Maricopa Association of Governments

Pedestrian Plan 2000

Final Report

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MARICOPA ASSOCIATION of GOVERNMENTS

Maricopa Association of Governments

Pedestrian Plan 2000

Executive Summary

Prepared for the

Maricopa Association of Governments

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MAG Pedestrian Working Group

The MAG Pedestrian Working Group consists of representatives of MAG member agencies, the development, architecture and landscape architecture communities. The Working Group will annually review and update the *MAG Pedestrian Plan 2000* and develop activities to educate the region about the benefits of walking.

Chairman, Michael Branham, Surprise
Bruce Meyers, Arizona Department of Administration
Michael Eagan, American Society of Landscape Architects
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Maureen Mageau-DeCindis, Valley Metro.
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Maricopa Association of Governments Staff

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DEFINITION OF TERMS

- ADA – the federal Americans with Disabilities Act
- Barriers – vertical screening placed in buffers, commonly trees and shrubs, concrete (jersey) barriers, etc.
- Buffer – the distance between the edge of the pavement and the edge of a sidewalk, commonly used for landscaping
- Captive Pedestrians - people who walk because they have limited (based on income) opportunity to travel via other modes.
- Captive Pedestrian Activity - areas where there is a higher potential number of captive pedestrians.
- Composite Pedestrian Activity - the highest level of linked, unlinked, and captive pedestrian trip activity.
- Districts – potential pedestrian activity level areas; districts are stratified into four levels representing the four general classifications of pedestrian intensity areas outlined in the 1*995 MAG Pedestrian Area Policies and Design Guidelines*.
- *Latent Demand Model* – a travel demand model that estimates the level of potential pedestrian activity that could occur along a roadway corridor if conditions throughout the transportation network were ideal for walking
- Linked Trips – trips that either start or finish with walking, but also have a non-walking component to the trip (i.e., bicycle, car, or transit)
- MAG – the Maricopa Association of Governments
- Non-linked Trips – trips that occur entirely by walking
- *Pedestrian Area Policies and Design Guidelines* – adopted by MAG in 1995 to help identify general pedestrian principles and recommendations as well as pedestrian area types and associated design guidelines
- Pedestrian Design Assistance Program – a MAG sponsored competitive funding program initiated in 1996 which implements MAG's *Pedestrian Area*

Policies and Design Guidelines

- Pedestrian Level of Service– the "grade" calculated by the *RPC Model* ("A" is the best, "F" is the worst); the Level of Service Category reflects the quality of the walking environment, from a pedestrian's perception of safety or comfort.

- Stakeholders Group – a volunteer group assisting the MAG Pedestrian Working Group in developing the *MAG Pedestrian Plan 2000*

- Pedestrian Working Group – principle group working on the *Pedestrian Plan 2000*; comprised of staff from member jurisdictions representing planning, transportation, transit, engineering, landscape architecture, bicycle and trail planning

- *Roadside Pedestrian Conditions (RPC) Model* – a statistically calibrated pedestrian model that measures the perceived safety or comfort of pedestrians walking alongside the roadway

- TAZ – Traffic Analysis Zone; a geometric area used in aggregating socio-economic data used in travel demand modeling.

- TEA-21 – the *Transportation Equity Act for the 21st Century*; federal transportation and planning legislation

- TIP – Transportation Improvement Plan; a five-year plan for transportation improvements compiled from MAG's member agencies transportation needs

- Trip Generators and Attractors – trip origins (e.g., residences) and destinations (e.g., business, schools, parks, trailheads, etc.) respectively.

- Unadjusted Lateral Separation – the minimum distance, between the centerline of the right-most motor vehicle travel way and the centerline of a sidewalk, required to achieve a particular Pedestrian Level of Service

Executive Summary

INTRODUCTION

The Phoenix metropolitan area is one of the largest in the United States with a population of nearly 3 million distributed over approximately 1000 square miles. Due to the low density, land use uniformity, and geographic extents of the metropolitan area, the motor vehicle is the predominant mode of transportation in the Valley. Traffic congestion is a daily feature of the major roadways and its impacts to the metropolitan community are extensive. As the metropolitan area continues to expand and traffic congestion increases, Maricopa Association of Governments (MAG) and its member agencies are seeking ways to better serve the mobility needs of the Region's population, industry, and visitors. A greater focus on multimodal solutions is occurring with numerous initiatives underway to better use the existing transportation infrastructure.

Pedestrian improvements abound in many areas within the Region

Simultaneously, the Region's tremendous growth has given the metropolitan community a greater appreciation for the way pedestrian facilities help create a sense of community while broadening the transportation choices of the Region's residents and visitors. As a result, there are now a number of high-quality pedestrian facilities in a variety of settings. The Maricopa Region has a topography that is conducive to walking and for a significant part of the year, walking is pleasant. However, to a large extent the existing transportation system provides minimal accommodation. While the vast majority of roadways with significant traffic have sidewalks, many sidewalks are located immediately adjacent to motor vehicle travel lanes carrying significant volumes of high speed traffic resulting in uninviting walking conditions.

