Chapter 5

Pedestrian Priority Model (PPM)

The model has three basic components, which include:

- *Pedestrian Attractors*
- *Pedestrian Generators*
- *Pedestrian Detractors*

5.1 MODEL OVERVIEW

The Pedestrian Priority Model (PPM) was developed to determine the most likely areas within the City of San Diego where pedestrians are likely to be (either currently or if missing walkway improvements were added). The model was created to prioritize communities for the preparation of individual sections of the PMP and to help prioritize projects so as to affect the largest number of pedestrians possible. The PPM identifies existing and potential pedestrian activity areas citywide. The model utilizes existing data available city-wide as part of an extensive GIS database.

5.2 COMPUTER MODEL DESCRIPTION

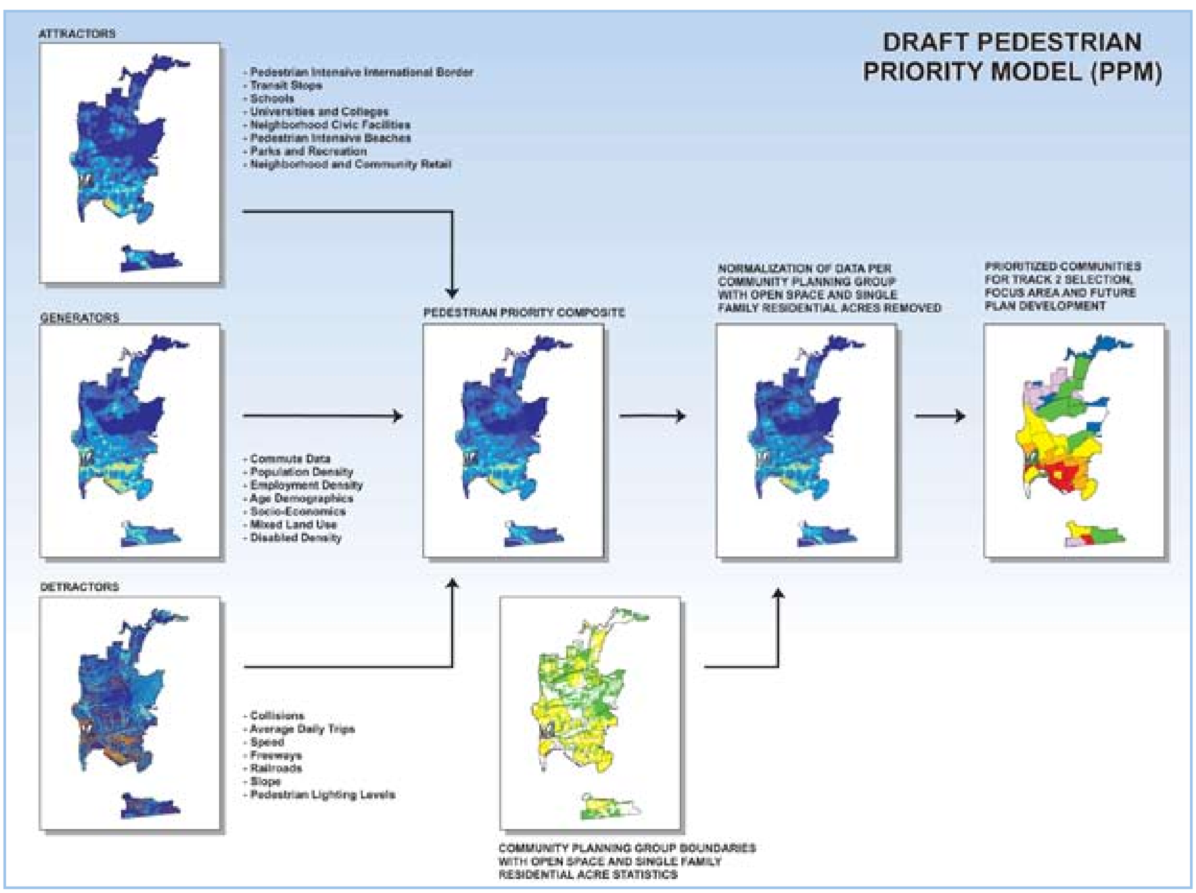
The model has three basic components, which include:

- Pedestrian Attractors
- Pedestrian Generators
- Pedestrian Detractors

When these three interim models are combined, they create a Pedestrian Priority Model. See Figure 7, GIS Process Chart. The city is divided up into a grid of cells. Each grid represents an area on the ground that is 5,625 square feet (75 x 75 feet cell size). This cell size was chosen to capture the best detail possible in relation to the overall scale of the datasets and the geographic size of the City of San Diego.

The model identifies the characteristics of each particular area in geographic space and assigns a numeric value for each of these characteristics. The score per area is then added to create a ranking for that particular area in geographic space.

