling. Thus, in the retail market the employment density has decreased, while in the office building market and the industrial market the employment density has increased. Table 1 indicates the employment per 1000 square feet that have been identified by the consultant for 2000.

FACTORS INFLUENCING CHANGE

FARs and employment densities are changing as firms work to gain efficiencies to improve their profitability. The following identify some of the forces that are changing the structure of commercial development.

Work schedule. Until the last ten years, it was fairly typical that most people worked 8 to 5 Monday thru Friday. In order to better serve customers and/or reduce personnel costs, companies are moving to different work schedules such as extended hours (6 AM to midnight for the entire week) or a 24/7 schedule. Thus, a company might employ three hundred people but they are spread though the week and over the day. For example, a typical Walgreens drug store employs 25 people at each store but a 24-hour drug store has nearly 40 people. Another example is the American West reservations center in Tempe. The employment density is 18.7 people per 1,000 square feet due to the 24/7 schedules and the use of part-time people.

Part time versus full time. In the past, most jobs were full-time (typically 40 hours with benefits). Now more jobs are considered part time (under 20 hours with limited benefits) and can found in most areas of employment, especially retailing and services. For example, only 4-6 people in a Walgreens out of a total workforce of 25-40 people are full-time and practically all of the 250 people at a Wal-Mart are part-time. The use of part-time people is frequently associated with changing concepts of the work schedule.

Services offered. The number of people employed at a site can be greatly influenced by the services being offered. For example, a grocery store typically employs fewer than 100 people but if a pharmacy is added then typically 6 people are added to the employment base. The number of services being offered also may increase the size of the store. Fry's stores frequently have pharmacies and banks and so are larger than Bashas, which frequently do not offer these services

Work location. People used to go to a site to work. Now, there are more options such as work-at-home, at the employer's site or at a client's site. Many supermarkets had on-site butchers, but now many are working from a central site and transporting the cut meat to site. This reduces the number and expense of on-site butchers. It is also difficult to identify the true employee density for such operations as delivery or construction workers.

Use of technology. Technology has a tremendous impact on location. For example, many grocery stores are introducing self-checkouts to reduce the number and/or hours worked of human checkers. The most typical use of technology is the increasing ability to work at home and communicate with the office site and/or clients.

Land use management. Many cities are implementing regulations that will influence FARs and employee densities. For example, cities are recommending more mixed-use projects that will draw residential and commercial usages to a single site.

Land usage. The drive to heighten efficiencies increases FARs as developers try to make the greatest economical use of a site. More and more stores are trying to combine uses. For example, Wal-Mart superstores combine a supermarket with a discount operation; developers are making more use of PADs where a restaurant such as McDonalds can share the land with the

shopping center. Thus, FARS may continue to increase but not at the rate evident in the last few years. Further, tenants will try to enhance the efficiency of their space to sure that most of the space is allocated to revenue generation. For example, the inclusion of a bank within a grocery store gains both market attraction (both uses bring customers) and space efficiencies.

Economy. Prior to the 2001 economic downturn, several firm such as Wells Fargo, American Express, and Charles Schwab were considering the development of corporate campuses, similar to the USAA campus in north Phoenix, which is over 700 acres. The idea of such a campus is to bring all workers to a single location with a set of office buildings and other features such as restaurants, day-care, and recreation facilities. The purpose was to create a corporate identity and a desirable place that would attract the needed skilled workers. However, as the economy slowed, many of the plans were shelved, and whether the concept will come back is largely unknown.

Table 1
FAR, Employment densities and Cluster
1989 and 2000

Description	1989		1989		2000	
	1989 FAR	Employees per 1000 SqFt	Cluster Size (Acres)	2000 FAR	Employees per 1000 SqFt	Cluster Size (Acres)
RETAIL						
Neighborhood	0.23	1.43	16	0.23	1.18	21
Community	0.23	1.84	48	0.23	.72	49
Regional	0.25	2.26	92	0.27	1.24	144
Strip	0.23	1.86	4	0.25	1.30	5
OFFICE						
Small	0.25	3.21	1.3	0.78	3.13	4.9
Large	0.75	2.50	3.3	3.36	3.08	4.8
INDUSTRIAL						
Warehouse	0.27	1.37	2.1	0.37	2.54	2.8
Manufacturing	0.27	2.23	6.1	0.34	2.82	10.7
PUBLIC						
Schools	0.25	1.44	8.3	0.21	1.21	20.3
Government	0.25	2.50	NA	0.33	3.98	NA
HOTEL/MOTEL/RESORT						
Hotel/motel	0.25	2.61	6.2	0.70	0.68	3.9
Resorts	0.25	1.96	18	0.62	0.45	NA

NA=sample too small—data not available

PAPER 6

RESIDENTIAL CLUSTER SIZES

Introduction

In analyzing subdivisions, the average size of subdivisions prior to 1985 was 280 lots. Since then, the average subdivision size has steadily declined from 129 during the 1985-89 time period to 103 lots in the 1990-94 time period to the current 98 lots. There are many reasons for the decline in size. Now, most subdivisions are part of a master planned community, which might encompass thousands of lots such as McDowell Mountain. Further, many subdivisions within a community might be started at the same time by different builders and for different market segments. Thus, the smaller size allows builders to adjudge market acceptance of specific plans. Land costs within a master planned community can be quite high in order to sustain the front costs of the amenity features such as lakes, golf courses and jogging trails. Thus, to keep capital costs low relative to expected returns, a builder might buy smaller parcels.