MAG is a leader in promoting improvement in the Valley's streetside environments to better accommodate pedestrian travel. Past pedestrian planning efforts conducted by MAG and its member agencies have led to a variety of pedestrian-oriented policies, programs, and roadway improvements. Prominent among these are the *1993 Pedestrian Plan*, the creation of the MAG Pedestrian Working Group, a region-wide household travel survey, the publication of the *1995 Pedestrian Area Policies and Design Guidelines*, the "Walking and Bicycling Into the 21st Century" Conference Series, and the Pedestrian Design Assistance Program. Evidence is plentiful throughout the Region of the increasing trend of planning and building more pedestrian-accommodating roadways.

Plan Purpose

In 1998, the MAG Regional Council adopted a work program that specifically directed the production of an update to the *1993 Pedestrian Plan*. This update, identified as the *Pedestrian Plan 2000*, outlines programs and actions to promote better pedestrian accommodation throughout the Region's transportation system. It incorporates a unique approach: it provides flexible design tools, specifically roadside Performance Guidelines, to assist MAG member agencies in creating better walking environments within the existing or new roadway network. Following the *Plan Goals and Objectives* section these new planning & design tools are outlined.

PLAN GOALS AND OBJECTIVES

Goals and objectives are an integral part of any plan because they provide direction and focus to an overall vision. For the *Maricopa Association of Governments (MAG) Pedestrian Plan 2000*, they are the result of community input and translation of this input into tasks that address where MAG can take specific actions, or support and encourage actions on the part of their member jurisdictions and agencies. Whether through action or support, the MAG Plan can play an integral part in increasing and enhancing the pedestrian experience in the MAG Region.

Definitions

Goal: A "Goal" is a long-term end toward which programs or activities are ultimately directed. It broadly addresses a desired outcome that supports the Plan Purpose.

Objective: An "Objective" is a specific, measurable, intermediate end that is achievable and allows measurement of progress towards a goal.

Plan Purpose

The purpose of the *MAG Pedestrian Plan 2000* is to identify and recommend programs and actions that guide and encourage the development of pedestrian areas and facilities and ultimately increase walking as a viable mode of transportation throughout the Region. The Pedestrian Working Group developed five broad goal categories as follows:

Land Use

Goal I ***Promote and guide land use that is conducive to pedestrians and results in a mode shift away from automobiles and towards pedestrians.***

Objective 1.1. Provide and maintain a safe, convenient and enjoyable walking environment that responds to the varied needs of a diverse walking population.
Objective 1.2. Incorporate the *MAG Pedestrian Area Policies and Design Guidelines* into policies, street and development standards to provide safe, convenient and enjoyable walking.
Objective 1.3. Promote and foster coordination between jurisdictions in the planning and implementation of bicycle, trails, transit, pedestrian and other alternative transportation modes.

Public Awareness

Goal II Develop a variety of educational programs to promote the benefits of pedestrian-oriented design. Initiate demonstration projects to illustrate these benefits using potential pedestrian demand and pedestrian design techniques.

Objective 2.1. Construct facilities that demonstrate successful pedestrian design.

Incorporating pedestrian facilities into new development is an objective for the Region.

Objective 2.2. Conduct public education and involvement campaigns to assist and encourage people to walk.
Objective 2.3. Promote workplace walking incentive programs.
Objective 2.4. Distribute the *MAG Pedestrian Area Policies and Design Guidelines* to a broader audience.
Objective 2.5. Improve motorists' understanding of the need to share the roadway with non-motorized travelers, especially at intersections and crosswalks.
Objective 2.6. Implement pedestrian safety education programs to improve observance of traffic laws, and to promote safety for pedestrians of all ages.
Objective 2.7. Distribute the *Pedestrian Plan 2000* to a broad audience.

Funding

Goal III Provide funding for pedestrian facility development that results in walking as a key form of transportation in the region.

Objective 3.1. Provide dedicated and on-going pedestrian funding sources to ensure the construction of pedestrian areas and facilities.

Objective 3.2. Identify and encourage funding to fully integrate pedestrian projects and programs in all transportation and development projects.
Objective 3.3. Provide a staff position at the local level to oversee pedestrian programs and facilities to maximize pedestrian potential in all planning and development projects.
Objective 3.4. Evaluate proposed pedestrian projects using the objective criteria developed in this Plan (e.g. the *Latent Demand* and the *Roadside Pedestrian Conditions Models*) to help gauge how the projects will meet potential pedestrian travel demand and to what extent the proposed projects will improve walking conditions.
Objective 3.5. Promote the benefits of pedestrian projects and remove barriers to their acceptance through the funding of demonstration projects.
Objective 3.6. Publicize and market successful existing pedestrian areas and projects in order to support increased funding.

Design for People

Goal IV ***Develop, build and maintain a diversity of pedestrian facilities that recognize the region's character, variety and intensity of land use patterns, and is responsive to the region's diverse population.***

Objective 4.1. Build new pedestrian facilities that accommodate the needs of all types of pedestrians in new developments and retrofit existing areas to accommodate pedestrians.

Linkage

Goal V ***Provide a regional pedestrian network that identifies and safely links on- and off-street transportation modes with pedestrian areas and destinations.***

Objective 5.1. Integrate appropriate pedestrian facilities into all levels of planning, design, construction and maintenance activities relative to transportation as defined by design performance guidelines in the *MAG Pedestrian Plan 2000*.
Objective 5.2. Link primarily transportation related pedestrian facilities to other pedestrian support facilities, such as urban trails, bicycle facilities, pathways, etc.
Objective 5.3. Include pedestrian needs in regional and local trail and bicycle plans.
Objective 5.4. Use pedestrian linkages to transit to maximize connec-

tions between origins and destinations.

