

January 20, 2016

TO: Members of the MAG Population Technical Advisory Committee

FROM: Joshua Wright, Wickenburg, Chair

SUBJECT: TRANSMITTAL OF MEETING NOTICE AND TENTATIVE AGENDA

Tuesday, January 26, 2016 - 10:00 a.m.
MAG Office, Second Floor, Chaparral Room
302 North 1st Avenue, Phoenix

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

Members of the POPTAC may attend either in person or by telephone conference. If you are attending via audio conference please contact Merry Holmgren at (602) 254-6300 at least one day prior to the meeting.

If you drive to the meeting, please park in the garage under the building and bring your ticket to the meeting; parking will be validated. For those using transit, the Regional Public Transportation Authority 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 Scott Wilken 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 14 people for the MAG POPTAC. If you are unable to attend the meeting, please make arrangements for a proxy from your jurisdiction with Merry Holmgren at (602) 254-6300.

TENTATIVE AGENDA
MAG Population Technical Advisory Committee
January 26, 2016

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 to limit their comments to three minutes. A total of 15 minutes will be provided for this agenda item, unless the Chair of the POPTAC provides for an exception to this limit. 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 November 10, 2015.

4. POPTAC Ad Hoc Subcommittee

Discussion of the need to continue the Ad Hoc subcommittee in its current form, to reorganize and create a technical working group, or to use the full POPTAC to discuss technical issues.

5. Arizona State University Manufactured Home Study

Consultants from Arizona State University will provide a presentation on a recent study of manufactured housing in the MAG region.

6. AZ-SMART and 2015 MAG Socioeconomic Projections Methodology

The MAG Socioeconomic Projections are based on model methods and assumptions. These assumptions and methods are essential to the AZ-SMART model system and include, but are not limited to: geography, population and population density, employment and employment density,

2. For information.

3. For information, discussion, and approval of the minutes of November 10, 2015.

4. For information, discussion and possible action.

5. For information and discussion.

6. For information, discussion and possible action.

persons per household, special populations (e.g. group quarters, seasonal, transient), real estate development, and occupancy rates. The MAG POPTAC will be requested to recommend approval of these model methods and assumptions. Please see **Attachment One**.

7. 2015 MAG Socioeconomic Projections Draft One

MAG is in the process of developing a new set of socioeconomic projections for 2014 to 2050. The projections timeline will be discussed.

8. MAG Interactive Map Viewer Update

MAG staff will demonstrate recent enhancements to the MAG Interactive Map Viewers.

9. Maricopa County Trip Reduction Survey Live/Work Maps

MAG staff will give a presentation on analysis of the data from the 2014 Maricopa County Trip Reduction Program survey.

10. Data Collection and Review

Ongoing data collection efforts include land use information such as General Plan amendments and development projects. The land use data collected are used in preparing socioeconomic projections and conducting regional analyses. An update will be given regarding current collection efforts. A schedule for the collection of data for the next six months is included in **Attachment Two**.

11. Regional Updates

MAG POPTAC members and MAG staff will have the opportunity to provide an update on development within their jurisdiction, general plan amendments, and other projects.

12. Next Meeting of MAG POPTAC

The next meeting is scheduled for Tuesday, February 23, 2016 at 10:00 a.m.

7. For information and discussion.

8. For information and discussion.

9. For information and discussion.

10. For information and discussion.

11. For information and discussion.

MINUTES OF THE
MARICOPA ASSOCIATION OF GOVERNMENTS
POPULATION TECHNICAL ADVISORY COMMITTEE

November 10, 2015
MAG Offices, Saguaro Room
302 N. 1st Ave, Phoenix

MEMBERS IN ATTENDANCE

*Patrick Banger, Gilbert, Chair
Josh Wright, Wickenburg, Vice Chair
#Tracy Clark, ADOT
Larry Kirch, Apache Junction
Alison Rondone, Avondale
#Andrea Marquez, Buckeye
*Stacey Bridge-Denzak, Carefree
*Luke Kautzman, Cave Creek
*Sam Andrea, Chandler
Thomas Doyle, El Mirage
#Ken Valverde, Fountain Hills
VACANT, Gila Bend
*Thomas Ritz, Glendale
Joe Schmitz, Goodyear
VACANT, Guadalupe
*Sonny Culbreth, Litchfield Park

#Roldofo Lopez for Kazi Haque, Maricopa
#Rachel Applegate for Matt Holm, Maricopa County
*Wahid Alam, Mesa
*Paul Michaud, Paradise Valley
Jason Cleghorn, Peoria
Adam Miller, Phoenix
Travis Ashbaugh, Pinal County
*Keith Newman, Queen Creek
*Bryan Meyers, Salt River Pima-Maricopa Indian
Community
#Adam Yaron, Scottsdale
Lloyd Abrams, Surprise
Suparna Dasgupta, Tempe
Cory Whittaker, Valley Metro
Gregory Arrington, Youngtown

**Not in attendance*
#Participated via audio conference

OTHERS IN ATTENDANCE

Scott Wilken, MAG
Merry Holmgren, MAG
Anubhav Bagley, MAG
Jason Howard, MAG
Jesse Ayers, MAG
Peter Burnett, MAG
Scott Bridwell, MAG

Lora Mwaniki-Lyman, MAG
Nicole Funicello, MAG
Celina Brun, MAG
#Mark Eckhoff, Florence
Kevin Burke, Paradise Valley
#Vicki McIntire, US Census Bureau
#Pauline Nunez, US Census Bureau

1. Call to Order

The meeting was called to order at 10:04 a.m. by Vice Chair Joshua Wright. Voting members Tracy Clark, Andrea Marquez, Ken Valverde, Rodolfo Lopez, Rachel Applegate, and Adam Yaron attended via audioconference. Presenters Vicki McIntire and Pauline Nunez and audience member Mark Eckhoff also attended via audioconference.

2. Call to the Audience

There were no comments from the audience.

3. Approval of the Meeting Minutes of August 25, 2015

Cory Whittaker made a motion to approve the minutes of August 25, 2015. Joe Schmitz seconded the motion, and the motion carried unanimously.

4. Draft July 1, 2015 Municipality Resident Population Updates and Methodology

Scott Bridwell gave a presentation on the July 1, 2015 municipality resident population updates and methodology. He discussed the methodology for drafting the county level population controls totals, and for distributing population at the place level. He discussed growth trends and overall results for Maricopa County and Pinal County. He said that staff is seeking a recommendation of approval provided that the final county control totals are within one percent of the draft control totals. Joshua Wright said that the POPTAC Ad Hoc Subcommittee recommended approval of the Draft July 1, 2015 Municipality Resident Population Updates for MAG Member Agencies provided that the Maricopa County and Pinal County control totals are within one percent of the final control total. Gregory Arrington seconded the motion, and the motion carried unanimously.

5. 2015 Resident Population and Employment Projections for Maricopa County and Pinal County

Jesse Ayers gave a presentation about the 2015 resident population and employment projections for Maricopa County and Pinal County. He talked about the methodology to create the population control totals for the county level, differences in the methodology since 2012, and differences in assumptions since 2012. He introduced Lora Mwaniki-Lyman, who discussed the methodology for creating the employment projections. She discussed assumptions used for future year employment growth and commute flows. Jesse Ayers said that staff is seeking a recommendation of approval of the Draft ADOA 2015 to 2050 population projections for Maricopa County and Pinal County; and the draft 2015 to 2050 employment projections for Maricopa County and Pinal County based on the methodology, provided the County control totals are within three percent of the final control totals. Joshua Wright said that the POPTAC Ad Hoc subcommittee recommended approval of the Draft ADOA 2015 to 2050 population projections for Maricopa County and Pinal County; and the draft 2015 to 2050 employment projections for Maricopa County and Pinal County based on the methodology, provided the County control totals are within three percent of the final control totals. Cory Whittaker seconded the motion and the motion carried unanimously.

6. 2015 Census Test Update

Vicki McIntire gave a presentation on results and lessons learned on the 2015 census test. She said that one of the goals of the test was to use expanded technology for the 2020 decennial census, including online response and smartphones for follow-up interviews. She said that the advancements will save the Census Bureau up to \$5 billion compared to Census 2010. She said that the self-response rate was approximately what they had hoped. She said that the new collection methods improved productivity more than their target. She talked about upcoming preparations for the 2020 census.

7. MAG Homeless Count Update

Celina Brun gave an update on the 2015 homeless street and shelter count. She said there was a five percent decrease in homeless individuals since the previous year. She talked about demographic information, veteran status, and family statistics for homeless individuals. She talked about the difficulty of counting homeless youth. She said that the count was conducted over the last ten days in February, rather than the last ten days of January, which is the normal timeframe. Gregory Arrington asked when the next count would occur. Celina Brun said the next count would be conducted in January. Gregory Arrington asked about homeless individuals moving between cities. Celine Brun said homeless counts seem to decrease in the Phoenix area when the weather gets hotter. She also said that this year a

report was produced that has municipality data for each municipality that submitted data, along with their three-year trend. Suparna Dasgupta asked why the count was conducted in February instead of January this year. Celina Brun said that it was because the Super Bowl and related activities occurred around the normal count timeframe, and would affect the accuracy of the count.