Figure 7: Pedestrian Priority Model (PPM) Process Chart



Five types of attractors are:
- *Schools,*
- *Transit stations,*
- *Parks facilities*
- *Neighborhood retail*
- *Community serving destinations (post offices and libraries)*

5.2.1 Pedestrian Attractors

The Pedestrian Priority Model identifies pedestrian activity areas by utilizing pedestrian-related geographic features that are likely to attract pedestrians. Refer to Table 29 for the specific features used in this portion of the model.

a. Five types of features have been used:
- Schools,
- Transit stations,
- Parks and recreation facilities including beaches,
- Neighborhood and community retail, and
- Neighborhood and community serving destinations (post offices and libraries)

Table 29: Pedestrian Attractor Factors and Scoring

Pedestrian Attractors	Points	Weighted Multiplier	Final Score
Pedestrian Intensive International Border	6	1	6
Major Multi-Modal Transit Center (> 10,000 boardings and alightings per day)	5		5
Major Transit Stops (1,000-10,000 boardings and alightings per day)	4		4
Transit Stops (100-1,000 boardings and alightings per day)	3		3
Elementary Schools (Including Private)	3		3
Middle Schools	2		2
Universities and Colleges	2		2
Neighborhood Civic Facilities (Libraries, Post Office & Religious Facilities)	2		2
Neighborhood and Community Retail	2		2
Pedestrian Intensive Beaches	2		2
Parks & Recreation (excludes non-useable open space)	1		1
High Schools	1		1
Weighting Values Based on Distance to Attractor			
1/8 Mile	1.5	1	1.5
1/4 Mile	1		1
1/3 Mile	0.75		0.75
1/2 Mile	0.5		0.5

b. Points were assigned to several categories in each feature type, recognizing certain features were more likely to attract pedestrians than other features.

c. Once identified, concentric circles (referred to as buffers) were drawn around each feature type at increasing distances from the feature's center point.

d. Weighted distance values were assigned to each buffer. For example, a 1/8-mile radius buffer is assigned a higher value than 1/2-mile radius buffer, since more people were likely to walk 1/8 of a mile than 1/2 of a mile.

e. The values assigned to each feature type were multiplied by the weighted distance values for each distance buffer. For example, (as shown on Table 30) if schools were given a value of five, transit stops a value of four, 1/8 of a mile a distance value of five, and 1/2 a mile a distance value of four, then a school with a 1/2 mile radius buffer would have the same multiple weighted value (20) as a transit stop with a 1/8 mile radius buffer.

Table 30: Point Comparisons

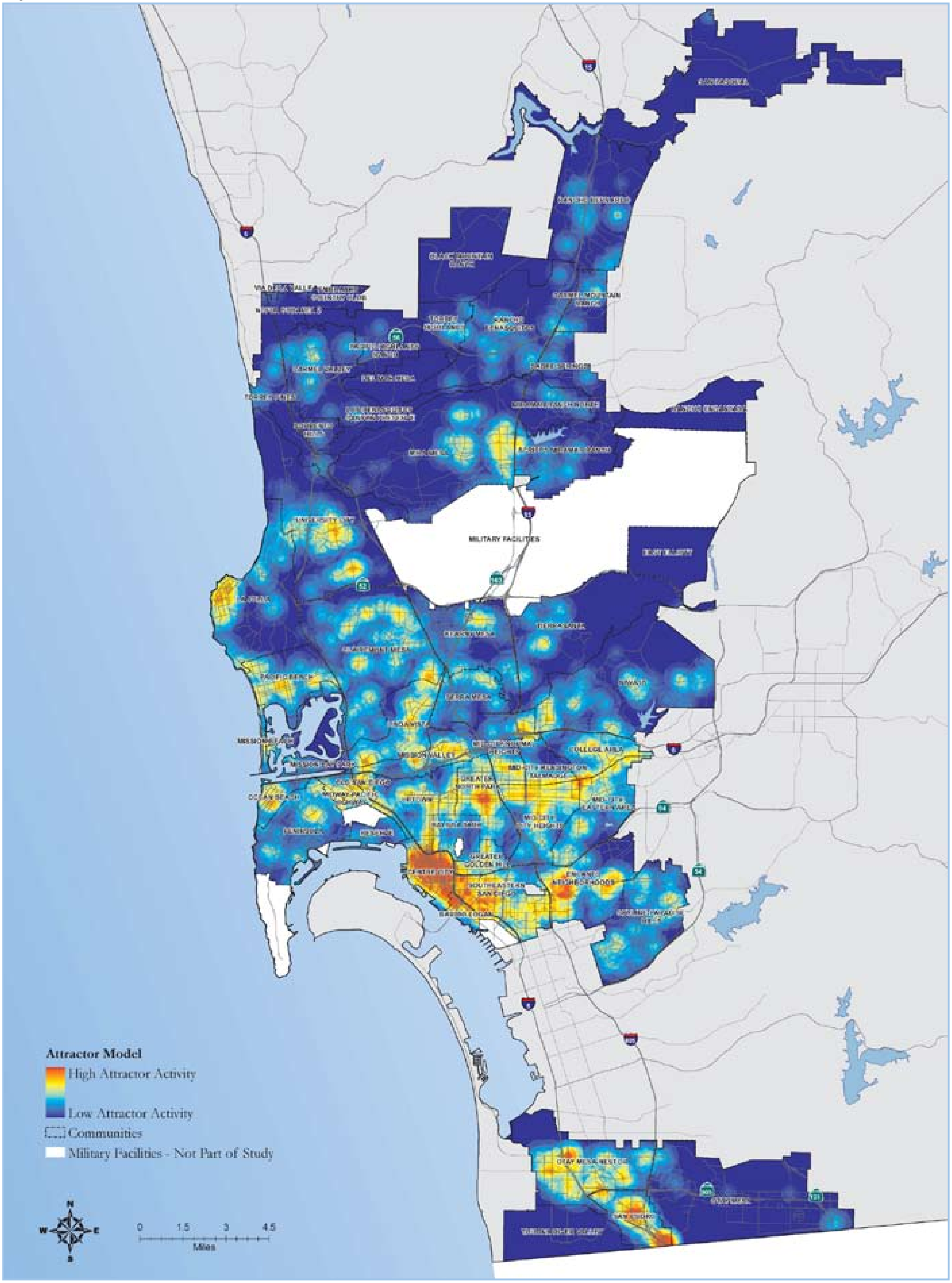
Features (points assigned)	Buffer Radius (weighted value) 1/8 mile (5 value)	1/2 mile (4 value)
Schools (5 points)	25	20
Transit (4 points)	20	16