Objective 5.5. Include a pedestrian element in all local General Plans.

THE ROADWAY DESIGN PERFORMANCE GUIDELINES

One of the major regional initiatives reflected throughout the goals and objectives of the *MAG Pedestrian Plan 2000* is to establish performance guidelines for pedestrian facilities within road right-of-ways. Establishing regionwide performance guidelines, as opposed to rigid roadway cross-sections, gives design flexibility to MAG's member agencies. Providing this flexibility within performance guidelines, as opposed to prescriptive cross-sectional standards, will ensure that roadways will meet the needs of other travel modes while simultaneously encouraging pedestrian travel throughout the MAG Region. The Maricopa Association of Governments recognizes that its constituent members have unique goals, challenges, and constraints with respect to their transportation networks and right-of-ways. Accordingly, roadway performance guidelines are the best way to achieve these regional goals.

Cross-sectional design flexibility is a central approach in the MAG Pedestrian Plan 2000.

There are two major steps to creating these performance guidelines. First, geographic areas, as defined by roadway corridors, within the MAG Region are classified, or mapped, into the differing categories of potential pedestrian activity they represent. This classification is necessary to establish the appropriate performance guidelines for roadways serving differing levels of potential pedestrian activity in the Valley. For example, higher performing pedestrian facilities should be provided in areas where many people could be induced to use sidewalks and other pedestrian facilities. In areas where there would be relatively few travelers inclined to use walking to get to their destination(s), the guidelines for pedestrian facility performance should not be as high. By considering potential pedestrian usage, MAG member agencies will be better able to balance the cost of improvements with the benefits generated.

The second step in the process is to establish appropriate roadside design performance guidelines for the categories of pedestrian trip activity. These performance guidelines establish the lateral separation between the roadway travel lanes and the roadside sidewalk area based upon factors such as traffic volume, speed, and vehicle mix as well as geometric cross-sectional features of the roadway. These performance guidelines are outlined below following an overview of the first step in the process.

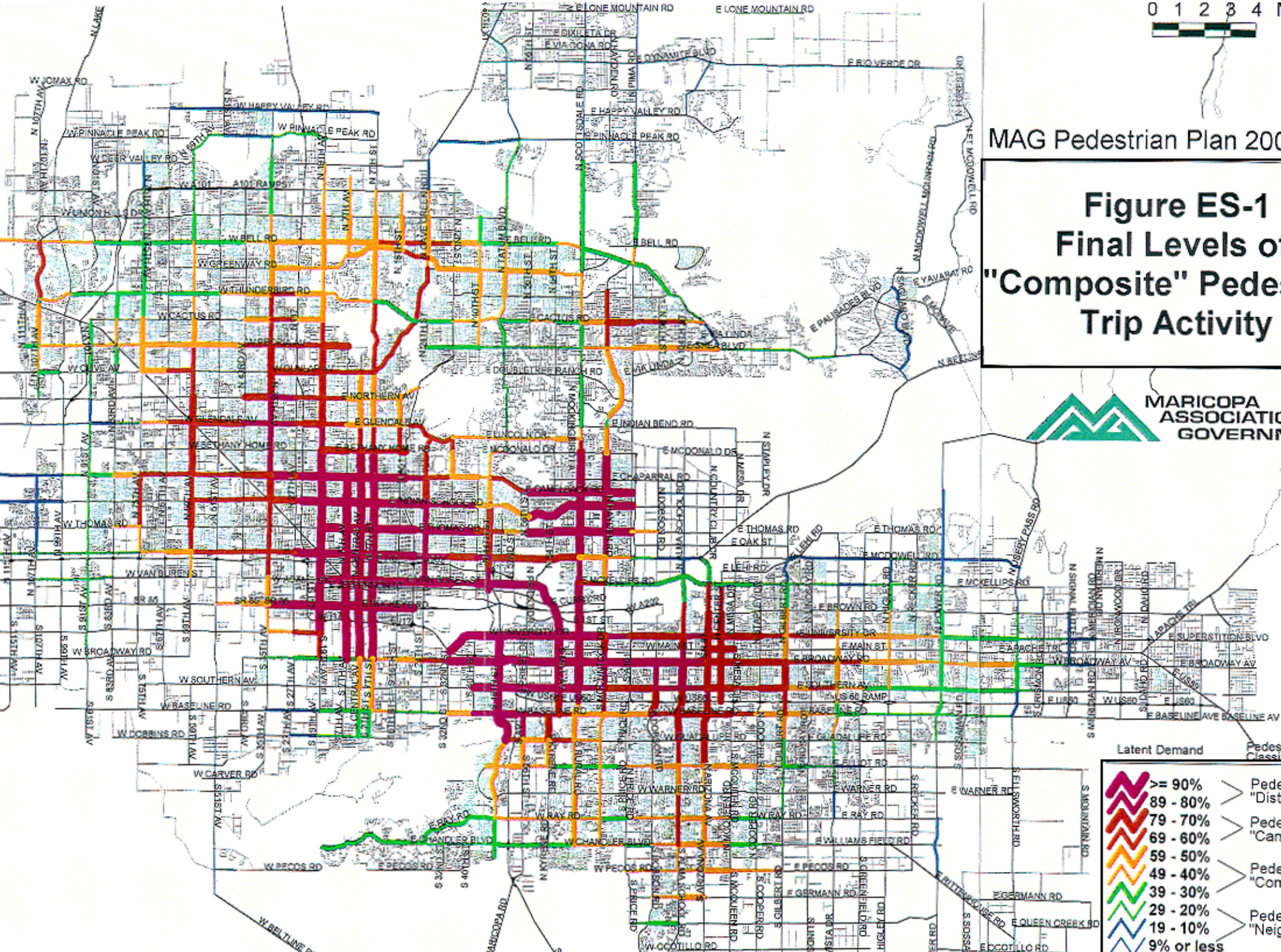
Potential Pedestrian Trip Activity: The Latent Demand Model