8. AZ-SMART and Preparation of 2015 MAG Socioeconomic Projections

Jesse Ayers gave a presentation on the 2015 MAG socioeconomic projections. He talked about the timeline of the projections process. He said that the final county-level control totals will be released by the end of December, and after that release, staff has nine months to produce sub-county projections. He said that in February, the first draft of the projections will be available for review, and MAG staff will be visiting member agencies to review that draft. He said that subsequent drafts will be available for review as needed. He said that the approval process will begin with POPTAC in May, with approval by MAG Regional Council in June. He talked about the base and build-out review that occurred in September and October.

9. Data Collection and Review

Jason Howard discussed the updated data collection and review schedule. He also introduced Nicole Funicello, who will be collecting land use documents.

10. Regional Updates

Lloyd Abrams said that Surprise has entered the sixty-day review timeframe for their General Plan update, which ends November 17th. Joshua Wright recognized that this would have been Patrick Banger's final POPTAC meeting as Chair, and thanked him for his service. He also introduced Kevin Burke, Town Manager of Paradise Valley, who will become the new Vice Chair of POPTAC pending approval by the Regional Council Executive Committee later in November.

11. Next Meeting of MAG POPTAC

Vice Chair Joshua Wright said that the next meeting is scheduled for Tuesday, January 26, 2016 at 10:00 am. The meeting adjourned at 11:05 am.

Data, Models, Methods, and Assumptions in the MAG Socioeconomic Projections 2016

Introduction

The purpose of this document is to describe the methodologies, assumptions, analyses, data collection activities, and data sources to be used in developing a base year database, build-out analysis, and housing, population, and employment projections. This year MAG staff will continue to make use of a brand new model system specifically developed for the MAG region: Arizona's Socioeconomic Modeling Analysis and Reporting Toolbox, hereinafter referred to by its acronym, AZ-SMART. AZ-SMART is a complex model system that requires many data inputs and assumptions.

This document is organized into 3 major topics each with a number of sub-topics. These are each briefly summarized below:

1. AZ-SMART Base data

The development of population and socioeconomic projections requires the collection of a substantial amount of base data. *These items will be for information and discussion only.* These data sources include the following:

- A. Census Data Sources. Many Census databases are utilized to construct AZ-SMART's base year database.
- B. MAG Employment Database. This database's construction and utilization in the base year database is described.
- C. MAG Residential Completions Database. Residential completions inform the base year database and the early years of the projections.
- D. MAG Existing Land Use Database. This database helps MAG Staff to allocate base year built space and occupant data.
- E. MAG Future Land Use Database. The Future Land Use (FLU) database is derived primarily from general plan documents and maps. It is enhance by the Development Projects Database.
- F. MAG Development Projects Database. MAG staff collect known development projects from Member Agencies on an ongoing basis. These developments are reviewed by Member Agencies annually, and serve as a basis for future development in the region.
- G. MAG Sub-Regional Geographies. A few of the most common geographies are described, such as Transportation Analysis Zones (TAZs), Regional Analysis Zones (RAZs), and Metropolitan Planning Areas (MPAs). AZ-SMART base year and projections can aggregate to most geographies even if they are not described here.
- H. Base Population and Housing Variables. These data sources and methods are utilized to develop the base database of population and housing.
- I. Base Employment by Land Use and Industrial Sector. These data sources and methods are used to develop employment by both land-use type and NAICS sectors.

- J. Other Data Collection Efforts. Many other datasets are collected and analyzed, such as schools, mobile homes and RV parks, airport enplanements, hotels, and age restricted communities. These datasets assist us in allocating several types of special populations such as transient, seasonal, and group quarters populations.

2. AZ-SMART Models and Urban Simulation System

The development of population and socioeconomic projections requires a number of models and methods. These include the following:

- A. Overall Model Process and Objectives. *This is for information and discussion only.*
- B. AZ-SMART and UrbanSim. UrbanSim is a widely utilized tool for urban microsimulation. UrbanSim's history and use is briefly described. *This is for information and discussion only.*
- C. Overall Methodology for Preparing County and Sub-County Projections. This section describes the methodology for allocating projections of population and employment from the county level down to the individual land parcels and development projects. *It is requested that POPTAC approve these methodologies.*
- D. County-Level Projections Models. The models used to produce projections at the county-level. *This is for information and discussion only.*
- E. Parcel-Level Simulation Model. The methods to allocated population and employment projections down to the parcel level is described here. *It is requested that POPTAC approve these methodologies.*
- F. Metropolitan Area Tabulation and Review. The projections must be aggregated to other levels, analyzed, reviewed internally and with Member Agencies, and potentially refined to fit known short-term conditions on the ground. *This is for information and discussion only.*
- G. Transportation Demand Model Feedback. Accessibility is a major component of the projections process. Population and employment are located using accessibility based factors. This feedback process is described here. *It is requested that POPTAC approve these methodologies.*

3. AZ-SMART Model Assumptions and Methods

Additional detail concerning many of AZ-SMART's model methods and assumptions are outlined in this section.

- A. MAG Socioeconomic Projection Geographies. Important geographies are described. *This is for information and discussion only.*
- B. Population and Employment Projections Control Totals. Methods and data sources used to project population and employment at the county level are discussed. *It is requested that POPTAC approve these methodologies and datasets.*
- C. Methods and Factors for developing housing, households and population projections. Details on densities and gross to net conversions (where necessary) are described. *This is for information and discussion only.*
- D. Methods and Factors for developing non-residential built space and employment projections. Floor to area ratios and square feet per job assumptions are described. *This is for information and discussion only.*

- E. Special Population Projections. Numerous special populations are projected and allocated as required by the transportation and air quality models. *This is for information and discussion only.*
- F. AZ-SMART classifications and typologies. A variety of classifications of land use, built space, employment sector, etc., are used in the model system. *This is for information and discussion only.*

1. AZ-SMART Base data

The development of socioeconomic projections requires the collection and merging of a substantial amount of data from varying sources with differing data quality and resolution. This section begins with a bullet point list of the major datasets that went into the base database. Following this list are sections 1A through 1J that provide additional detail. **All items in sections 1A through 1J are for information and discussion only:**

- Population and Housing: American Community Survey 5 year data (2010-2014), MAG Residential Completions database (see below), County Property Assessment data, MAG/ADOA Annual Population Estimates
- Group Quarters (Institutional and Non-institutional): MAG group quarters inventory
- Detailed Population Characteristics: American Community Survey (ACS) Public Use Microdata Sample (PUMS) - 5-year data (2009-2013),
- Employment: July 1, 2014 MAG Employer Database, County level control totals developed from QCEW/BLS data
- Residential Completions: April 2, 2014 to June 30, 2014, submitted and reviewed by MAG member agencies
- Existing Land Use: Land use current as of December 2014, reviewed by MAG Population Technical Advisory Committee (POPTAC)
- Built space: Maricopa County Assessors data current as of July 2014. Newer downloads from the Assessor will inform the first year of the simulation, 2015.
- Future Plans: General Plans current as of 2015 or later, reviewed by MAG POPTAC
- Development Data: data current as of 2015 or later, reviewed by MAG POPTAC
- TAZ system: TAZ2015 supplied by MAG Transportation Division
- Educational institutions: Inventory of schools from Arizona Department of Education and post high school institutions, reviewed by MAG member agencies in December 2014
- Mobile Home and RV Parks: Inventory of mobile home and RV parks, reviewed and updated by MAG member agencies in December 2014
- Airport 2014 and projected enplanements for Sky Harbor and Williams Gateway airports
- Retirement Areas: Age restricted communities reviewed by MAG POPTAC
- Hotels/Motels/Resorts: Inventory of hotels/motels, reviewed and updated by MAG member agencies in December 2014

A. Census Data Sources

This item is for information and discussion only.

The following variables were extracted from the 2010-2014 American Community Survey (ACS) and used as a part of the projections base: resident population in households, resident population in group quarters, total housing units, occupied housing units and vacant housing units.

Because the 2010-2014 ACS targets April 1, 2014, it was necessary to adjust the database to July 1, 2014 to provide a mid-year benchmark for the projections series. This adjustment was carried out by adding the sum of housing units constructed from April 2, 2014 through June 30, 2014 and demolitions during the same time period, from the April 1, 2014 housing unit figure.

By applying census occupancy rates and persons per occupied household to the July 1, 2014 housing stock, a July 1, 2014 population was derived and subsequently matched to ADOA July 1, 2014 population update by 2014 Census place.

The MAG projections needed a 2014 base of housing units and population by TAZ. To derive this base, MAG added to the April 1, 2014 census housing unit count by TAZ new residential housing units completed, less any demolitions between April 1, 2014 and July 1, 2014.

B. MAG Employment Database

This item is for information and discussion only.

Total 2014 employment at the county-level was derived from a population control total developed by the ADOA and QCEW data. Total employment includes self-employed as well as wage and salary workers.