f. Each of the individual buffered feature types with their multiplied weighted values were overlaid on the citywide cell grid.

g. Within each cell, the feature points were multiplied by the weighted values and then added to other feature point scores with a resulting total attractor value assigned to the cell.

h. The areas that have high concentrations of cells with high values were identified. These high concentration areas identify existing and potential high pedestrian activity areas with known barriers in each community planning area throughout the City. The results of the attractor model are shown on Figure 8.

Figure 8: Attractor Model Results



Nine types of generators are:

- *Walk to work (census)*
- *Population density*
- *Employment density*
- *Senior age density*
- *Household income*
- *Youth age density*
- *Disability density*
- *Existing mixed use areas*
- *Programmed mixed use areas*

5.2.2 Pedestrian Generators

The Pedestrian Priority Model also utilizes demographic data as indicators of the potential volume of pedestrians based on how many people live or work within the pedestrian activity areas identified in the first step of the model. Total population and employment were used as well as other demographic data, such as age and income data. Pedestrian activity areas that contain a greater number of people living or working within them were more likely to have more people walking. The model uses the SANDAG defined pseudo Census blocks known as Master Geographic Reference Areas (MGRAs) citywide and U.S. Census Bureau Census Block Groups. Land use adjacency was also used to determine areas of high pedestrian activity using the SANDAG Existing Land Use database. This land use adjacency helped to determine both the existing and proposed mixed land use factors.

Table 31: Pedestrian Generator Factors and Scoring

Pedestrian Generators	Points	Weighted Multiplier	Final Score
Census Mobility: People who walk to work			
> 2	3	2	6
1 - 2	2		4
.25 - 1	1		2
< .25	0		0
Population Density (People per acre)			
> 25	3	2	6
5 - 25	2		4
1 - 5	1		2
Employment Density (Employees per acre)			
> 15	3	2	6
5 - 15	2		4
1 - 5	1		2
Age Density: Senior Citizens per acre (65			
> 10	3	2	6
5 - 10	2		4
1-5	1		2
< 1	0		0
Household Income (Affects Transportation			
< $34,500	3	1	3
$34,500 - $63,400	2		2
> $63,400	1		1
Age Density: Children per acre (under 16			
> 10	3	1	3
5 - 10	2		2
1-5	1		1
< 1	0		0
Disability Density: People with disabilities			
> 5	3	1	3
2 - 5	2		2
1-2	1		1
<1	0		0
Existing Mixed Land Use Adjacencies			
Housing near employment & commercial	3	1	3
Housing near commercial	2		2
Housing near employment	1		1
Proposed Mixed Use			
As shown in adopted Community Plan	2	1	2

a. The MGRA total population is divided by the MGRA area to determine the population density.

b. The MGRA total employment is divided by the MGRA area to determine the employment density.

c. The total population less than 16 years old and 65 years old and over is divided by the Census Block Group area to determine the density of these two age classes.

