Pima Association of Governments Travel Demand Model

Statement of Purpose

One of the concerns raised about the Broadway: Euclid to Country Club Roadway Improvement Project is the accuracy of traffic projections on which the design is being based. This concern arises from two sources -- (1) the modeling process used to develop projected traffic volumes from the projected regional population projections, and (2) the population projections themselves. This document discusses both the modeling process and regional projections including recommended 2050 population growth scenarios for Pima County recently released to the Pima Association of Governments (PAG) by the Office of Population and Statistics in the Arizona Department of Administration.

Projecting Travel Demand

Projecting travel demand is challenging due to the continual shifting of factors that affect growth and use of the transportation system. Similarly, while the methodology for deriving projected travel demand utilizes state-of-the-art tools and modeling processes, the results are often inexact and need to be used with care. Information presented in this paper shows that in the case of Broadway, current regional modeling underestimates current traffic volumes by 11% to 36% (see Table 3 on page 5).

Population projections change over time based on demographic and other factors. The recommended 2050 population projections for Pima County are lower than the currently PAG-adopted 2040 projections. The high, medium, and low population estimates are in fact lower than the 2040 values – by -3%, -14% and -27%, respectively (see Table 2 on page 4).

PAG will make a more detailed analysis before adopting an official 2050 population estimate for Pima County. Changes in projected traffic volumes, particularly for particular roadway segments, are not however necessarily commensurate with changes in regional population growth. Factors such as the location of future population and jobs growth need to be taken into account as discussed below. The process used by PAG to factor in these considerations is described in the Future Land Use and Projections section below.

Traffic Studies to Date for Broadway: Euclid to Country Club Project

The traffic studies done to date for this project are based on two projected traffic scenarios. The first is based on the currently-adopted PAG 2040 traffic projections for Broadway Boulevard, adjusted to account for local factors. These volumes represent a growth rate of about 25%. The second set of volumes assumes a growth rate about a third lower than that assumed by PAG. Table 1 shows the values used for the various Broadway segment for both scenarios.

The project website http://cms3.tucsonaz.gov/broadway/broadway-documents-studies contains two reports documenting the traffic work to date. The first is the initial traffic study that evaluated six and eight-lane options for both the full growth rate and lowered growth rate traffic projections. PDF files of the full report with appendices (254 pages) and an "executive summary" containing the text only (34 pages) are provided. The second is the "special traffic analysis" which summarizes the initial document and other subsequent work including the evaluation of a four-lane section. This information was presented at the Broadway Citizens Task Force study session held October 4, 2012.

Table 1. Comparison of Current, 2040 Adopted and Reduced Volumes Projections Used To Date

	Current ADT	PAG 2040 ADT	Full Growth Rate Used for traffic study dated March 2012			Low Growth Rate Used for Special Traffic Analysis Report		
			2040 ADT	Change	Rate	2040 ADT	Change	Rate
Broadway Blvd								
West of Euclid	35,000	33,000	39,000	4,000	10%	37,500	2,500	7%
Euclid to Highland	34,000	41,000	41,000	7,000	17%	38,500	4,500	12%
Highland to Campbell	34,000	46,000	46,000	12,000	26%	42,000	8,000	19%
Campbell to Tucson Blvd	40,000	56,000	56,000	16,000	29%	50,500	10,500	21%
Tucson Blvd to Country Club	40,000	46,000	47,000	7,000	15%	44,500	4,500	10%
East of Country Club	41,000	53,000	53,000	12,000	23%	49,000	8,000	16%
Average of Segments:	37,333	45,833	47,000		26%	43,667		17%