The geographic identification, mapping, and classification of potential pedestrian trip activity areas in the Region was accomplished using a travel demand modeling analysis called the *Latent Demand Model*. It applies a travel demand theory similar to that used in motor vehicle and transit travel forecasting, but with adjustments based on specific travel characteristics of the pedestrian. The *Latent Demand Model* uses much of the same socio-economic data as is used in MAG's transportation forecasting model.

The *Model* estimates potential pedestrian activity in the corridor area of individual roadway network segments, based upon the frequency and proximity of adjacent trip attractors and generators. The *Model* assumes that there are no inhibitions to pedestrian travel other than distance - it reflects the travel market *potential* of every study network corridor area with no constraints due to current walking conditions.

Approximately 1000 miles of major roadways in the MAG Region were selected to provide a regional coverage. Two planning horizons were analyzed: existing land use and future land use. Data inputs for the existing conditions analysis were: existing public schools & universities; public parks & urban trails; population density, income levels, and employment values within MAG's traffic analysis zonal data. For the future land use planning scenario, existing urban features (e.g., public schools, parks, trails, etc.) were analyzed along with future population and employment projections as anticipated in MAG's 2020 land use zonal data sets.

The study corridor areas were analyzed and ranked regionally according to their latent travel demand, or potential pedestrian activity. The regional ranking results (on a zero to one hundred percent scale) are reflected in the map, Figure ES-1. Note: If the ranking of a roadway corridor not included in the study network is desired, one may interpolate the rankings of the surrounding network to determine the approximate ranking for the roadway corridor of interest.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MAG Pedestrian Plan 200
Figure ES-1
Final Levels of
"Composite" Pedes
Trip Activity
MARICOPA
ASSOCIATIO
GOVERNM
Latent Demand
Pedes
Classi
>= 90%
89 - 80%
79 - 70%
69 - 60%
59 - 50%
49 - 40%
39 - 30%
29 - 20%
19 - 10%
9% or less
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Pedestrian Activity District Classifications

The *Latent Demand* modeling results are stratified into groups approximately representing the four general classifications of pedestrian (activity intensity) areas outlined in the *1995 MAG Pedestrian Area Policies and Design Guidelines*. The stratification schedule of the Latent Demand Scores into the four general pedestrian (activity) area types is:

Latent Demand 100% to 80% = ***Highest potential*** for pedestrian activity. Represents the "District" area type from the ***1995 MAG Pedestrian Area Policies and Design Guidelines*** which are"...areas of high intensity with a wide variety of land uses with a regional apeal..."

Latent Demand 79% to 60% = ***Second highest potential*** for pedestrian activity. Represents the "Campus" area type from the ***1995 MAG Pedestrian Area Policies and Design Guidelines*** which are "...high intensity areas with a single or limited mix of land uses..."

Latent Demand 59% to 30% = ***Third highest potential*** for pedestrian activity. Represents the "Community" area type from the ***1995 MAG Pedestrian Area Policies and Design Guidelines*** which are "...areas of low to medium intensity..."

Latent Demand 29% to 0% = ***Fourth highest potential*** for pedestrian activity. Represents the "Neighbor hood" area type from the ***1995 MAG Pedestrian Area Policies and Design Guidelines*** which are "...areas of low intensity with a limited mix of land uses..."

This classification then permits the establishment of appropriate roadside walking environment performance guidelines in the Region.

Performance Guidelines: The Roadside Pedestrian Conditions Model

Depending on roadway and traffic conditions, providing a sidewalk is the first step

in better accommodating and encouraging pedestrian travel. However, the amount of seperation (or buffering) between the pedestrian travel way and moving traffic stream is a major factor in how pedestrians perceive the safety of their environment.

The *1995 Pedestrian Area Design Guidelines* listed many factors that affect pedestrians' sense of safety, or accommodation, alongside the roadway. These include:

> *...on-street parking as a buffer for pedestrians from moving vehicles...*(Principle #9); *...the intensity and speed of traffic...which is adjacent to the sidewalk* (Principle #10); *... separate* (the walkways) *from the curb whenever possible...provide a bikelane or on-street parking as a buffer...*(Recommendation #13); and *...use traffic calming to limit the speed of vehicles...*(Recommendation #15) among others.