Using the 2014 Maricopa County employment control total, 2014 regional employment estimates were prepared. An employer database for Maricopa County and Pinal County employers was purchased from Dunn & Bradstreet/ Harris InfoSource. This database was merged with employers from the Trip Reduction Program, records from public agencies, with records verified via telephone, email and the internet, subjected to quality control measures and reviewed by MAG member agencies.

Each employer was geocoded and employment then summed by land use classification to TAZs. These estimates were then adjusted to the county employment control total for employment not captured in the major employer database based on the underlying land use. This resulted in sub-regional employment estimates which in turn were summed to RAZ and MPA.

C. MAG Residential Building Completions Database

This item is for information and discussion only.

A residential building completion requires a certificate of occupancy for each new residential unit. Since April 1990, MAG has collected residential building completions by unit type from MAG member agencies. The four unit types are single family, condo/townhouse, apartment and mobile home.

After initial collection efforts, the number of residential completions are summed by unit type and forwarded to MAG member agencies for review and verification. Adjustments to the total residential completions by unit type require the submittal of documentation. Each completion is also geocoded, enabling MAG to aggregate new development by MAG geography. Residential completions to July 1, 2014 were used in calculating the base for the 2016 projections.

D. MAG Existing Land Use Database

This item is for information and discussion only.

The Existing Land Use database identifies the current land use pattern in the urban area. MAG maintains more than 100 classifications of land use, which were established by MAG in concert with its member agencies. This table of MAG land use codes is updated by MAG staff periodically and approved by POPTAC members.

The Existing Land Use database was created by MAG staff based on an analysis of the Maricopa County Assessor parcels, aerial photo interpretation, Arizona State Land Department data, MAG databases and input from MAG member agencies and then circulated to the agencies for review and verification. Changes were made based on comments provided.

The Existing Land Use dataset is important to the projections process because it establishes areas that have already been developed or are not suitable for further development. The developed areas become ineligible for the allocation of population and employment growth, except where the area is planned for redevelopment. Non-developable areas include open space or environmentally sensitive lands, or areas where the relief makes construction infeasible.

E. MAG Future Land Use Database

This item is for information and discussion only.

The Future Land Use database is based on the general plans of MAG member agencies and identifies both the type of development that is anticipated to occur in the future and the density of that development. For example, rural residential land use allows for up to one unit per acre. In those areas designated rural residential, a maximum is established so that the projections model does not exceed the one unit per acre density authorized.

The Future Land Use database also uses the standard MAG land use categories which allows for a direct comparison between existing and planned land use. The difference between the existing and planned land use databases helps determine where development may take place.

MAG tracks general plan land use data for all member agencies. Member agency land use codes are translated into a common region-wide land use category system through a lookup table. The lookup table tracks minimum, target, and maximum development densities for both dwelling units and employment land uses. Land use lookup values can be modified through comments by MAG member agencies.

- Selected attributes in the General Plan Land Use dataset are
 - *MPA Land Use Code* – Land use category created by jurisdiction
 - *MAG Land Use Code* – MAG land use categories creating a common coding system for the region
 - *Density Range* – Derived from general plan descriptions.
 - *Minimum* – Least dense development allowed by land use
 - *Target* – Expected development density by land use
 - *Maximum* – Most dense development allowed by land use
 - *Mixed Use Split* – Further definition of mixed use; defines mixed use as percentages of single land use types. For example, Business Park mixed use could be 70% industrial and 30% office. See more information on mixed use areas in the next section.

Notes on Mixed Use Areas

- The MAG projections are consistent with member agency general plans and planned area developments.
- Many plans have areas defined as multiple or mixed 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.
- In many cases MAG member agencies have provided the multiple use categories. In some cases MAG has estimated the multiple use categories based on descriptions in the general plan or used default multiple use categories.
- Default categories are consistent with past local multiple use development but can be modified, area by area, with member agency input and feedback.

F. MAG Development Projects Database

This item is for information and discussion only.

The Developments database was developed in conjunction with MAG member agencies. Information is collected on an ongoing basis on residential and non-residential developments including number of units or square footage by land use parcel. An estimated date for the initiation of the development is also determined at the same time. Member agencies review the Developments database regularly for completeness and accuracy.

The Developments database was developed in conjunction with MAG member agencies. Information is collected on residential and non-residential developments including number of units or square footage by land use parcel. An estimated start date for the development is also determined at the same time. Member agencies review the Developments database regularly for completeness and accuracy. The Developments database includes redevelopment and age restricted projects as well.

- Major Attributes in the Developments database are
 - *MAG Land Use Code* - MAG land use typology creating common coding system for region
 - *Age Restricted Project Flag* – Denotes a development restricted to people age 55+
 - *Redevelopment Project Flag* – Denotes a project that will replace existing development
 - *Development Status* – Defines how close a project is to completion
 - *Conceptual* – Project has not started jurisdiction review
 - *Anticipated* – Project is going through jurisdiction review
 - *Final Plat* – Project has been approved by jurisdiction. This category also includes non-residential site plans.
 - *Active* – Project is under construction
 - *Start Year* – Estimated year project will start construction
 - *End Year* – Estimated year project will be completed
 - *Total Units* – Amount of units to be built in project

- *Mixed Use Split* – Further definition of mixed use; defines mixed use as percentages of single land use types. For example, Business Park mixed use could be 70% industrial and 30% office.

G. MAG Sub-regional Geographies

This item is for information and discussion only.

Maricopa County is subdivided into 29 municipal planning areas, 153 regional analysis zones and 2,299 traffic analysis zones. MPAs include the corporate limits of a municipality plus any adjacent areas that are anticipated to become a part of those corporate limits in the future. RAZs are subunits of MPAs. RAZs are further divided into TAZs. The TAZ is the smallest unit for which MAG prepares projections. Their boundaries are defined using major streets and landmarks. In addition, MAG also includes Pinal County and parts of Yavapai and Gila Counties in its transportation modeling area, as transportation needs are influenced by the people living and working in Pinal, Yavapai and Gila Counties.

H. Base Population and Housing Variables

This item is for information and discussion only.

AZ-SMART and MAG transportation models require a July 1, 2014 base population, housing, and household total by TAZ2015 along with a detailed synthesized population and housing dataset from which to begin the modeling process.

The following data were used to produce the base July 1, 2014 population and housing variables:

- ACS 2010-2014 data by block, block group, tract, place and county for April 1, 2014 housing units by type, occupied housing units by type, population, households, and group quarters population.
- American Community Survey (ACS) 2010-2014 household and person level characteristics by 2010 Census block group.
- Arizona Department of Economic Security July 1, 2014 Population Update by Census 2010 place approved by MAG Regional Council.
- MAG Built Space database developed by combining and cross checking data from the Maricopa County Assessor's Office database, US Census Bureau Housing Data, MAG's Residential Completions database, and MAG's Major Group Quarters, Apartment, and Mobile Home/RV Park database.

All data sources are developed and maintained for July 1, 2014, but it is necessary to adjust and reconcile different data sources. MAG staff utilizes to use the following methodology to allocate and reconcile the totals to the TAZ2015 geography:

- The MAG housing inventory is reviewed and adjusted to match ACS 2010-2014 dwelling unit counts at the census block group geography. This review was done in conjunction with the Maricopa County Assessor's data.

- MAG staff utilized UrbanSim's built in micro-population synthesizer called SynthPop (<https://github.com/UDST/synthpop>). SynthPop is used to synthesize individually linked household and person records from the census Public Use Microdata Sample (PUMS) sample records to match modified ACS 2010-2014 totals (modification described in the next bullet point) at a specially created geography called "pseudo-block groups." Pseudo-block groups are census block groups combined with the census place geography. This allows SynthPop to use household and person level aggregations from the 2010-2014 American Community Survey (ACS) 5-year average at the block group geography while synthesizing the output to match the population at the census place geography simultaneously.
- It is necessary to adjust the aggregations from ACS 2010-2014, which are only available at the census block group level, to both a slightly different geography (pseudo-block group) and timeframe (July 1, 2014). The totals will be updated proportionally based on a ratio of total households and population from April 1, 2014 to July 1, 2014 at the block group geography.
- Once the ACS 2010-2014 totals are adjusted for both space and time, SynthPop can produce individual household and person records at the pseudo-block group geography. This data is then input into AZ-SMART to match the individual household and person records to the MAG housing inventory at the Assessor Parcel geography. Households and persons are matched by comparing and ranking attributes from the PUMS record (e.g. dwelling unit size, household income, etc.) to similar attributes obtained from the MAG housing inventory (e.g. dwelling unit size, dwelling unit value per square foot, etc.). The end result of this process is a very detailed parcel level database of land, built space, and individual households and person records matching census totals. While the data are very detailed, it is a synthetic or hypothetical representation of real households that reflects their characteristics.
- The resulting database is then aggregated to the TAZ2015 geography for review by POPTAC members.