Pima Association of Governments (PAG) Role in Travel Demand Modeling

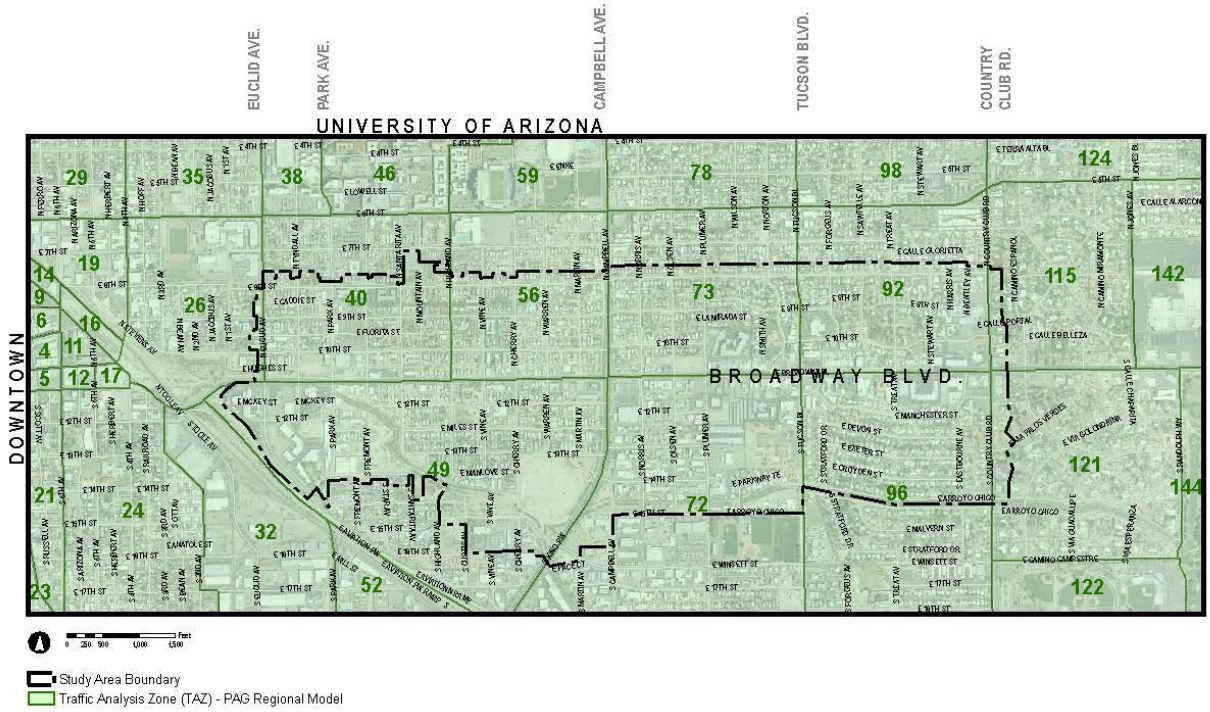
Metropolitan Pima County is designated as a Transportation Management Area (TMA) by the Federal Highway Administration (FHWA). TMAs are required to develop up-to-date regional transportation improvement plans that are consistent with regional funding levels, provide for air quality conformance with U.S. Environmental Protection Agency requirements, and provide equal access to transportation across all socio-economic levels. PAG is the designated agency to perform this function for Pima County. This regional transportation planning role includes developing and maintaining a travel demand model that supports land use planning, identification and evaluation of transportation improvements to address existing and future needs, congestion management, and air quality modeling.

PAG Model Description

The PAG travel demand model utilizes sophisticated modeling software to generate and distribute trips to the roadway network and across transportation modes. The area included in the model, which essentially includes all of eastern Pima County, is divided into Traffic Analysis Zones (TAZs). A TAZ can be a single land use, such as a Costco or hospital, or several square miles of neighborhood development that includes residential and commercial land uses. Along Broadway Boulevard between Euclid Avenue and Country Club Road, there are four TAZs on the north and three on the south. A map of the TAZ's relative to the Broadway corridor is provided in Figure 1.

Land use within each TAZ is divided into subcategories. Residential land use types are subdivided by household size (1 person, 2 persons, 3+persons) and income level (5 income levels are defined). Commercial land uses are categorized by employment type. Six employment sectors are defined. Special land uses are also defined in the model, including hospitals, college campuses (U of A, Pima College), casinos, and Davis-Monthan AFB. Based on these land uses, the population and employment within each TAZ is estimated.

Figure 1. Broadway Improvement Project Study Area Traffic Analysis Zones



Trip generation characteristics for each land use type are determined from household travel surveys conducted by PAG. The last travel survey was conducted in 2008. These surveys provide information regarding the number and type of daily trips generated by each household type and mode of travel. These data are used in the travel demand forecasting modeling process to produce person trips generated within each TAZ. Five trip types are generated:

- home to/from work
- home to/from school
- home to/from shopping
- home to/from all other destinations
- non-home (i.e. at work or school) to/from other destinations (i.e. shopping, etc.)

Future Land Use and Population

Land use conditions used for future travel demand forecasting are determined based on the general plans adopted by each jurisdiction in the region, specific development plans created for subareas, such as downtown Tucson and the University of Arizona, and population projections for the region that are developed by PAG in coordination with a regional Population Technical Advisory Committee (PopTAC). Population projections for the PAG region are developed based on future population growth scenarios developed by the Office of Population and Statistics in the Arizona Department of Administration. Population growth scenarios for each county for 2050 were recently released by the state. The 2050 growth scenarios for Pima County as well as the previous projections for 2040 are provided in Table 2. The State provides projections in a range as shown in the table. It can be seen that the decrease from the current 2040 projections for the various scenarios ranges from 3% to 27%.

Table 2. Pima County Population Projections

	Population	Change from 2040	
Current, 2012	989,864		
2040 Projection	1,770,610	--	Used to develop the current 2040 regional model
2050 Projection - Low	1,292,564	-27%	PAG and PopTAC will determine the official regional 2050 projection based on these scenarios.
2050 Projection - Medium	1,518,154	-14%	
2050 Projection - High	1,715,706	-3%	

PAG and the PopTAC will develop official 2050 projections for the region based on the growth scenarios provided by the state, as well as distribute the population across the county based on general and specific plans and existing growth trends. The official population projections and distribution will be utilized by PAG to develop the 2050 regional travel demand model. This process will take at least a year.