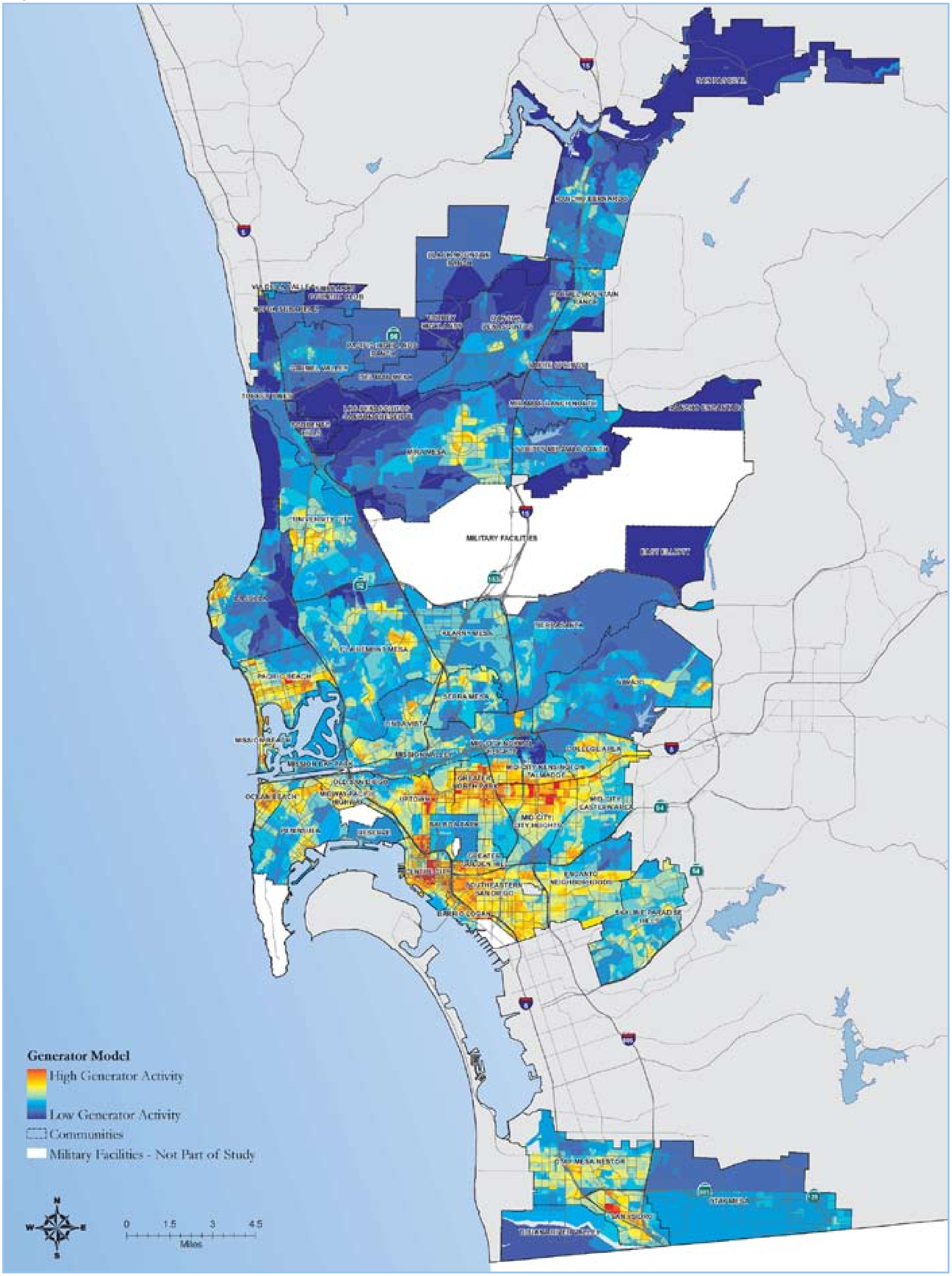
d. The employment and population MGRA densities as well as the age densities were categorized into density ranges and assigned points, so that MGRAs with higher density ranges receive higher initial points.

e. Median Household Income, Census Mobility, Age Densities and Disability Density were based on the Census Block Group and data was received from the Long Form taken in the year 2000.

f. The points from the age densities, income and disabled density were overlaid to make a citywide cell grid.

See Table 31 - Generators Point System for the specifics within the Generator portion of the model. Also, refer to Figure 9 Generator Map, for the results of the mapping exercise.

Figure 9: Generator Model Results



Six types of Detractors include:
- *Collisions*
- *Average Daily Trips*
- *Street Lighting*
- *Speed Limits*
- *Slope*
- *Railroads and Freeways*

5.2.3 Pedestrian Detractors

Detractors are features that are likely to discourage or detract people from walking. Examples of detractors include:
- Pedestrian / Vehicular Collisions
- ADT (Average Daily Trips)
- Street Lighting
- Speed Limits
- Slope
- Railroads and Freeways