These are the some of the factors affecting the perceptions of the Region's pedestrians. Accordingly, an objective, reliable scientific method that reflects the pedestrians' sense of comfort while walking along a given roadway was selected to help produce the performance guidelines. The method, or measure, is the *Roadside Pedestrian Conditions (RPC) Model*. The *Model* was developed in 1998 and has already been adopted by several metropolitan areas and state departments of transportation across the United States. It uses measurable traffic and roadway variables such as:

- Lateral separation between pedestrians and motor vehicle traffic (including the presence, and width of sidewalks)
- Amount and speed of motor vehicle traffic
- Percentage of heavy vehicles (trucks)
- Number of travel lanes
- Presence of a paved shoulder, bikelane, or on-street parking
- Width of buffer between sidewalk and roadway
- Trees or other "protective" barriers in the buffer

Based upon these factors, the *RPC Model* produces statistically calibrated results that are stratified into six grades, or levels of service (see Table ES-1). Level "A" reflects the best conditions for pedestrians and Level "F" represents the worst conditions. The *RPC Model* was used to develop the tables and matrices of the performance guidelines for roadside design.

TABLE ES-1 RPC Model Levels of Service

LEVEL OF SERVICE CATEGORIES

Level-of-Service	RPC Score
A	≤ 1.5
B	> 1.5 and ≤ 2.5
C	> 2.5 and ≤ 3.5
D	> 3.5 and ≤ 4.5
E	> 4.5 and ≤ 5.5
F	> 5.5

Pedestrian Facility Performance Guidelines: Using the Matrices

Following a decision to incorporate a sidewalk in a roadway design, perhaps the singlemost important design consideration is determining the appropriate amount and type of lateral separation and buffering between the sidewalk and the motor vehicle travel lanes. Mentioned in the *1995 Design Guidelines*, the appropriate amount and type of separation and buffering depends on traffic and geometric conditions – simple cross-section standards do not allow roadway designers the flexibility to provide the *target quality* walking environment, particularly with regard to the sense of safety or comfort afforded to pedestrians. While the *1995 Pedestrian Area Policies and Design Guidelines* can be referenced for shade canopy and other pedestrian facility environment aspects, this *Plan* focuses on guidelines for lateral separation and buffering.

The 1995 Pedestrian Area Policies and Design Guidelines provide guidance on the location of amenities within the pedestrian environment.

Accordingly, such design guidance, in the form of performance standards rather than prescriptive roadway cross-sections, is developed as the major component of this *Plan*. The format of these performance guidelines allows roadway designers to consider various design options in achieving the minimum walking environment quality according to the roadway's classification of potential pedestrian activity, or district.

Accordingly, minimum walking environment quality thresholds (or pedestrian levels of service) are established in Figure ES-2. These performance thresholds establish that roadways within areas with the highest potential to serve pedestrian trip activity (or a mode shift) in the MAG Region should provide the highest quality walking environment with respect to pedestrians' sense of safety. Tables ES5-1A through C and Table ES5-2 have been developed using the *RPC Model* to determine the roadway cross-sectional geometry necessary to meet these performance thresholds. These tables provide planners and engineers with design information to achieve the performance guidelines for roadways. Step-by-step instructions for using these tables are provided below.

Step 1: Establish the target pedestrian level of service.

Based on the results of the *Latent Demand Score* analysis, the roadway corridors shown on the *Final Composite Levels of Pedestrian Trip Activity* (Figure ES-1) were

classified into different categories. Roadways that are within the first regional category, the "District" (bright purple on Figure ES-1), have the highest level of potential trip activity, and should therefore provide the best quality of service to pedestrians – Pedestrian Level of Service "A". Roadways in the second highest category, the "Campus" (red-orange corridor areas on the map) should, at the minimum, meet Level of Service "B" walking conditions. Roadways in the third and fourth highest regional categories (yellow, green, and blue corridors on the map) should, at the minimum, meet Level of Service "C" walking conditions. Local jurisdictions may choose to meet a higher quality of service for pedestrians along a particular route due to other mitigating factors.

Pedestrian Level of Service A	
Latent Demand 100 to 80 =	**Highest potential** for pedestrian activity. Represents the **District**" area type from the *1995 Guidelines*.
Pedestrian Level of Service B	
Latent Demand 79 to 60 =	**Second highest potential** for pedestrian activity. Represents the **Campus**" area type from the *1995 Guidelines*.
Pedestrian Level of Service C	
Latent Demand 59 to 30 =	**Third highest potential** for pedestrian activity. Represents the **Community**" area type from the *1995 Guidelines*.
Latent Demand 29 to 0 =	**Fourth highest potential** for pedestrian activity. Represents the **Neighborhood**" area type from the *1995 Guidelines*.

FIGURE ES-2. Roadside Pedestrian Level of Service Thresholds

Step 2: Determine the unadjusted lateral separation needed to achieve the target level of service.

After determining the roadway's Pedestrian District, the roadway designer should reference one of the following tables:

- Table ES5-1A: Pedestrian "District" (Level of Service "A" conditions)
- Table ES5-1B: Pedestrian "Campus" (Level of Service "B" conditions)
- Table ES5-1C: Pedestrian "Community" and "Neighborhood" (Level of Service "C" conditions)

Based on the existing roadway traffic conditions (or anticipated ultimate conditions, if conditions are expected to change significantly), find the corresponding *unadjusted* lateral separation necessary to achieve the target walking condition for pedestrians. This *unadjusted* lateral separation is the amount of separation needed between the sidewalk and the roadway, given no other protective design features such as street trees, on-street parking, or other parallel protective barriers.