An additional reason is the local homebuilding industry has come to be dominated by national builders such as Pulte and KB Homes. These companies are basically production builders. They need to sustain a level of construction to support their corporate infrastructure and capital needs. Thus, they tend to build at all times, even in weak markets, with the idea of being able to attract a buyer through attractive financing, pricing arrangements or other marketing concessions. Given the large scale of these companies, local speculative products do not typically represent a large share of their national production. But to minimize risk, national builders do keep their current exposure low by building small subdivisions, which allow them to more quickly adjust to changing market conditions. Thus there really no reason to expect a sudden increase in subdivision sizes above the typical 100-lot subdivision.

The average lot size has not changed appreciably, with the average being 7,475 square feet for pre-1985; 7,525 for 1985-89; 7,984 for 1990-94; and 7,690 currently. The difference is that range of sizes appears to have become greater with more subdivisions moving into the 5,500 sq.ft. range or lower with cluster style housing. Thus, many builders, in order to maintain affordability of housing with higher land prices, are trying to get more homes in a subdivision by lowering lot sizes.

Based on average lots sizes, the typical subdivision has allocated 16 acres (net acres) for housing. The issue then becomes how much is being allocated for other uses such as streets and open space. Typically, about 25 percent of a subdivision is allocated for streets and other public access, although some subdivision are allocating another 10 to 15 percent for public open space such a trails and/or parks. This is especially evident where subdivisions are using a small lot concept.

Larger lots, with 2 units or fewer per acre, do not have a decrease in acres for usable acres. Similarly, the highest density units typically have about three acres of non-buildable space.

Based on an analysis of the development database and the Greater Phoenix Housing Study, Table 1 details the cluster sizes by residential land use type.

Table 1
Residential Cluster Sizes

Land Use Code	Density	Gross Acres	Net Acres*
Rural Residential (Limited Sample)	Under 1 DU/Acre	50	50
Estate Residential	DU/Acre	46	46
Large Lot Residential	1-2 DU/Acre	45	45
Medium Lot Residential	2-4 DU/Acre	25	19
Small Lot Residential	4-6 DU/Acre	20	15
Medium Density Residential	4-10 DU/ Acre	26	20
High Density Residential	10-15 DU/Acre	17	14
Very High Density Residential	More than 15DU/Acre	18	13

*Net acres based on the assumption that the proposed subdivision would lose a certain percentage of its gross acreage for streets right-of ways, etc.

PAPER 7

RESIDENTIAL DEVELOPMENT VELOCITY CURVES

Introduction

In forecasting residential activity, it is important to understand the development trends of units that come to market. Typically, growth is fairly slow in the beginning of a project, but beyond a certain point the continued growth accelerates until it reaches another point at which it begins to decrease and tails off towards its limits. Hence the curve typically takes on a “S” shape and is frequently referred to as Life Cycle Analysis.

A typical life cycle of a small area can be described as an “S-Curve” indicating that development of an area will start slowly, speeds up velocity and stops when all homes are absorbed. Based on an analysis of the Greater Phoenix Housing Study (The Meyers Group, Landiscor), a series of S-curves were developed and are presented in FIGURE 1. Subdivision sales activity is analyzed over the 1979 to 1999 time period.

Factors impacting Development Velocity:

Size of Subdivisions: On the metropolitan (Metro) level, over 90 percent of starts were sold by the end of year 5. Except for the 500+ housing units subdivisions, most subdivisions approached sell-out by the end of year 6. Most of the activity occurred in the first few years with the remaining activity being focused on probably less desirable lots and models. The 500+ projects tend to be very consistent over time with half of the project being started by the end of year 7. This scale of projects has always been relatively rare in the area and typically associated with active adult communities such as Sun City or Sun Lakes. Currently, most active adult communities are smaller subdivisions within master planned communities.