Distribution of Trips by Mode

A sub-model estimates mode share for the five trip types. The sub-model essentially considers three primary factors in estimating how many trips are assigned to pedestrian, transit, and bicycle modes - travel time, household characteristics (income level, auto ownership), and land use accessibility for each mode (i.e. is there a transit route available nearby). The travel time for a transit trip includes the time to walk to/from a transit stop, waiting time at the transit stop, in-vehicle travel time, and potential transfer waiting time. Bike and pedestrian travel times are calculated for each trip based on an assumed travel speed for each mode. The sub-model also considers car-pooling. Three annual household income levels are currently defined in the sub-model: less than $20K, $20K-$60K, and greater than $60K.

A series of parameters in the sub-model model produce thresholds by which a trip will be assigned to a given mode type. Information gathered from the household travel survey conducted by PAG is used to help set the sub-model parameters. Transit person-trips are assigned to a transit route which may run on several roadways (i.e. Route 8 – 6th Ave/Broadway). Regionally, approximately 1.5% of person-trips are assigned to transit. On Route 8, the current existing conditions model assigned 9,600 riders to Route 8. The actual 2011/2012 daily ridership was 10,519, about 10% more than the predicted amount. Accuracy within 10% for this sort of modeling is considered a good result.

Approximately 1.5% of all person-trips in the region are assigned to bicycle. Bicycle ridership estimates for specific roadway segments are not available. The bicycle, transit, and pedestrian person-trips are subtracted from the total person trips generated by the model. The remaining person-trips are assigned to autos, assuming an average occupancy of 1.5 persons per auto. This occupancy was determined from information provided by the 2008 household travel survey. The autos are then distributed to the roadway network, producing the daily traffic volume estimates that are used to assess future roadway capacity needs.

Current Travel Demand Forecast Models

PAG maintains the following travel demand models:

Existing Conditions Model – This model is the base-line from which future models are developed. The current existing conditions model reflects land use, roadway, and traveler characteristics for 2010. This model was calibrated using 2010 traffic count data. A comparison of the traffic volumes estimated by the 2010 model and the actual current traffic counts for several parallel arterials (Broadway Blvd, Speedway Blvd, 6th St, and 22nd St) is provided in Table 3. It can be seen that the model underestimates the actual volumes for the major arterials. For Broadway, these amounts range from 11% to 37%. The model understates the total volumes of the four roadways by 6% to 8%.

Table 3. Comparison of 2010 Existing Conditions Model Estimated Volumes with Actual Volumes

	2010 Daily Traffic Volume		
	Model Results	Actual Count	Difference
Broadway Blvd			
Euclid Ave to Campbell Ave	25,000	34,000	36%
Campbell Ave to Country Club Rd	36,000	40,000	11%
Speedway Blvd			
Euclid Ave to Campbell Ave	50,000	49,000	-2%
Campbell Ave to Country Club Rd	48,000	50,000	4%
6th St			
Euclid Ave to Campbell Ave	25,000	21,000	-16%
Campbell Ave to Country Club Rd	17,000	17,000	0%
22nd St			
Euclid Ave to Campbell Ave	33,000	37,000	12%
Campbell Ave to Country Club Rd	47,000	53,000	13%
Combined Volumes (Broadway, Speedway, 6th, 22nd)			
Euclid Ave to Campbell Ave	133,000	141,000	6%
Campbell Ave to Country Club Rd	148,000	160,000	8%

2040 Long Range Regional Transportation Plan (RTP) Model – This model reflects the 2040 regional population/employment projections and the roadway/transit improvements in the 2040 Regional Long Range Transportation Plan that was adopted by the PAG Regional Council (adopted July 1, 2010; update approved in March, 2012). The current plan can be found at the following link:
www.pagnet.org/Programs/TransportationPlanning/2040RegionalTransportationPlan/tabid/809/Default.aspx

The model includes all of the RTA-funded roadway/transit improvements. The RTP model is typically updated every 3-4 years to incorporate changed conditions, including existing traffic volumes, planned network improvements, population/employment projections, and updated information on travel characteristics. This update starts with the development of a new Existing Conditions Model. Before the model can be developed, the official 2050 projections need to be approved per the process described earlier in this paper in the section “Future Land Use and Projections”. With the release of the projections by the State, this review process is underway and is expected to take at least a year before the projections are determined and the model updated.

5-yr Transportation Improvement Plan (TIP) Model – This model looks out 5-years from existing conditions and reflects the roadway/transit improvements adopted for the current 5-yr TIP (2011-2015) and population/employment estimates for 2015. The TIP includes projects that are anticipated to be implemented in the next 5-years. The 5-yr TIP model is updated each year, and is used to update the Transportation Improvement Plan (TIP). The TIP is updated annually through a multi-step process in association with PAG's member jurisdictions and other implementing agencies. The goal of the process is to develop a TIP that makes optimum use of available federal, state and local funds and resources to serve the region's multi-modal transportation needs. Figure 2 illustrates this process.

The TIP implements the long-range Regional Transportation Plan. You can read more at: www.pagnet.org/Programs/TransportationPlanning/PlansandPrograms/TransportationImprovementProgram/tabid/172/Default.aspx

Figure 2. Transportation Improvement Program (TIP) Process