Table ES5-1A Unadjusted Lateral Separation* - Pedestrian "District" (Latent Demand: 100-80)

All values below produce Pedestrian (safety) Level of Service "A" in unscreened conditions

Posted Speed	Truck %	Average Daily Traffic (ADT) and Laneage																	
		60,000	50,000	40,000		30,000		25,000		20,000		17,500		15,000	12,500	10,000	7,500	5,000	2,500
		6L	6L	6L	4L	6L	4L	6L	4L	4L	2L	4L	2L	2L	2L	2L	2L	2L	2L
Speed > 55 mph	> 4%	120	113	104	120	94	108	88	102	94	120	89	115	108	102	94	84	73	56
	2 - 4%	83	78	71	83	64	75	60	70	64	83	61	79	75	70	64	57	49	37
	0 - 2%	60	56	51	60	46	53	42	50	46	60	43	57	53	50	46	40	34	25
Speed 41 - 50 mph	> 4%	92	87	80	92	72	83	67	78	72	92	68	88	83	78	72	64	55	42
	2 - 4%	68	63	58	68	52	61	48	57	52	68	49	64	61	57	52	46	39	29
	0 - 2%	51	48	44	51	39	46	36	43	39	51	37	49	46	43	39	34	29	21
Speed 30 - 40 mph	> 4%	71	66	60	71	54	63	50	59	54	71	51	67	63	59	54	48	41	30
	2 - 4%	55	51	47	55	42	49	39	46	42	55	39	52	49	46	42	37	31	23
	0 - 2%	44	41	37	44	33	39	30	36	33	44	31	42	39	36	33	29	24	17
Speed < 30 mph	> 4%	53	50	45	53	40	47	37	44	40	53	38	51	47	44	40	36	30	22
	2 - 4%	44	41	37	44	33	39	30	36	33	44	31	42	39	36	33	29	24	17
	0 - 2%	38	35	31	38	28	33	25	31	28	38	26	36	33	31	28	24	20	14

* Includes all space between outside edge of travel lane to inside edge of sidewalk

Note: The above table was developed with the assumption that all roadways have raised curbing along the travel lane edge. For roadways with an open-shoulder cross section, refer to the RPC Model equation in the Technical Appendix.

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Table ES5-1B Unadjusted Lateral Separation* - Pedestrian "Campus" (Latent Demand: 79-60)

All values below produce Pedestrian (safety) Level of Service "B" in unscreened conditions

Posted Speed	Truck %	Average Daily Traffic (ADT) and Laneage																	
		60,000	50,000	40,000		30,000		25,000		20,000		17,500		15,000	12,500	10,000	7,500	5,000	2,50
		6L	6L	6L	4L	6L	4L	6L	4L	4L	2L	4L	2L	2L	2L	2L	2L	2L	2L
Speed > 55 mph	> 4%	67	63	58	67	52	60	48	56	52	67	49	64	60	56	52	46	39	29
	2 - 4%	45	42	38	45	34	40	31	37	34	45	32	43	40	37	34	30	25	18
	0 - 2%	31	29	26	31	23	27	21	25	23	31	21	30	27	25	23	20	16	11
Speed 41 - 50 mph	> 4%	51	47	43	51	38	45	35	42	38	51	36	48	45	42	38	34	28	20
	2 - 4%	36	33	30	36	27	32	24	29	27	36	25	34	32	29	27	23	19	13
	0 - 2%	26	24	22	26	19	23	17	21	19	26	17	25	23	21	19	16	13	8
Speed 30 - 40 mph	> 4%	38	35	32	38	28	33	26	31	28	38	26	36	33	31	28	24	20	14
	2 - 4%	28	26	23	28	20	25	19	23	20	28	19	27	25	23	20	18	14	9
	0 - 2%	22	20	18	22	15	19	14	17	15	22	14	21	19	17	15	13	10	6
Speed < 30 mph	> 4%	27	25	23	27	20	24	18	22	20	27	18	26	24	22	20	17	13	9
	2 - 4%	22	20	18	22	15	19	14	17	15	22	14	21	19	17	15	13	10	6
	0 - 2%	18	16	14	18	12	15	11	14	12	18	11	17	15	14	12	10	7	4

* Includes all space between outside edge of travel lane to inside edge of sidewalk

"NS" indicates that a sidewalk is not necessary to achieve the designated Pedestrian Safety Comfort Level

Note: The above table was developed with the assumption that all roadways have raised curbing along the travel lane edge. For roadways with an open-shoulder cross section, refer to the RPC Model equation in the Technical Appendix.

Table ES5-1C Unadjusted Lateral Separation* - Pedestrian "Community" (Latent Demand: 59-30) and "Neighborhood" (Latent Demand: 29-0)