Another segment of the base population that needs to be accounted for is group quarters population. Group quarter populations are split into five categories based on the living facilities: dorms, prisons, nursing homes, military, and other. It is proposed to use the following methodology to estimate the control totals and allocate to the parcel level database:

- Military totals are obtained and the totals confirmed by directly contacting the individual agencies (e.g. Luke AFB).
- The allocation will begin by comparing the MAG Major group quarters inventory with the MAG Built Space database. New built space records are added to the built space inventory as needed to accommodate group quarters population.
- When the ACS 2010-2014 block group contains group quarters population, and there is one or more built space records of group quarters type to accommodate the population, the group quarters population is assigned there.
- When the ACS 2010-2014 indicates there is group quarters population in a block group where the built space inventory does not have an appropriate record for allocation, allocate the total to vacant housing units from the housing inventory. It is expected that these records indicate the presence of small group homes.
- The resulting database of group quarters at the parcel level is then aggregated to the 2015 TAZ geography.

I. Base Employment by Land Use and Industrial Sector

This is for information and discussion only.

AZ-SMART and the current MAG transportation models require employment classified by both land use categories, including work-at-home and construction, and North American Industry Classification System (NAICS) sector based employment.

The following data sources are available for the creation of the required employment databases: Bureau of Labor Statistics (BLS) and the Quarterly Census of Employment and Wages (QCEW) annual totals by 3-digit NAICS categories, the MAG Employment database (with spatial locations built from various public and private sources), the Department of Defense Statistical Information Analysis Division for military employment, and the ACS 5-year average (2010-2014) data for unincorporated self-employed (USE) totals.

Detailed analysis of the MAG Employer database against the build space database has indicated a presence of non-site-based (NSB) jobs. These include workers that are not located at one site; examples include temporary workers, and workers involved in construction, landscape, and janitorial services. To develop base July 1, 2014 employment control totals for Maricopa County, it is proposed to make some adjustments to the county employment totals both within NAICS categories and to split some proportion of each NAICS category to include work-at-home (WAH) employment and NSB employment utilizing the following methodology:

- Compare BLS-QCEW and military county totals to the MAG Employer database and adjust to a new county total based on this analysis.
- Allocate USE county total employment to NAICS categories based on estimates provided by a MAG consultant white paper (Applied Economics, 2009).
- In 2009, a MAG consultant conducted an analysis of the employer database by NAICS categories and suggested the proportions of each sector that are work-at-home and non-site-based.
- Re-allocate some larger public employment categories to new NAICS codes to better reflect the purpose of the employment. For instance, move some large State employment (e.g. ASU) to the education category and some local employment (e.g. Maricopa Integrated Health Systems) to the appropriate medical category.
- Estimate WAH and NSB employment totals for the county by NAICS categories by analyzing the MAG Employer database. Employment points falling onto parcels with a residential land use are split into WAH and NSB categories:
 - Up to two employees on a residential land use in the NAICS code as WAH
 - Additional employees beyond two on a residential land use as NSB.

Once an adjusted total employment for Maricopa County by NAICS categories is complete it is next necessary to allocate the totals sub-regionally and convert them to land use-based employment totals. MAG staff proposes to rely upon the MAG Employer, Existing Land Use, and Built Space databases for this spatial allocation and conversion:

- Compute the difference between total employment by category in the MAG employer database and the total employment control totals by category for the county.

- Factor up (or down) this difference in employment by category utilizing the existing MAG Employer database points to match the county level control totals.
- Check the number of jobs in each built space record and compute the number of square feet each job occupies. If this number falls below the number set in a previously estimated “building square foot per job” table (which specifies for each building type how much floor space each job requires) then expand the built space record’s square footage and value to accommodate the number of jobs assigned to it.

After all of the employment by category is assigned to built space records at the parcel level of geography, the jobs must be summed up by land use category and TAZ2015 for review by POPTAC members:

- Generalize MAG’s 2014 Existing Land Use database into five categories: Retail, Office, Industrial, Public, and Other.
- Overlay the modified Employer database onto the Generalized Land Use database and compute the total employment by the five land use categories and two additional categories of work-at-home and non-site-based.
- Aggregate the land use based employment totals to the TAZ2015 geography.

J. Other Data Collection Efforts

This item is for information and discussion only.

Other data needed by the modeling process include post high school institutions and enrollment, elementary and secondary school institutions and enrollment, mobile home and recreational vehicle parks and number of residential and non-residential units, current and projected enplanements for Sky Harbor and Phoenix-Mesa Gateway airports, current and projected retirement areas, built space inventories which are parcel level datasets derived from County Assessor master tables for both residential and non-residential buildings, and hotels, motels and resorts and number of beds and employees. The data on recreational vehicle parks, hotels, motels and resorts are used to develop estimates and projections of non-resident population. The MAG Population Technical Advisory Committee (POPTAC) reviewed this information and provided comments.

2. AZ-SMART Models and Urban Simulation System

A. Overall Model Process and Objectives

This item is for information and discussion only.

The primary purpose of the population and socioeconomic projections developed by MAG is for input into the MAG transportation and air quality models. These projections are also used for a wide variety of regional planning programs such as human services, regional development and by MAG member agencies in developing long range plans.

Some important objectives of the modeling process are to:

- Establish a linkage between transportation, land use and air quality models. A representation of this linkage is depicted in Figure A.
- Incorporate a geographic information system (GIS) into the process for better data sharing and review with member agencies and for maintaining an innovative approach to land use planning.
- Establish a process by which MAG member agencies can contribute their local knowledge into the model results so they are well-suited to usage by member agencies.

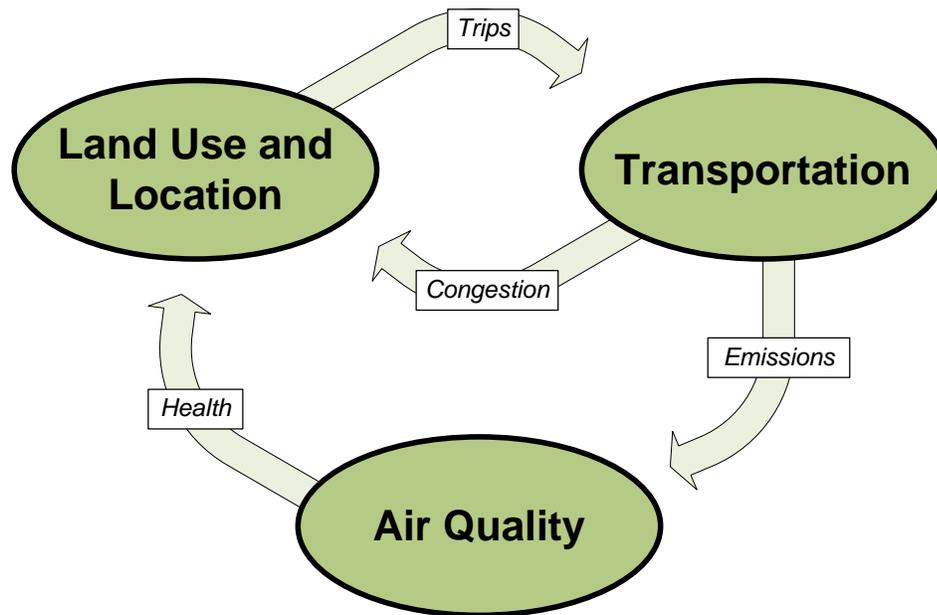


Figure A: Links in the MAG Modeling Process

B. AZ-SMART and UrbanSim

This item is for information and discussion only.

Arizona's Socioeconomic Modeling, Analysis and Reporting Toolbox (AZ-SMART) is a modeling suite that supports socioeconomic activities at MAG, other councils of governments (COGs) and metropolitan planning organizations (MPOs), and elsewhere throughout the state. This modeling suite is a platform on which to build, calibrate, run, and analyze socioeconomic projections and projection models. It also seamlessly integrates with other third party models. The UrbanSim model system constitutes the bulk of the third party model used in the system and is described below.

UrbanSim is a software-based urban simulation system for supporting planning and analysis of urban development, incorporating the interactions between land use, transportation, the economy, and the environment. It is intended for use by MPOs, cities, counties, non-governmental organizations, researchers and students interested in exploring the effects of infrastructure and policy choices on community outcomes such as motorized and non-motorized accessibility, housing affordability, greenhouse gas emissions, and the protection of open space and environmentally sensitive habitats. It was developed by Prof. Paul Waddell at the University of Washington. Prof. Waddell is now at the Department of City and Regional Planning at the University of California at Berkeley. UrbanSim is used worldwide and is the most widely used land use model in the United States. It is being used in at least 10 MPOs¹. Documentation for UrbanSim, its various models and configurations, and numerous scholarly papers can be found at the UrbanSim.org website².

C. Overall Methodology for Preparing County and Sub-County Projections

It is requested that POPTAC approve these methodologies.

The land use, population, and socioeconomic models are based on a three-tier modeling process as shown in Figure B. The first tier (green box) is a demographic model that is used to produce county control totals. The second tier involves using a parcel-level simulation model to allocate the county control total population and employment to Assessor parcels. The third tier allows for the aggregation of the parcel-level population and employment to Metropolitan Planning Areas (MPAs), Transportation Analysis Zones (TAZs), Regional Analysis Zones (RAZs), or almost any other geography that parcels aggregate into. The system draws upon the detailed GIS representation of Assessor parcels in the second tier. This also provides a feedback mechanism whereby MAG staff may review simulation results with interested stakeholders and utilize that feedback to revise the model results.