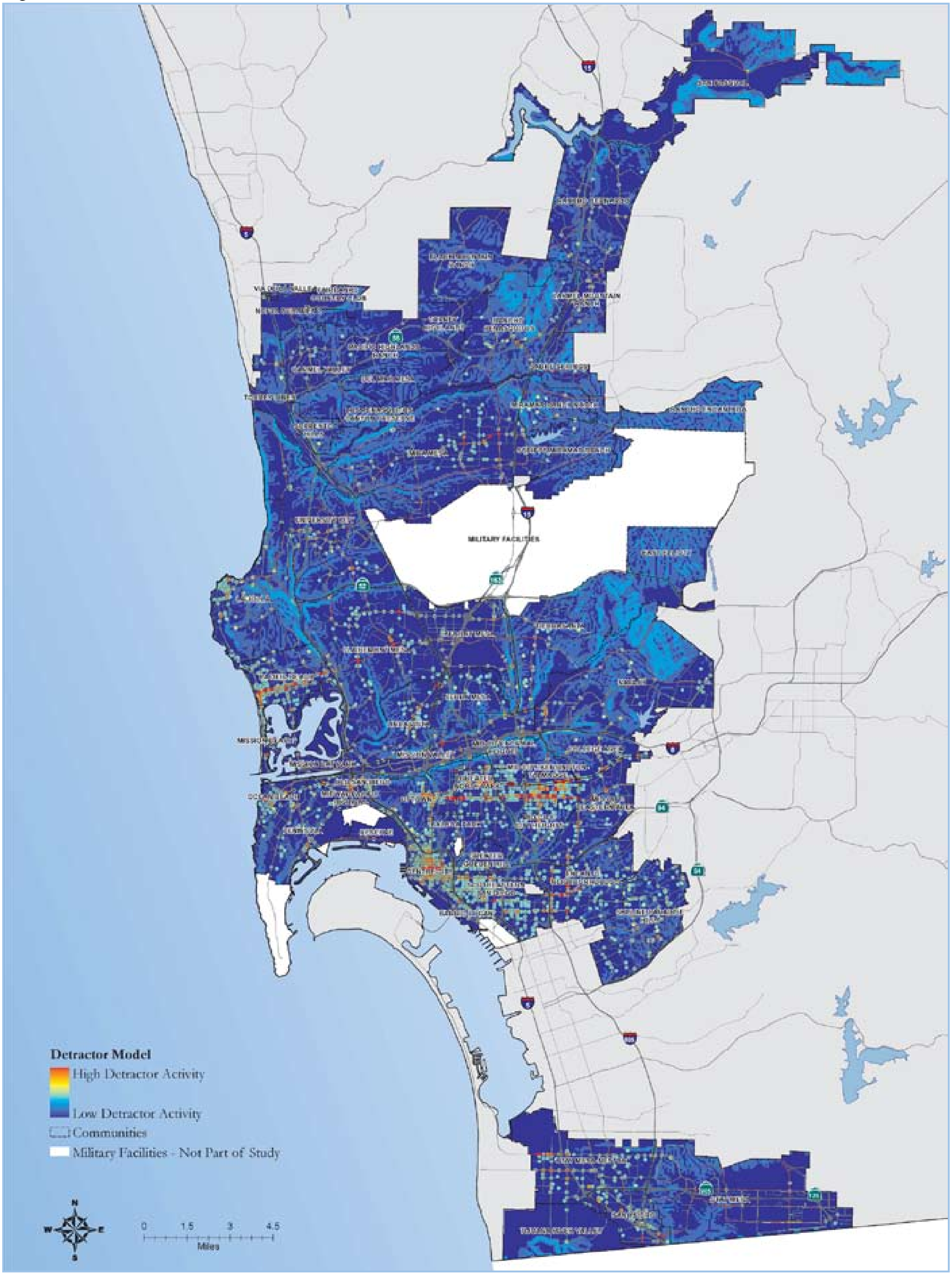
Detractors are also physical limitations of topography or street patterns and intensity of vehicular use that prevent pedestrians from getting around from their origin to their intended destination. The presence of a detractor, although a negative for walkability, increases the ranking of an area for priority pedestrian treatments. If an area has the potential for higher levels of walking based on generators and attractors, but missing pedestrian elements or barriers are in the way of making the area more used by pedestrians, then it should receive a high priority for funding and treatments.

Table 32: Pedestrian Barrier Factors and Scoring

Pedestrian Detractors	Points	Weighted Multiplier	Final Score
Collisions Per Year (1/16 mile buffer applied to each collision)			
1 +	3		9
.5 - .9	2	3	6
0 - .5	1		3
0	0		0
Average Daily Trips as it Affects Crossing Wait Time, Safety & Visibility			
> 45,000	3		6
35,000 - 45 ,000	2.5		5
25,000 - 35,000	2		4
15,000 - 25,000	1.5	2	3
10,000 - 15,000	1		2
5,000 - 10,000	0.5		1
< 5,000	0		0
Speed as it Affects the Ability to Cross Safely			
> 45	3		3
35 - 45 mph	2	1	2
25 - 35 mph	1		1
< 25 mph	0		0
Lack of Street Lighting			
estrian walking more than 300 ft from street lights	3		3
150-300 ft	2		2
75 - 150 ft	1	1	1
0 - 75 ft	0		0
Railroads & Light Rail as Barriers to Pedestrian Travel			
	1	1	1
Freeways as Barriers to Pedestrian Travel			
	1	1	1
Slope & Canyons as Barriers to Pedestrian Travel			
Landform Feature with Slope > 25%	2		2
Landform, Walkway or Street Slope 10-25%	1	1	1
Walkway Slopes < 10%	0		0

Refer to Table 32 - Detractor Point System, to see the specific factors and weighting for detractors. Figure 10 should be referenced to see the results of the Detractor Analysis.