All values below produce Pedestrian (safety) Level of Service "C" in unscreened conditions																		
Posted Speed	**Truck %**	**Average Daily Traffic (ADT) and Laneage**																
		60,000	50,000	40,000		30,000		25,000		20,000		17,500		15,000	12,500	10,000	7,500	5,000	2
		6L	6L	6L	4L	6L	4L	6L	4L	4L	2L	4L	2L	2L	2L	2L	2L	2L	
Speed > 55 mph	> 4%	36	33	30	36	26	32	24	29	26	36	25	34	32	29	26	23	19	
	2 - 4%	23	21	18	23	16	20	14	18	16	23	15	21	20	18	16	13	10	
	0 - 2%	14	13	11	14	9	12	8	11	9	14	8	13	12	11	9	7	5	
Speed 41 - 50 mph	> 4%	26	24	21	26	18	23	17	21	18	26	17	24	23	21	18	16	12	
	2 - 4%	17	15	14	17	11	15	10	13	11	17	10	16	15	13	11	9	7	
	0 - 2%	11	10	8	11	7	9	6	8	7	11	6	10	9	8	7	5	3	
Speed 30 - 40 mph	> 4%	18	16	14	18	12	15	11	14	12	18	11	17	15	14	12	10	8	
	2 - 4%	13	11	10	13	8	10	7	9	8	13	7	12	10	9	8	6	4	
	0 - 2%	9	8	6	9	5	7	4	6	5	9	4	8	7	6	5	3	1	
Speed < 30 mph	> 4%	12	11	9	12	7	10	6	9	7	12	7	11	10	9	7	6	4	
	2 - 4%	9	8	6	9	5	7	4	6	5	9	4	8	7	6	5	3	2	
	0 - 2%	6	5	4	6	3	5	2	4	3	6	2	6	5	4	3	2	NS	

* Includes all space between outside edge of travel lane to inside edge of sidewalk

"NS" indicates that a sidewalk is not necessary to achieve the designated Pedestrian Safety Comfort Level

Note: The above table was developed with the assumption that all roadways have raised curbing along the travel lane edge. For roadways with an open-shoulder cross section, refer to the RPC Model equation in the Technical Appendix.

MARICOPA ASSOCIATION of GOVERNMENTS

Table ES5-2 Alternative Buffer Widths[1] (in feet)

Un-adjusted Separation in feet (from Table 1	Planted Buffer[2] - Tree Spacing (feet on center)					
	200 o.c.	100 o.c.	60 o.c.	40 o.c.	20 o.c.	10 o.c.
	Buffer Width	Buffer Width	Buffer Width	Buffer Width	Buffer Width	Buffer Width
125	109	67	47	36	23	15
120	105	64	45	35	22	14
115	100	62	43	33	21	14
110	96	59	41	32	20	13
105	91	56	39	30	19	13
100	86	53	37	29	18	12
95	82	50	35	27	17	11
90	77	48	33	26	17	11
85	73	45	31	24	16	10
80	68	42	29	23	15	10
75	64	39	28	21	14	9
70	59	37	26	20	13	8
65	55	34	24	18	12	8
60	50	31	22	17	11	7
55	46	28	20	15	10	7
50	41	25	18	14	9	6
45	36	23	16	12	8	6
40	32	20	14	11	7	5
35	27	17	12	10	6	4
30	23	14	10	8	5	4
25	18	12	8	7	5	4*
20	14	9	6	5	4	4*
15	9	6	4	4	4*	4*
10	5	4*	4*	4*	4*	4*

1. Includes all space between outside edge of travel lane to inside edge of sidewalk
2. Parking has a tremendous effect on providing a greater sense of safety to the pedestrians alongside the roadway, but it has limited application (on-street parking is not a viable option on roadways with higher operating speeds)

* Buffer limited by practical planting width

Step 3: (Optional) Explore options to reduce the unadjusted lateral separation (or buffer) width.

In many cases, there will not be sufficient right-of-way width to provide the recommended unbuffered area between the sidewalk and roadway. For these reasons, or aesthetic considerations, the roadway designer may choose other methods to achieve the same level of service for pedestrians, but with a reduced lateral separation, or buffer width. There are numerous alternatives to reduce buffer width depending on the roadway, traffic, and adjoining land use conditions:

- ***On-Street Parking***: On-street parking can provide a protective "wall of steel" between the pedestrian and the traffic stream. Depending on the percentage of anticipated occupied parking spaces, this type of "buffer" can reduce the amount of unadjusted lateral separation by up to 50 feet. This measure, however, often is limited by the function of the roadway, types of adjoining land uses, and local jurisdictional parking management policies.
- ***Bicycle Lanes or Undesignated Shoulders***: Roadway cross-sectional elements such as wide curb lanes, striped bicycle lanes, and undesignated paved shoulders provide a sense of separation between the pedestrian way and the traffic stream. As such, they contribute to lateral separation by an amount equal to their actual cross-sectional width.
- ***Vertical Barriers***: Vertical barriers are often used in constrained cross-sections where no space is available for other protective measures. Barrier walls can drastically reduce the amount of unadjusted separation, however they are an expensive solution recommended only for the most severely constrained conditions.
- ***Street Trees and Landscaped Buffers***: Shade trees and landscaping between the sidewalk and the roadway are very effective buffering techniques that can be achieved at relatively low cost. With due consideration for clear recovery areas and minimum planting widths, the lateral separation, or buffer, can be reduced dramatically to meet right-of-way constraints while achieving the minimum target pedestrian level of service in the roadside environment.

Table ES5-2 shows *Alternative Buffer Widths* that can be provided if street trees are used to reduce the unadjusted lateral separation between the sidewalk and the roadway. It is reflective of the positive effect of tree spacing on pedestrians' sense of safety with respect to motor vehicle traffic. As with Tables ES5-1A through C, this table was derived using the *RPC Model* in conjunction with direct observations and roadway evaluations throughout the MAG region.

