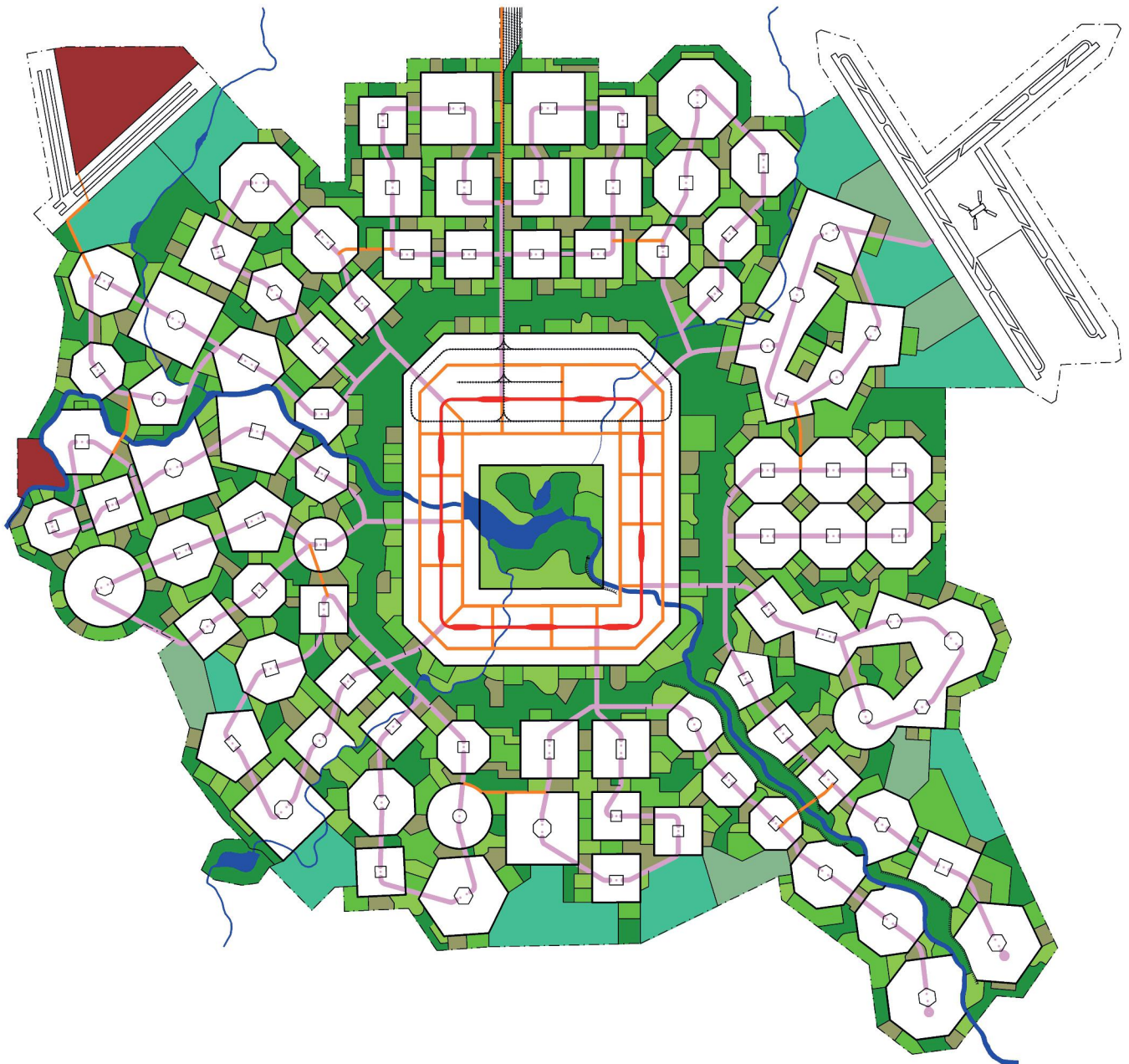


# PEDESTRIA

## AN AUTOLESS CITY

By Doug Windes

Non-Metric, English Unit Version





**PEDESTRIA**  
**AN AUTOLESS CITY**

By Doug Windes

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I dedicate this book to my parents, Bob and Bette Windes, who instilled in me the knowledge that through hard work, perseverance, and sheer will, anything is possible, and dreams can be made to come true.....

This book is a dream come true.