Figure 10: Detractor Model Results



5.3 COMPOSITE MODEL

The Pedestrian Priority Model combines the Generators, Attractors and Detractors to identify areas that have high generators, attractors and barrier points.

The Pedestrian Priority Model combines the Generators, Attractors and Detractors to identify areas that have high generators, attractors and barrier points.

a. The Attractor, Generator and Detractor grid cell points were overlaid on top of each other to produce the Pedestrian Priority Composite Model.

b. The combined grid cells that contain generators, attractors and detractors were added to provide a total composite value for each combined cell.

c. The composite value identifies the areas that have a higher pedestrian activity point total.

d. The ranking of each community is then normalized by dividing the total pedestrian score by the community's acres. This allows the comparison of communities based on a common denominator and identifies the communities with high densities of pedestrian activity.

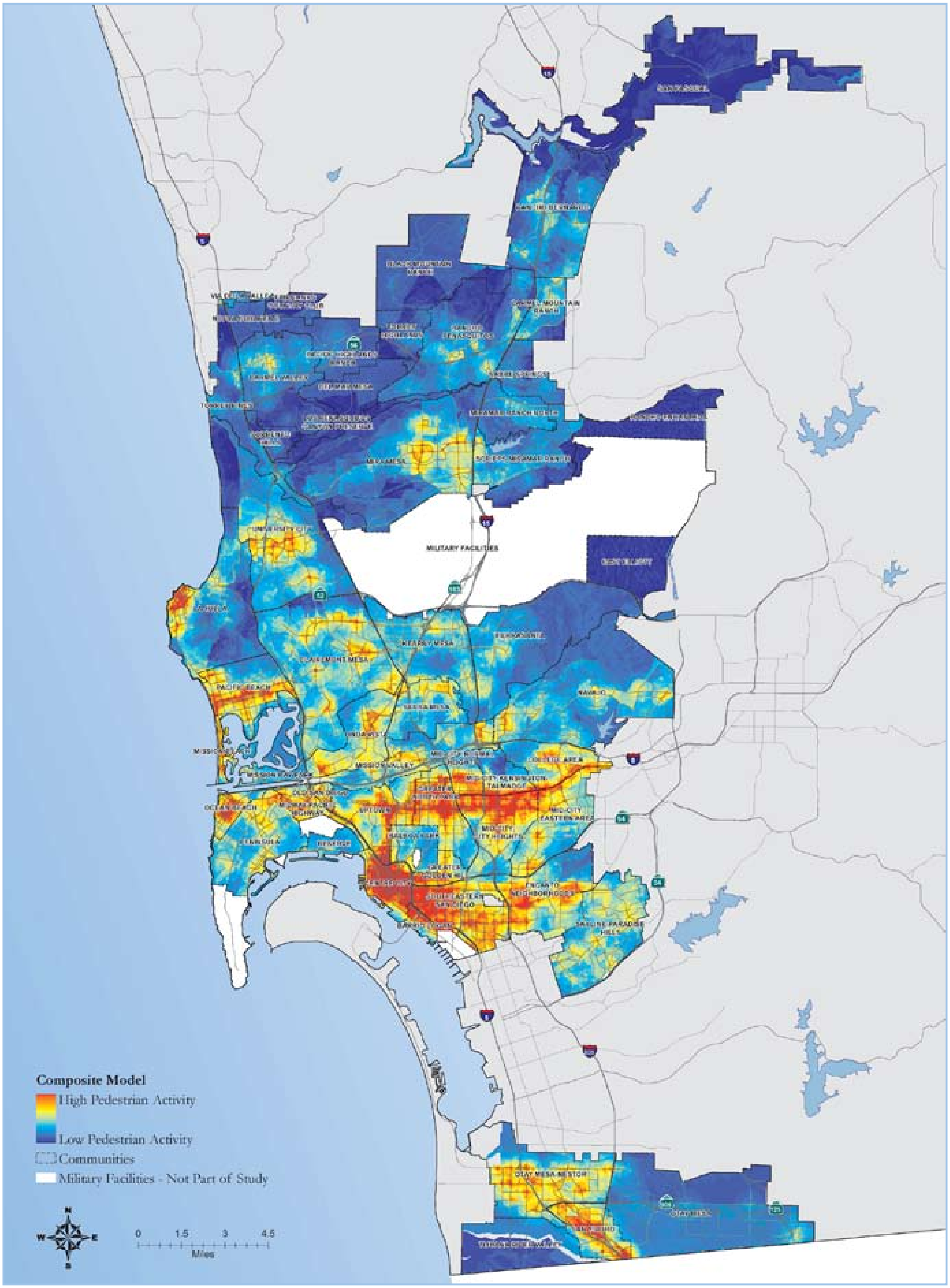
Refer to Figure 11, Composite Map, to see the results of the compositing of the three previous mapping efforts.