¹ See <http://urbansim.org/overview/> (last accessed 1/19/2016)

² See <http://www.urbansim.org> (last accessed 1/19/2016)

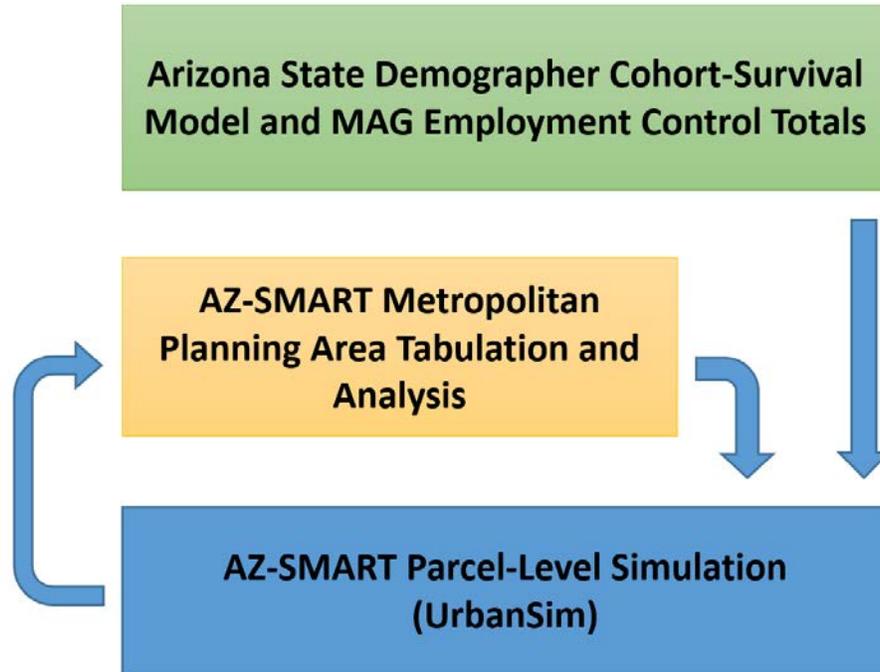


Figure B: Three Tier Modeling Process

D. County-level Projections Models

This item is for information and discussion only.

The first tier in the modeling process is a county-level model. In accordance with Executive Order 2011-04, the preparation of county and state level population projections is the responsibility of the Arizona State Demographer at the ADOA. This model is a cohort-survival demographic model projecting births, deaths and net migration in each county annually out to 2050. This model incorporates population by single year of age, sex, 6 race/ethnicity categories, birth rates, death rates, and net migration trends. The model takes into account short-term economic conditions, but not long-range employment trends. The Arizona State Demographer, using this model, created a population data series, to be consistent with the results of the 2015 population estimate.

The county-level cohort component model was developed with input from the Council for Technical Solutions (CTS) which is made up of representatives from each of the Regional Councils in Arizona, representatives from each of the State universities, representatives from the Department of Health Services (DHS) and the Arizona Department of Transportation (ADOT), along with demographic experts. CTS evaluated the methods and results of the model. In addition, MAG staff regularly reported the findings of CTS to the POPTAC.

Since the MAG transportation models require employment projections as well as population projections, MAG’s regional economist started with projections of employment by industry category (NAICS) obtained from Moody’s Analytics’ Economy.com, then adjusted them by using

an employment to population ratio, the MAG employer database, along with local knowledge, trends, and input from MAG member agencies. These methods and results were also presented to and approved by the MAG POPTAC.

E. Parcel Level Simulation Model

It is requested that POPTAC approve these methodologies.

The Parcel Level Simulation Model is designed to allocate population and employment from the county level down to Assessor parcels. This simulation model utilized a customized version of UrbanSim. Once simulation results are allocated to the parcel level, results can be aggregated as necessary to other geographies such as the TAZ. Assessor parcels are a collection of parcels that are slightly modified when necessary to cover the entire county in a GIS based on contiguous land uses while respecting other essential geographies such as TAZs. The Parcel Level Simulation Model is a micro-simulation model that tracks the individual parcels, the built space on those parcels, and the individual “agents” (households and persons, and jobs) that occupy the built space. A more detailed description of the Parcel Level Simulation Model follows; also see Figure C.

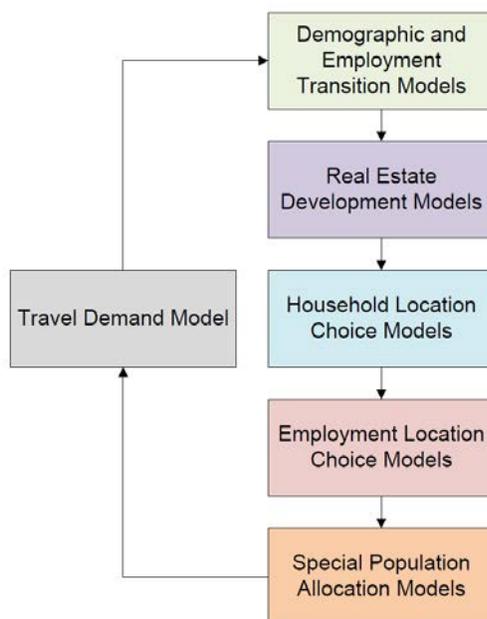


Figure C: Parcel Level Simulation Model Process

Population and employment by industry sector results from the county level control totals feed the Parcel Level Simulation Model. The Demographic and Employment Transition models calculate the difference between the control total for population and jobs and the current simulation year’s total of population and jobs by market area and industry sector (for employment). If these models find a difference, they clone or delete agents as necessary within

the market area until the control totals for the simulation year are met. Any new agents are assigned a status of “unplaced.” Unplaced agents are placed later in the simulation year by the location choice models.

The next step in the simulation process is to model real estate market demand and supply. Demand and supply of new built space is calculated by new, unplaced agents waiting to occupy the space and the current state of vacancy in the market area. A target vacancy rate is used to determine when to build new space. This target vacancy rate is intended to represent the long-term market clearing rate of vacancy in the market. If the vacancy rate in the market area is below the target vacancy rate, new built space will be constructed until the target is met. If the vacancy rate is above the target, no new space will be built unless there are known active developments in the market area. When locations for new built space are being considered, the location of new construction any given simulation year are constrained by two important datasets: known developments and general plans, both of which are maintained continuously by MAG staff and reviewed annually by member agencies. These datasets are used to estimate how much built space can be constructed on a given parcel, and the earliest simulation year the built space could be constructed from start years given by member agencies. Relative real estate prices per unit are also predicted and utilized in the location decisions.

Once the real estate development models have built new space to match the target vacancy rate by market area, “unplaced” households and jobs are located into the built space according to variables such as location, built space type and size, attributes of other households and jobs, accessibility to jobs and shopping opportunities, etc. The location choice models are specified as multinomial logit models, and are stratified into numerous different equations depending on the type of the agent. This allows different factors to influence the location of, for example, retail jobs vs. industrial jobs. The household location choice models are stratified by household income level, while the employment location choice models are stratified by industry sectors (primarily 2-digit NAICS).

After all agents have been located into built space, the simulation runs several additional models to handle special population types that do not necessarily follow market based development patterns. “Population following” employment such as public jobs (e.g. schools, public administration), non-site-based jobs (e.g. construction workers, landscape workers), transient population (population present for less than two weeks such as hotel visitors), group quarters population (e.g. prison, nursing homes), and seasonal population (defined as population present for greater than two weeks but less than six months) are all examples of special populations handled by these models. These models allocate control totals to built-space or land based on a weighting scheme specific to the population. For instance, transient populations are allocated to hotels and dwelling units, and nursing home populations are allocated only to nursing homes.

F. Metropolitan Area Tabulation and Review

This is for information and discussion only.

For the third tier of the modeling process, data results from the parcel level are aggregated as necessary for review. In this model system almost any geography may be used, however, Metropolitan Planning Areas (MPAs) and Transportation Analysis Zones (TAZs) are the most common. It does this primarily using a point-in-polygon type operation whereby the centroid of parcels are considered to be 100% inside of a single upper-level geography.

At this level the model results are analyzed and evaluated by stakeholders. Stakeholders include MAG Member Agencies and internal MAG staff (staff experts in MAG's Transportation and Environmental Divisions). The results from the parcel level simulation model are analyzed and evaluated for consistency and reasonableness using known short-term and expected long-term trends in real estate development, vacancy rates, and other market conditions. MAG Member Agencies provide a critical role in this review level by providing feedback from City staff who are well versed in the local and expected conditions in their respective areas. MAG modeling staff are able to take this feedback and utilize it as input to fuel subsequent AZ-SMART model runs to refine the results to match expected conditions on the ground.

G. Travel Demand Model Feedback

It is requested that POPTAC approve these methodologies.