In summary, this section of the *MAG Pedestrian Plan 2000* provides roadside design performance guidelines primarily focused on pedestrians' perception of personal safety and comfort in the roadside environment. While this is an important ingredient in improving the regional pedestrian environment, other parts of the pedestrian transportation system must be enhanced as well to achieve the overall objectives of the Maricopa Association of Governments. These include: meeting ADA accessibility standards, improved pedestrian accommodation & safety at intersections and mid-block crossings, and providing the shade canopy and street furniture and other pedestrian travel amenities covered in the *1995 MAG Pedestrian Area Policies and Design Guidelines* and applicable local, state, and national roadway and traffic design guidelines. Objectives such as these along with minimizing pedestrian-vehicle conflicts and street crossing distances at intersections are integral to the overall improvement in the Region and should be pursued with equal vigor as improving the roadside walking environment.

Thomas Road "Before": Lack of sidewalk buffering results in a walking condition (level of service) "E" under these roadway conditions.

ACTION PLAN

This section provides a summary of necessary actions and programs to meet the Regional goals and objectives outlined in Section 2 of this *MAG Pedestrian Plan 2000*. This Action Plan was developed through interaction among the standing MAG Pedestrian Working Group, the Public Stakeholders Group, the consultant team, and MAG staff. It consists of specific short term (one year), mid-term (2-3 years) and long-term (4-5 years) programs and activities that are necessary to bring about an increase in walking trips in the Region and a corresponding decrease in traffic congestion. Table ES6-1 presents the Action Plan in a tabular matrix form.

Thomas Road "After": A buffered lateral separation provides a better ("Level of Service "B") walking environment under the same traffic conditions.

meframe

Program)	Year 1	Year 2	Year 3	Y
Pedestrian Area Policies and Design Guidelines with recent pedestrian design and ADA standards.				
cations and details to incorporate MAG Pedestrian Design Guidelines.				
hip of the MAG Pedestrian Working Group (PWG) to ensure representation of various jurisdictions and multi-modal planners.				
Membership category to the MAG PWG to broaden representation to business groups, homebuilders, special interest groups, etc.				
s				
and financial support of the MAG Design Assistance Program.				
vice Announcements on pedestrian safety, the benefits of walking and other MAG Pedestrian programs.				
an-oriented educational session to present at regional planning, bicycle, trail, and/or transportation conferences.				
planning, design, and environmental awards programs to include a Pedestrian Project award category.				
t the Walking and Bicycling into the 21st Century Pedestrian Conference.				
destrian Awards Program and tie into the Walking and Bicycling into the 21st Century Conference.				
visual program on the MAG Pedestrian Program or on pedestrian oriented design for presentations to community organizations.				
destrian Conference in the Phoenix metropolitan region.				
d Rideshare programs to implement pedestrian specific programs.				
budget for the continued publication of the *Pedestrian Area Policies and Design Guidelines* and the *MAG Pedestrian Plan 2000* docu- .				
e and/or Excecutive Summary of the *Pedestrian Area Policies and Design Guidelines* document for easy distribution.				
he *Pedestrian Area Policies and Design Guidelines* and the *MAG Pedestrian Plan 2000* documents, brochures and Excecutive Summaries, Planning and Zoning departments and Commissions of member agencies.				
ent to the original *Pedestrian Area Policies and Design Guidelines* document that includes summaries of recent pedestrian projects and				
retation and revision of state legislation and policies to allow use of state transportation funds for pedestrian facilities.				
es to the Congestion Management rating system based on the *Latent Demand* and *Roadside Pedestrian Conditions* models and their				
or a MAG pedestrian planner to provide support to pedestrians as a vital component of a region-wide multi-modal transportation system.				
jurisdictions to establish a pedestrian planner position to ensure that pedestrian needs are integrated into all projects.				

Program)	Year 1	Year 2	Year 3	Y
Demand and *Roadside Pedestrian Conditions* models as evaluation tools to select federally funded transportation projects.	▬			
of the Pedestrian *Latent Demand Model* and the *Roadside Pedestrian Condition Model* in project evaluations at the local level.		▬	▬	
or the MAG design assistance program.	▬			
and Pedestrian Working Group participation in the Long Range Transportation Plan update process and in the development of the ment Program.	▬			
e Pedestrian Conditions Model to determine the degree to which projects provide appropriate pedestrian design.	▬			
rdinance for the inclusion of pedestrian oriented design as an integral part of infrastructure development in all plan review processes.	▬			
ons to use the *Roadside Pedestrian Conditions Model* to promote more pedestrian-oriented design.		▬	▬	
appropriate pedestrian accommodations are occurring when evaluating Federally funded projects including the Congestion Management	▬			
usion of pedestrian design in the transit design guidelines being prepared by RPTA, and in other local design standards and guidelines.	▬			
of the RPC and PLD Models in rating pedestrian projects.		▬	▬	
ons to maintain connectivity between transportation related pedestrian facilities and other transportation modes such as transit and		▬	▬	
n between member jurisdictions on open space and multi-modal transportation planning.	▬			

ic course of action designed to achieve an objective that is implemented either by MAG staff or by the Pedestrian Working Group. This is the “who” of the Goals and Objectives.
cific course of action designed to achieve an objective that is implemented by MAG’s member jurisdictions or agencies, and which can be supported by MAG staff and its policies and/or the Pede