5.4 MODEL RESULTS CITYWIDE

The Pedestrian Priority Model combines the Generators, Attractors and Detractors to identify areas that have high generators, attractors and barrier points.

The intent of the PMP model is to identify the areas with the highest concentration of factors that help to predict walkable or potentially walkable conditions, not a total score for a community. Refer to Figure 11, Composite Map, to see the results citywide.

Figure 11: Composite Model Results



5.5 MODEL RESULTS BY COMMUNITY PLANNING AREA

The model results were adjusted so to as not give an advantage to any community based solely on size and it was adjusted to not unfairly affect communities that were mostly made up of single family residences and open space.

In order to normalize and rank the results of the model by community, the raw score was divided by the total number of acres found within the community. The resultant average score per acre is shown on Table 33.

In addition to normalizing the results by acre, it was determined by the PWG that communities that consisted of a large amount of low density housing and open space, were not being reflected fairly in the overall rankings. The intent of the model was to identify concentration of conditions that either do or would support high levels of pedestrian activity or that possessed barriers and issues that were preventing this level of activity.

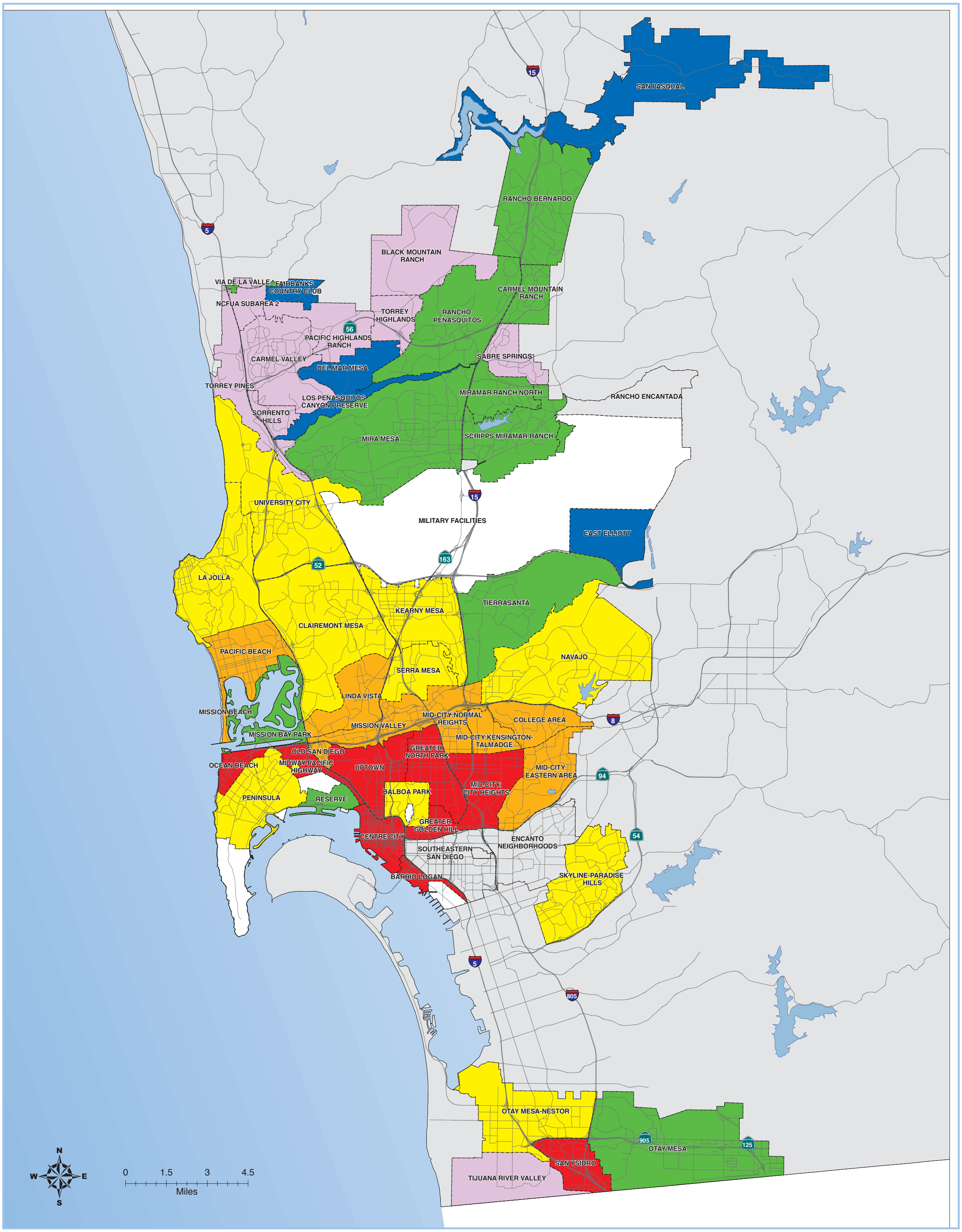
To avoid penalizing those communities with large land areas of open space and single family residential uses, the model results were adjusted by the removal of all acreage that was classified as low to moderate density single family housing and the removal of all passive open space areas. Both the cells scores and the acres were removed from the model calculations. The primary intent of the model is to identify the highest existing or potential concentrations of pedestrian activity and based on the rankings used in this model, single family residential neighborhoods and undeveloped open space will never be concentrated areas of pedestrian activity. With this adjustment, the rankings of each community are more reflective of the goals sought by this model.