Representing the interaction between land use and transportation is an important part of the projections process. To represent this interaction, results from this model were fed to a travel demand model as inputs. A full set of socioeconomic data from UrbanSim was fed to the MAG Regional Travel Demand Model at the TAZ level of geography, including but not limited to total population, total households, dwelling units by type (single and multi-family), households by income quintile, total jobs and jobs by land use type, and special population variables.

Outputs from the travel demand model, in the form of travel time "skims," are taken from the travel demand model and fed back into the next year of the Parcel Level Simulation Model. These skims take the form of TAZ to TAZ travel time matrices by time of day and mode type. Although many variables were provided in these travel time skims, not all proved to be statistically significant to the simulation's location choice models. Examples of accessibility variables include, but are not limited to, the natural log of the number of retail jobs within 20 minutes travel time in the off-peak single occupant vehicle mode, population within 30 minutes travel time in the transit combined mode, the number of jobs within 45 minutes travel time in the transit combined mode, and the population with a bachelor's degree or higher within 15 minutes. Other non-travel time-related variables were also found to be significant in the location choice models. Examples include the straight line distance to the Phoenix CBD, a Boolean variable for whether or not a building is within a quarter mile of a light rail stop (current or future), and Boolean variables for whether or not a building is within a quarter mile of a freeway. Additional details of the specific models, their coefficients, and other diagnostic information is available.

In addition, due to the time that the travel demand model takes to simulate, the travel demand model is not run for every simulation year. The travel model was run based on professional judgement from our travel modelers on staff at MAG, consultants, and finally input from

member agencies. The years for which the travel model is run correspond to major changes in the travel network and/or the passing of a certain number of years.

3. AZ-SMART Model Assumptions and Methods

A. MAG Socioeconomic Projection Geographies

This item is for information and discussion only.

- Maricopa County is subdivided into 29 municipal planning areas (MPAs), 153 regional analysis zones (RAZs), 2,299 traffic analysis zones (TAZs).
- The RAZ and TAZ geographies may be modified through comments by MAG member agencies and by MAG transportation planning/modeling staff.
- Each municipality has its own MPA, which delineates the area of planning concern for each jurisdiction. The following process is followed to define MPA boundaries:
 - Prior to the development of a new set of socioeconomic projections, MAG reviews the MPA boundaries with each member agency through the MAG POPTAC. Maps are distributed showing the MPA boundaries from the last set of projections and input is requested.
 - Any area that has been annexed by a jurisdiction which falls outside the current MPA is automatically added to the MPA. Areas which have been de-annexed are removed.
 - Where a jurisdiction requests a change to its MPA, MAG sets up a meeting with the parties involved. Normally this meeting would include the jurisdiction requesting the MPA boundary enlargement, other affected member agencies, if involved, and possibly adjoining jurisdictions. The County is always invited to participate.
 - If there are no objections from the other entities involved, the change to the MPA is made.
 - If there are objections to the expansion of the MPA, and no consensus compromise is reached by the jurisdictions, MAG will leave the MPA boundaries as they existed in the last set of projections. Ultimately, whichever jurisdiction annexes the territory, will have it included in its MPA.
 - A jurisdiction is responsible for reviewing and providing input on land use, base data, surveys, assumptions and draft socioeconomic projections for the entire MPA.
- TAZs are required for transportation planning with input from the MAG POPTAC.
- TAZs are modified as expected growth in a 30-year horizon expands geographically or densities in existing TAZs warrant TAZ splits.
- TAZ boundaries are delineated utilizing existing and future highway corridors, transit networks, major arterials, waterways/canals, and other natural features such as mountains.
- TAZs and RAZs fall completely within only one MPA, as TAZs add up to RAZs, and RAZs add up to MPAs.
- TAZs used for the 2016 projections will be identified as TAZ2015.

B. Population and Employment Projections Control Totals

It is requested that POPTAC approve these methodologies and datasets.

A. Population

- The Arizona State Demographer created a cohort-component population projection model to be consistent with the results of the 2014 Population Estimate. The cohort-component model was created with input from the Council for Technical Solutions.

- MAG develops its sub-regional resident population projections to be consistent with population control totals for Maricopa County developed by the Arizona State Demographer.

B. Employment

- The Arizona Department of Administration (ADOA) Office of Employment and Population Statistics (EPS) does not produce county level long-term employment forecasts, therefore it is necessary to obtain employment projections from another source.
- MAG staff, along with a consultant (Jeff Tayman from University of California, San Diego), conducted an analysis of commercial long-term socioeconomic projections for purchase.
- Based on the analysis and consultant recommendations, it was recommended that MAG purchase population and employment projections from Moody's Economy.com and Woods and Poole. These are annual projections of employment by NAICS code for Maricopa County. In addition, MAG subscribes to quarterly employment forecasts for the Phoenix metro area (including Maricopa and Pinal counties) produced by Marshall Vest at the University of Arizona Economic and Business Research Center. The University of Arizona forecasts augment Moody's Analytics' Economy.com (Moody's Economy.com) socioeconomic projections by updating the projection base to the current year and provide a benchmark for the analysis of Moody's Economy.com projections.
- Derive employment growth rates for Maricopa and Pinal counties from Moody's and Woods and Poole's employment projections and for the Phoenix metro area from Marshall Vest's employment projections and conduct a comparative analysis of the employment growth rates and employment to population ratios. The comparative analysis also included a review of the series against the employment forecasts for 2014 and 2015 released by the ADOA EPS and national economic forecasts by the National Association of Business Economists (NABE).
- Calculate projected employment numbers for three components – covered employment, military, and uncovered employment. Based on the analysis, apply growth rates derived from Marshall Vest's employment projections to the base employment data for Maricopa County for uncovered employment. Apply an 11-year average growth rate to project the uncovered employment. Hold military employment at its 12-year average number for the projections. Employment to population ratios were developed utilizing the ADOA draft population projections and were found to be growing for Maricopa County and stable for the Phoenix metro area.
- Derive county level employment by business sector by year from a combination of the two series (Moody's Economy.com and Marshall Vest at the University of Arizona).

C. Methods and Factors for Developing Projections of Housing

This item is for information and discussion only.

A. Residential Density

- In developing TAZ population projections, the MAG socioeconomic models project residential dwelling units from parcels identified for residential uses in the general plans or areas anticipated to be residential in the Developments 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 Developments database have the number of dwelling units being built/planned and thus do not need to use the densities identified in the general plan.

B. Gross to Net Density

AZ-SMART residential modeling assumes the use of net residential density. Net density means that land area has been taken out for transportation, right of way, and open space areas as part of the density given in the general plan document. An analysis of gross acres and net acres by different residential land use types has been conducted. The results are the basis for converting gross residential density to net residential density as needed.

Net Residential Density				
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	50	50
130	Large Lot Residential (SF)	1 du per acre to 2 du per acre	50	50
140	Medium Lot Residential (SF)	2-4 du per acre	50	38
150	Small Lot Residential (SF)	4-6 du per acre	50	37.5
160	Very Small Lot Residential (SF)	>6 du per acre (includes mobile home parks)	50	37.5
170	Medium Density Residential (MF)	5-10 du per acre	50	38.5
180	High Density Residential (MF)	10-15 du per acre	50	41
190	Very High Density Residential (MF)	> 15 du per acre	50	36
<i>Source: Arizona State University, 2001</i>				
<i>MAG GIS and Database Enhancement Project (Scaled values to a common 50 Gross Acres)</i>				

C. Persons per Household (PPHH)

Persons per household was derived from the ACS 2010-2014 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 allocated to the TAZ2015 geography using the data from Census 2010. PPHH is derived at the lowest level of geography possible then refined at the TAZ2015 level. This refinement is important since figures resulting from a sparsely developed TAZ may not adequately reflect future trends in the TAZ. The PPHH refinement is as follows:

- For TAZs where existing development in 2010 is less than 50% of the buildout number, PPHH from the RAZ will be used instead.
- Similarly, for RAZs where the existing development in 2010 is less than 50% of the buildout number, PPHH from the MPA will be used.
- A maximum PPHH at buildout will be set at 5.0.

D. Vacancy Rates

Vacancy rates are used in the buildout analysis and in the simulation model. An analysis of vacancy rates by census place was conducted and used to make a determination about the long-term or “structural” vacancy rate due to the normal migration and relocation of population within the region. This structural vacancy rate (roughly 5% for single family and ranging up to approximately 9% for larger multi-family developments) is used as a target that drives new residential development in the simulation model. For buildout analysis, the vacancy rates were calculated at the census block geography for single family (SF) and multi-family (MF) residential types. A census block to TAZ2015 lookup file was created to re-calculate the vacancy rates by TAZ2015. Vacancy rates were then applied to buildout dwelling units as follows:

- For TAZs where existing development in 2014 is less than 50% of the buildout number, use a 5% vacancy rate for this TAZ. The reasoning is that at the present time we do not know how this TAZ is going to look, so we assume a longer term average vacancy rate of 5%.
- For TAZs where existing development in 2014 is greater than 50% of the buildout number, use the minimum of either 5% or the current vacancy rate minus the percentage of the current dwelling units (DUs) that are considered seasonal use only (from the 2010-2014 ACS) then adding the percentage seasonal units back to arrive at a final vacancy rate. The reasoning here is that since the TAZ is mostly built out already, we have a good idea of how many seasonal units there will be in the TAZ and we want to maintain that in the calculation of vacancy rate.