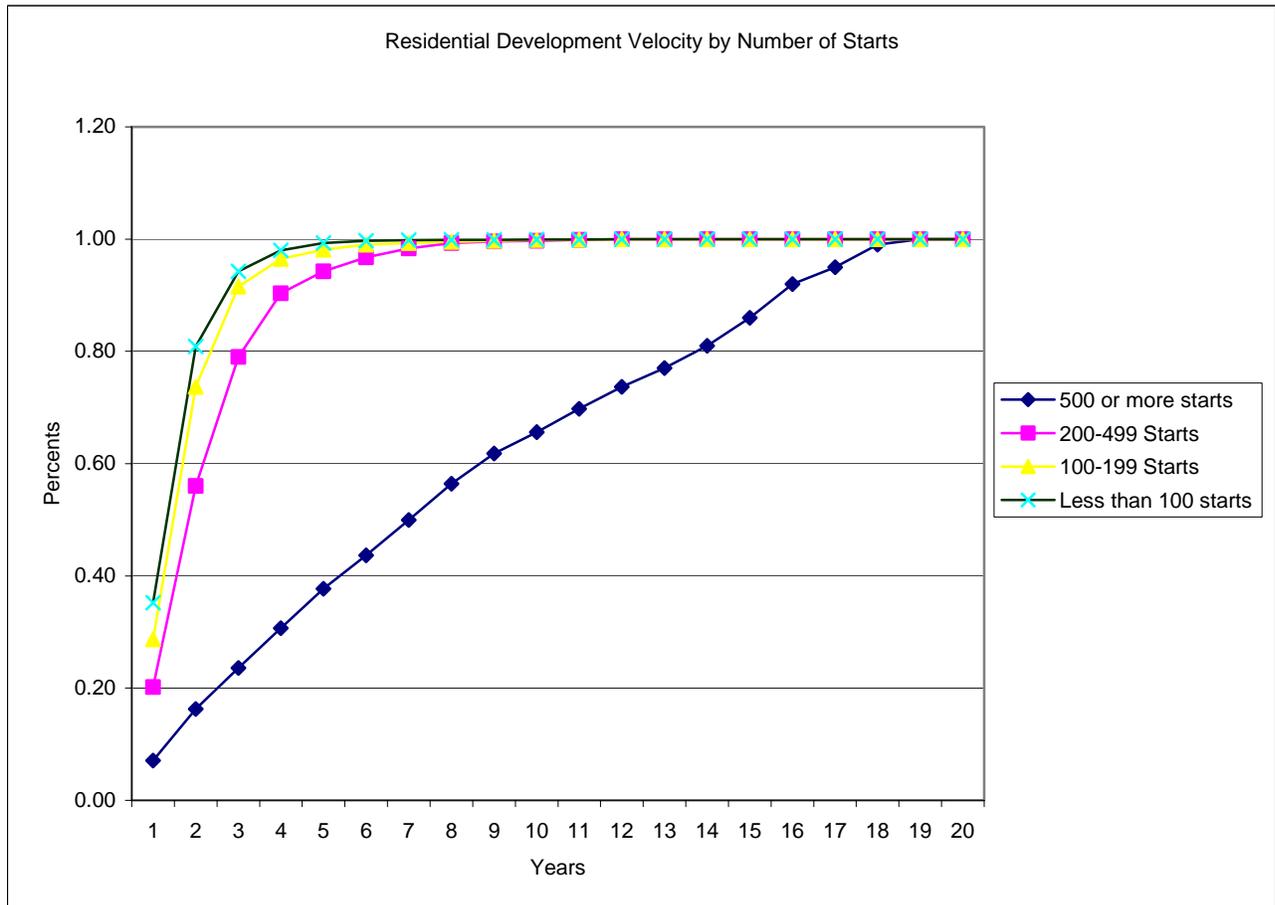
Time Dimension: The time dimension seems to show the greatest differences. In the 1980s, subdivisions tended to take longer time to sell out with nearly 20 percent of the lots remaining by year 12. The 1995-1999 time period is much quicker with a subdivision typically being sold out by the end of year 4. There are probably two key reasons for the difference. In the 1980s, subdivisions tended to be larger, which historically have longer sell-out periods. The other is the robust housing market of the 1990s, with low interest rates that drove sales at record paces.

Lot Size: Another dimension of sales activity is lot size. Basically, as lots get larger, which could well denote more expensive homes, the sales rate slows. This is especially evident in the early years, but all categories of lot sizes have over 90 percent of the homes sold at the end of year 4.

Market Conditions: Although the health of the housing market seems to be important, it is still true that the vast majority of developments sell out within five years and have less than 200 units.

Based on the analysis of the above parameters, it is recommended that the development velocity associated with 100-199 starts be used for projects with up to 200 units. FIGURE 1 details the velocity curves for various sized developments.

FIGURE 1: RESIDENTIAL VELOCITY CURVES



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TRANSIENT POPULATION PROJECTION METHODOLOGY

Separate methodologies were developed to produce projections of the transient population traveling to the Phoenix area for business reasons and the transient population coming for non-business reasons. Once these two sets of projections are prepared, separate projections of the hotel/motel/resort component and the other transient population component are derived from the total figures.