5.6 PRIORITY FOR PLAN DEVELOPMENT BY COMMUNITY PLANNING GROUP AREA

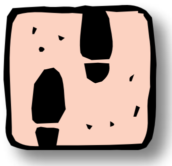
The model results follow known understandings that the highest potential for pedestrian use tends to be in our older neighborhoods that were provided with a good interconnected street system, have higher densities and mixtures of land use and transit access that all support more walking.

The overall rankings described in Table 36 are displayed on Figure 12. The ranked communities have been grouped by sets of 10. This ranking will be used as a guide to determine the order of plan development. The results of this map coincide with the higher pedestrian activity levels found in the traditional grid layout of the older communities, and with those communities having higher concentrations and mixtures of land use. The model also ranks communities high when they show a pattern of areas that have a predominance of district and corridor route types as well as areas with higher levels of pedestrian related crashes.

Figure 12: Community Ranking (see legend and results on Table 33)



Steps that can be taken ...



• The results of the Pedestrian Priority Model and the ranking of communities (Table 33) should be used to help set priorities for follow-on pedestrian master plans and potential funding of community wide or district wide pedestrian improvement projects.

• The appropriate City of San Diego Departments should continue to add to and adjust the model given changing conditions and validation of elements within the model that may or may not have been as accurate as desired.

• The results of the model should be made available to all community groups, planning interests, developers, project applicants, and planning / design / engineering professionals to assist in their efforts at improving pedestrian safety, accessibility, connectivity, and walkability.

• The results of the PMP must be provided and updated as part of any follow on community specific pedestrian master plan.

Table 33: Community Ranking Normalized by Size
(adjusted for open space and low density residential)

	Community	Avg Score per Acre (Total Scores / Acres - Open Space & Low Density Residential)
1	CENTRE CITY	268.8
2	GREATER NORTH PARK	223.0
3	SOUTHEASTERN SAN DIEGO	219.9
4	GREATER GOLDEN HILL	219.4
5	UPTOWN	219.2
6	MID-CITY:NORMAL HEIGHTS	212.8
7	BARRIO LOGAN	210.6
8	MID-CITY:CITY HEIGHTS	207.7
9	SAN YSIDRO	205.6
10	MIDWAY-PACIFIC HIGHWAY	200.7
11	OLD SAN DIEGO	197.6
12	OCEAN BEACH	195.8
13	COLLEGE AREA	195.4
14	PACIFIC BEACH	188.4
15	MID-CITY:KENSINGTON-TALMADGE	183.8
16	ENCANTO NEIGHBORHOODS	183.0
17	MISSION BEACH	180.5
18	MID-CITY:EASTERN AREA	176.5
19	LINDA VISTA	173.2
20	SERRA MESA	149.4
21	CLAIREMONT MESA	147.9
22	MISSION VALLEY	147.2
23	PENINSULA	146.7
24	SKYLINE-PARADISE HILLS	140.9
25	OTAY MESA-NESTOR	137.6
26	BALBOA PARK	134.1
27	LA JOLLA	129.0
28	UNIVERSITY	125.5
29	KEARNY MESA	125.2
30	NAVAJO	123.5
31	CARMEL MOUNTAIN RANCH	114.1
32	MIRA MESA	106.1
33	SCRIPPS MIRAMAR RANCH	105.5
34	RANCHO PENASQUITOS	104.9
35	TIERRASANTA	102.0
36	RESERVE	101.1
37	MIRAMAR RANCH NORTH	99.4
38	MISSION BAY PARK	99.1
39	TORREY PINES	93.9
40	VIA DE LA VALLE	92.8
41	RANCHO BERNARDO	92.8
42	LOS PENASQUITOS CANYON PRESERVE	92.0
43	CARMEL VALLEY	91.6
44	SABRE SPRINGS	86.3
45	OTAY MESA	85.9
46	TIJUANA RIVER VALLEY	82.0
47	PACIFIC HIGHLANDS RANCH	74.1
48	NCFUA SUBAREA 2	70.5
49	TORREY HIGHLANDS	68.1
50	SORRENTO HILLS	65.0
51	BLACK MOUNTAIN RANCH	62.6
52	MILITARY FACILITIES	61.6
53	DEL MAR MESA	56.3
54	EAST ELLIOTT	46.8
55	RANCHO ENCANTADA	46.0
56	FAIRBANKS COUNTRY CLUB	44.7
57	SAN PASQUAL	39.1