E. County-wide Single Family / Multi-Family Proportions

- An analysis of Future Land Use shows that approximately 71% of residential lands at buildout will be single family.
- An analysis of census data from 1960 to 2010 shows the single family / multi-family split in Maricopa County remaining relatively stable.

MARICOPA COUNTY HOUSING UNITS TYPE PERCENTAGE			
Census Year	Single Family Unit Percentage	Multi-Family Unit Percentage	Mobile Home Unit Percentage
1960	88%	12%	N/A
1970	73%	20%	7%
1980	67%	25%	8%
1985	66%	26%	9%
1990	65%	27%	8%
1995	68%	27%	6%
2000	68%	26%	6%
2010	72%	23%	5%
Sources			
1960, 1970, 1980, 1990, 2000 - U.S. Census Bureau - Decennial Census			
1985, 1995 - MAG Special Census			
2010 - U.S Census Bureau - American Community Survey 3 year average 2008-2010			
MAG Residential Completions Database			
MAG Future Land Use Database			

F. 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 dataset of the communities was created.
- All developments are reviewed with member agencies to identify additional age restricted communities.
- TAZs with fifty percent or more of their residential land area under communities with deed restrictions on age of residents are flagged as age restricted TAZs.
- These age restricted flags are utilized only as an input for the transportation model and do not impact the projection series.

D. Methods and Factors for Developing Projections of Non-Residential Built-Space

This item is for information and discussion only.

A. Employment Density and Floor Area Ratios (FAR)

- 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 building floor space per employee.
- 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.
- FAR and employment density differ for each non-residential land use type.
- An analysis of employment density ranges by land use type was conducted by analyzing data in the MAG Built Space and the MAG Employer databases. Jobs by land use type were compared to building square footage by land use type.
- This analysis was compared to employment density ranges used in the 2003 and 2007 Socioeconomic Projections and found to be in line with employment density data ranges from those projections series.
- This analysis expands employment density ranges for more land use types as required by AZ-SMART and reflects the most current data available for the MAG region.
- The following table shows the results of this analysis.

Employment Density - Square Feet Per Job by Building Type			
Building Type	Minimum Square Feet Per Job	Target Square Feet Per Job	Maximum Square Feet Per Job
Mobile / Manufactured Home	150	250	350
Single Family Detached Home	150	250	350
Multi Family Attached Home	4410	16,700	31,930
Retail	330	640	2,060
MiniStorage	3370	11,760	36,310
Warehouse	240	740	2,090
Industrial	300	700	1,650
Office	140	330	990
Medical	130	330	400
Hotel	420	1,470	3,560
Civic	400	1,410	3,400
Education	240	830	2,000
Group Quarters	400	1,410	3,400
Public - Federal	70	250	610
Public - State	70	250	610
Public - Local	70	250	610
Agriculture	1240	4,350	10,510
Transportation	0	0	0
Other	1240	4,350	10,510
Open Space	0	0	0
<i>Source: MAG 2010 Built Space Database</i>			

- An analysis of FAR ranges by land use type was conducted by analyzing data in the MAG built space database by comparing building square footage to parcel square footage by land use type.
- This analysis was compared to FAR ranges used in the 2007 and 2013 Socioeconomic Projections and found to be in line with FAR data ranges from those projections series.
- This analysis expands FAR ranges for more land use types as required by AZ-SMART and reflects the most current data available for the MAG region.
- The following table shows the results of this analysis.

Floor Area Ratio by MAG Land Use				
MAG Land Use	Land Use Description	Minimum FAR	Target FAR	Maximum FAR
210	Low Density Commercial	0.01	0.33	5.50
220	Greenhouse Commercial	0.01	0.07	0.71
230	Specialty Commercial	0.01	0.16	7.57
240	Neighborhood Commercial	0.01	0.29	4.91
250	Community Commercial	0.03	0.23	5.44
260	Regional Commercial	0.02	0.26	0.84
270	Super-Regional Commercial	0.08	0.64	3.49
310	Storage Facilities	0.01	0.53	3.26
320	Warehouse	0.01	0.31	1.97
330	Light Industrial	0.01	0.32	3.63
340	Heavy Industrial	0.01	0.25	1.31
410	Office Low Rise	0.01	0.35	8.26
420	Office Mid Rise	0.02	2.40	13.05
430	Office High Rise	3.43	11.12	24.00
510	Hotel/Motel	0.01	0.57	10.02
511	Resorts	0.01	0.26	0.82
520	Educational	0.07	0.26	0.95
521	Preschool / Daycare	0.01	0.20	1.00
522	Schools K-12	0.01	0.18	6.59
523	Post High School	0.01	0.28	2.35
524	ASU	0.01	0.82	3.80
525	Dorms	0.01	1.35	5.15
530	Institutional	0.01	0.26	3.87
531	Religious	0.01	0.17	1.75
532	Medical Offices	0.02	0.28	4.32
533	Hospitals / Medical Centers	0.01	0.67	5.63
534	Nursing Homes	0.01	0.25	1.18
540	Cemeteries	0.01	0.13	0.78
551	Public Offices	0.03	0.94	7.66
552	Public Services	0.01	0.34	7.27
810	Business Park	0.06	0.21	0.32
820	Mixed Use	0.04	2.13	10.35
<i>Source: MAG 2010 Built Space Database</i>				

B. Non-residential Vacancy Rates

A projection of non-residential vacancy rates by building type is required for the simulation model to develop new non-residential real estate. MAG staff obtained data on the commercial real estate market from the vendor COSTAR. COSTAR data and reports contain longitudinal data going back as far as 2001 on non-residential vacancy rates in the Phoenix Metropolitan Area (which includes parts of Pinal County) and the United States as a whole. COSTAR provides these rates for broad classes of non-residential building types: retail (back to 2007), office (back to 2001), industrial (back to 2001). The average for each building type in the Phoenix area was compared with the same data at the national level. Where the rates met is where it was

assumed that the Phoenix market was similar to the national market, and that rate was used as the long-term structural vacancy rate for the simulation model. The rates are as follows: retail 6.5%, industrial 8%, and office 10.5%.

E. Special Populations Projections

This item is for information and discussion only.

A. 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 a MAG consultant. The base year group quarters population is based upon the results of the ACS 2010-2014 and the group quarter inventory prepared by MAG staff and reviewed by POPTAC previously.

- **Military group quarters population:** Military group quarters population is held constant at the current population of Luke Air Force Base at the recommendation of a consultant. MAG staff contacted a Luke Air Force Base representative to confirm the latest population of 927.
- **Prison and jail population:** Prison and jail population is projected as a percentage of the population in the age cohort of 20-44, increasing slightly throughout the projection horizon. Based on analysis of historical census data by a consultant it is recommended that a slight increase in the factor be applied throughout the projection horizon as follows: the rate will start at 1.4% and rise to 1.8% in 2050 in an annual linear fashion. During the simulation model run, the percentage of the population is calculated, then it is proportionally allocated to existing prison and jail sites in Maricopa County based on the current size of each facility. If a new prison or jail site is included in the simulation as a known development, the model will include that site in the allocation. The simulation model does not predict new prison and jail facilities, however.
- **College dormitory population:** College dormitory population is calculated as a percentage of the population in the age cohort 18 through 19. This percentage is held at a constant 11% throughout the forecasting horizon of 2050 at the recommendation of a consultant. During the simulation model run, the percentage of the population is calculated, it is then proportionally allocated to existing dormitory sites based on their size. If new dormitory sites are included in a known development in a later simulation year, the model will include those sites in the allocation. The simulation model does not predict new dormitory sites, however.
- **Nursing home population:** Nursing home population is calculated as a percentage of the population in the age cohort 75 and older. An analysis of historical census data by a consultant indicated a slow but steady downward trend since 1980. The pace of the decline slowed between 2000 and 2010 (0.7 percentage points) compared to the previous decade (3.4 percentage points). The consultant recommended that we trend the 2010 rate downward at a decreasing rate. To this end, the percentage decreases slightly throughout the projection horizon: The rate starts at 3.9% in 2014 and declines in a linear fashion annually to 3.7% in 2050. During the simulation model run, the percentage of the population is calculated, then this total is proportionally allocated to existing nursing home sites based on their size. If new nursing home sites are included in a known development in

a later simulation year, the model will include those sites in the allocation. The simulation model does not predict new nursing home sites, however.

- Other group quarters population: Other group quarters population, such as group homes, is calculated as a percentage of the entire population. At the recommendation of a consultant, the percentage is held at a constant 0.3% throughout the projection horizon of 2050. During the simulation model run, the percentage of the population is calculated, then this total is proportionally allocated to existing other group quarters sites based on their size. If new other group quarters sites are included in a known development in a later simulation year, the model will include those sites in the allocation. The simulation model does not predict new other group quarters sites, however.