Projecting the Business-Related Transient Population

The county-level projections of business-related transient population for the 2005-2055 period are developed using the following procedures:

1. Taking a conservative approach, the average annual number of business travelers to the Phoenix area over the 1992-99 period was computed as a baseline level of business travel activity. While the transient population coming to the Metro Phoenix area has exhibited substantial growth, the travel industry can be significantly affected by economic and other factors causing wide swings in the volume of travel. Annual estimates of the total number of domestic business overnight travelers for the 1992–1999 period from the Phoenix and Valley of the Sun Convention and Visitor Bureau Statistical Reports show substantial but erratic growth over the decade of the 1990s. Although statistics are not available for 2000 or 2001, it is well known that business travel has been adversely impacted this year, and any statistical analysis based on the experience of the 1990s may not be an accurate forecast of the future.
2. The visitor volume for the peak quarter and the low quarter was calculated. The seasonality was estimated using information from an unpublished analysis of Sky Harbor Airport passenger data by Professor Lee McPheters of Arizona State University. Based upon these data, it was estimated that the volume of travel to Phoenix during the peak quarter was 30.5 percent of the total and only 18.6 percent during the low quarter.
3. Total visitor days during the peak quarter and the low quarter were computed using average length of stay data for business travelers from the 1995 Metro Phoenix Visitor Study.
4. The average number of business visitors per day for the peak and low periods was calculated by dividing the total visitor day figures by the number of days in a quarter.
5. The average daily business-related transient population figures from step #4 were split into shares coming from each region of the country (East, Midwest, South, West) based upon the regional shares reported in the 1995 Metro Phoenix Visitor Study.
6. The number of business-related transient residents per 1000 employees in each region was computed using 1995 total employment data from the U. S. Bureau of Economic

Analysis. (1995 employment figures were chosen as the midpoint of the 1990s decade – the visitor data was based upon the 1992-99 period.)

7. Projections of total employment for each region were multiplied by the ratios computed in step #6 to produce projections of the business-related transient population coming from each region. These regional estimates were summed to produce projections of the total business-related transient population. The regional employment projections were developed from the 1995 U.S. Bureau of Economic Analysis Regional Projections. They were extended from 2045 to 2055 by extrapolating by linear trends.

Projecting the Non-Business-Related Transient Population

1. The county-level projections of non-business-related transient population for the 2005-2055 period were developed using the following procedures:
2. Similar to the approach for business-related travel, the average annual number of non-business travelers to the Phoenix area over the 1992-99 period was computed as a baseline level of travel activity.
3. The visitor volume for the peak quarter and the low quarter was calculated. The seasonality was estimated with information using an unpublished analysis of Sky Harbor Airport passenger data by Professor Lee McPheters. Based upon these data, it was estimated that the share of travel to Phoenix was 30.5 percent during the peak quarter and only 18.6 percent during the low quarter.
4. Total visitor days during the peak quarter and the low quarter were computed using average length of stay data for leisure travelers from the 1995 Metro Phoenix Visitor Study.
5. Average number of non-business visitors per day for the peak and low periods were calculated by dividing the total visitor day figures by the number of days in a quarter.
6. The average daily non-business-related transient population figures from step #4 were split into shares coming from each region of the country (East, Midwest, South, West) based upon the regional shares reported in the 1995 Metro Phoenix Visitor Study.
7. The number of non-business-related transient residents per 1000 population in each region was computed using estimates of the 1995 population of each region from the U.S. Census Bureau.
8. Projections of total population for each region were multiplied by the ratios computed in step #6 to produce projections of the non-business-related transient population coming from each region. These regional estimates were summed to produce projections of the total non-business-related transient population. The U.S. regional projections were developed from the latest U.S. Census Bureau state projections and were extended to 2055 by linear extrapolation of the regional share and applying the resulting projected shares to the latest Census Bureau national projections.

Projecting the Foreign Transient Population

The factors affecting the flow of foreign visitors to the Phoenix area are even more complex than those affecting domestic travel. The projection methodology relied upon information on the origin of travelers to the area from the 1995 Metro Phoenix Visitor Study.

Two sets of projections are prepared based upon the assumption that the foreign transient population was a share of the total transient population. For the first alternative, it is assumed that the foreign component would remain 7.5 percent of the total. The second alternative assumes that the volume of foreign travel to the Phoenix area would grow faster than domestic travel, with the share of the total rising gradually from 7.5 percent in 2000 to 10 percent in 2055.

Projecting the Hotel/Motel/Resort and the Other Transient Populations

The business, leisure (non-business), and foreign transient population figures were split into hotel/motel/resort and other transient population components using information on the distribution of business and leisure visitors by type of accommodation from the 1995 Metro Phoenix Visitor Study. The overall distribution for all travelers was employed to split the foreign component.