B. Airport Originations

Daily airport originations are required as part of the MAG transportation model for the two major airport sites in the region: Sky Harbor Airport in Phoenix, AZ and Phoenix-Mesa Gateway Airport in Mesa, AZ. Projections of flight originations for every five years from 2010 through 2050 were obtained from the respective airports master plans. Annual flight originations for both airports were calculated from every five-year numbers using a simple linear interpolation methodology. The originations are simply assigned to the respective airport location in the simulation model. The simulation model does not predict new airport locations.

C. 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 the MAG transportation models. An inventory of mobile home parks and RV parks was created to gather information on location and characteristics of the parks, expansion plans, as well as the number and types of residents during peak and low seasons. Seasonal residents are divided into three categories for projections, namely those residing in single and multiple family housing units (SFMFS), mobile homes (MHS) and RV parks (RVS). The inventory of mobile home and RV parks was last reviewed and updated by MAG member agencies in summer 2015.

- To calculate base year seasonal households and population by unit type (SFMFS, MHS, RVS), we start with the total units by type from the ACS 2010-2014 (SFMFS and MHS) and use the MAG RV database for RVS. We then apply the seasonal vacancy rate by type from the census to arrive at a total number of seasonal households. Then a constant 1.9 persons per household is assumed to estimate the seasonal population in the base year.
- Using information from the MAG General Plan database, multi-family/single family percentages are calculated for future years. Also, due to economic conditions, the 2014 vacancy rates are assumed to be too high, so using the recommendation of our consultant, we adjust the overall seasonal and non-seasonal rates down to a more normal 3.9% and 5.5% (respectively) by 2020 using a linear interpolation. These rates are held constant from 2020 to the end of the forecast horizon.
- The vacancy rates and multi-family/single family splits are used to forecast seasonal and non-seasonal units by type in the future simulation years.
- In the future simulation years, seasonal population and households by unit type are estimated from the exogenous forecast of total population, using the above calculated and adjusted vacancy rates by unit type.

- The seasonal population forecast totals by unit type are then proportionally allocated to seasonal units annually in the simulation model.

D. *Transient Population*

Transient population is defined as residents of the area for two weeks or less and is a part of the socioeconomic projections required by the MAG transportation models. To estimate transient population, an inventory of hotels, motels, and resorts was created to gather information on their location, number of rooms, occupancy, expansion plans, and information on new facilities. The inventory was last reviewed and updated by MAG member agencies in July 2012. Current data on visitor statistics and projections were obtained from the Arizona Office of Tourism (<http://www.azot.gov/research-and-statistics>; Last accessed 1/19/2016) to produce base transient population.

Transient Population is tightly correlated with employment and spending in the Accommodation and Food Services and Leisure and Hospitality sectors of the county economy. A consultant recommended that we base our methodology for generating future control totals on projections of employment. Using data obtained from the Arizona Office of Tourism and projections of employment from Moody's Economy.com, the following factors are used: 14 million annual overnight visitors to Maricopa County, staying an average of 3.5 nights, with an average party size of 1.2 (increasing linearly to 2.6 in 2020, held constant thereafter), with a 63%/37% split between stays in hotels and other locations respectively.

- First, average daily visitors are calculated by dividing annual visitors (14 million) by the average daily stay (3.5). This number is then split using the aforementioned percentages to get a hotel and other locations split.
- The 14 million annual visitors is increased over time in proportion to the total employment in the aforementioned sectors of the economy, giving us increasing totals for future allocation.
- Then for the future average daily visitors, we apply the same methodology to compute the base year splits by hotels and other locations.
- During the simulation, transient population projections at the county level are proportionally allocated to the hotel, motel, resort, and other sites based on their respective size. If the known developments dataset contains a new hotels, motels, or resorts, the allocation model will take those new sites into account. The simulation model does not predict new transient population sites.

E. *Schools*

School enrollment projections are a component of socioeconomic projections required by the MAG transportation models. Enrollments are projected for three grade levels: Kindergarten through 8th grade, 9th through 12th grade, and post-secondary education. The resulting enrollment projections serve as a primary input for forecasting site-based education employment.

The enrollment projections are based on a series on school site inventories developed by MAG staff. The *K-12 site inventory* details the location, current enrollment and student capacities of existing school sites, and classifies them by their type (public, private or charter) and grade-level

(primary, middle, high). The K-12 site inventory was compiled by geo-referencing charter and public school enrollment data from the Arizona Department of Education and geo-referencing private school enrollment data from internet resources. The *post-secondary inventory* details the locations and current enrollments of post high school institutions and classifies them into one of two groups: public schools, which include universities and community colleges, and private schools, which include traditional as well as trade/career schools. This dataset was developed from a phone and internet survey of post-secondary education providers to gather information on current enrollment and expansion plans. The *future sites inventory* contains potential school sites that new enrollments may be allocated to in future years. For future K-12 sites, the timing of the new site is dependent upon changes in enrollment within the school district. For post-secondary sites, the timing is defined in the inventory. The inventory was compiled from various sources, including member agency comments, Maricopa County land ownership data, and the MAG planned developments dataset.

Enrollment participation rates by age cohort, household income quintile, school type and school level were developed by a MAG consultant using data from the American Community Survey (ACS) and Arizona Department of Education. These rates are applied to socioeconomic outputs from AZ-SMART to generate the enrollment projections for each school type and level. For K-12, school sites are organized into districts and the enrollment in each district is allocated to school sites on the basis of their capacity. When districts exceed their capacity new schools are generated. For post-secondary sites, students are allocated on the basis of their previous enrollment. New sites are generated as prescribed by the future sites inventory.

F. AZ-SMART Classifications and Typeologies

This is for information and discussion only.

AZ-SMART requires a number of classification types for data. These AZ-SMART classifications are utilized internally for simulation purposes only. Classifications can be modified through comments by MAG member agencies.

A. Building Types

AZ-SMART requires a classification of building types. The following is a list of the building types for use in the model.

- Single Family Residential
- Multi-Family Residential
- Mobile Home Residential
- Retail
- Mini Storage
- Warehouse
- Industrial
- Office
- Medical
- Hotel

- Civic
- Education
- Group Quarters
- Public – Federal and State
- Public – Local
- Agriculture
- Transportation
- Other/Open Space

B. Employment Sectors

AZ-SMART requires a classification of NAICS employment sectors. The following is a table of the employment sectors for use in the model.

AZ-SMART Employment Sectors	
Employment Sector	NAICS Code
Agriculture, Forestry, Fishing and Hunting	11
Mining, Quarrying, and Oil and Gas Extraction	21
Utilities	22
Construction	23
Manufacturing	31-33
Wholesale Trade	42
Retail Trade	44-45
Transportation and Warehousing	48-49
Information	51
Finance and Insurance	52
Real Estate and Rental and Leasing	53
Professional, Scientific, and Technical Services	54
Management of Companies and Enterprises	55
Administrative and Support and Waste Management and Remediation Services	56
Educational Services	61
Health Care and Social Assistance	62
Arts, Entertainment, and Recreation	71
Accommodation	721
Food Services and Drinking Places	722
Other Services (except Public Administration)	81
Public - Federal and State	Part of 92
Public - Local	Part of 92
<i>Source: US Census Bureau 2007 NAICS</i>	

DRAFT MAG POPTAC Timeline From January 2016 to July 2016		
MAG Due Date	Member Agency Due Date	Activity
	Submit when the latest Plan or update is complete.	Submit General Plans for 60 day review.
	Submit when Amendment is ready for review.	Submit Major General Plan Amendments for 60 day review.
Ongoing	Ongoing	Submit Minor General Plan Amendments, Area Plans and Development Master Plans/Community Master Plans and Amendments.
Ongoing	Ongoing	Submit Planned Area Developments/Planned Community Developments/Planned Residential Developments/Unit Planned Development/Final Plats and Reports.
Ongoing	Ongoing	Submit copy of C404 Form to MAG.
Ongoing	Ongoing	Submit Annexations to MAG as they occur.
	January, 2016	Submit Q4 residential completions to MAG.
December, 2015	January, 2016	MAG sends jurisdictions list of all land use documents received for calendar year 2015 for their review.
January, 2016	February, 2016	MAG sends jurisdictions the draft 2015 General Plan and Developments database for review.
	April, 2016	Submit Q1 residential completions to MAG.
April, 2016	April, 2016	MAG sends jurisdictions the draft annexations between July 1, 2015 and March 31, 2016 for July 1 Arizona Department of Commerce population estimates. Jurisdictions verify and provide number of units.
April, 2016	May, 2016	MAG sends jurisdictions the 2015 draft Employer database for review.
July, 2016		MAG begins collection of 2016 Employer data.
	July, 2016	Submit public employment data for MAG Employer Database 2014.
	July, 2016	Submit Q2 residential completions to MAG.
July, 2016	July, 2016	MAG sends jurisdictions draft annexations between April 1, 2016 to June 30, 2016 for July 1 Estimates. Jurisdictions verify and provide number of units.