I would like to express special thanks to Poppy Milliken, Sarah Currin-Moles, Marybeth Buck, and Lara Jones for their editing skills and advice, and to Paige Hasson, Rob Thomas, and Les Schmadeka for their advice and feedback. Also, I am grateful to my wife Betty for her most valuable editing skills and for putting up with this project over so many years.

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# INTRODUCTION

The purpose of this book is to present the concept of an "autoless city", a city that functions without the mass use of the private automobile. In order to illustrate and substantiate this concept, an actual design is presented. This autoless city design is called "Pedestria". It is just one example (of which there could be many) created to demonstrate how such a city could function and appear.

Pedestria incorporates many ideas that collectively form the hypothesis of an autoless city. It illustrates these ideas and features through its physical design and regulatory organization. The major individual ideas of the autoless city concept are: transit orientation, pedestrian orientation, urban compaction, urban consolidation, and cluster development. Pedestria harbors an autoless society. It is environmentally benign because of the absence of most automobiles and their accompanying infrastructures. Pedestria is also designed with a number of characteristics that are associated with being autoless, but are not exclusively so. For example, Pedestria is a brand new city designed from scratch; it is developed through the procurement of a large amount of public or private land; it is finite in size (both in area and population); and it is reproductive (it has an administrative mechanism by which additional autoless cities will be built). All of these concepts and design features are substantiated and/or graphically represented throughout this book. They are illustrated with pertinent data, calculations, drawings, maps, tables, photographs, and explanations.

The basic format and progression of this book is as follows: It begins with a brief discussion about the success of the automobile, as well as a more lengthy discussion of the automobile's shortcomings. It then defines exactly what is meant by an autoless city and briefly explains why the first autoless city should be a brand new city built from scratch. Next, a cursory overview is given to familiarize the reader with Pedestria as a whole, followed by a detailed discussion of Pedestria's transportation systems and its urban development. Some of its more abstract concepts and issues are then dealt with, including finite growth and procreation of future autoless cities. There is also a discussion of various inherent problems, followed by an exploration of the many beneficial consequences of autoless cities. Finally, the last chapter discusses making this city a reality and contains recommendations for actual planning and construction of the first autoless city.

Most chapters contain footnotes documenting resources of factual information. Because there are a number of new words and phrases invented for this book (i.e. autoless, Pedestria, automobilialia), a glossary is included. It is located in the front of the book in the hope

that readers will familiarize themselves with these terms prior to continuing.

There may be some confusion as to the interchangeability between the frequently used terms "autoless city" and "Pedestria". "Autoless city" is a general term referring to any city or cities of an autoless nature, while "Pedestria" is one hypothetical example of an autoless city, specifically created for this book.

The design and map of Pedestria do exist, so they will most often be described in present tense. A real life Pedestria and other modern autoless cities do not exist; therefore, their discussions and descriptions will be in either present or future tense.

The main focus is the explanation of the autoless city concept using Pedestria as a model. Pedestria's transportation systems and its urban form are the center of this discussion and constitute the majority of the book. This dialogue includes considerable technical data and many references to maps and drawings. The positive results of an autoless city are also a primary focus of the book.

The remainder of the book is of a more secondary nature; these topics include the negative aspects of the automobile, the finite nature of Pedestria, its reproductive mechanisms, possible conversion of existing cities into autoless configurations, and development of the first autoless city. Although these are important topics, they have only been dealt with in a cursory way in order to help simplify the book and keep its focus on Pedestria's design.

The intention of this book is for the supplementary maps, photos, and illustrations to be studied concurrently as one reads. The book's text makes numerous references to this supplementary information. If the reader is only interested in the most basic understanding of this concept, then reading chapter 2 and studying the supplementary maps will suffice. Chapters 3 and 4 are the most in-depth of the book; they deal very specifically with Pedestria's transportation and urban configurations. **If nothing more, the reader should examine the supplementary maps at length, for they illustrate the actual design and are the most important part of this book.**

As author of this book I have a number of goals in mind. It is my intention that this book introduce the autoless city concept, which is an alternative to the automobile and its accompanying problems. I wish to promote thought and action in the direction of new alternatives to our present unsustainable urban configurations. It is my dream that autoless cities will help solve or reduce many major problems facing our

modern world. With this concept there is hope for creating a substantially better urban environment and to greatly reduce mankind's adverse impact on the globe. This idea can provide modern industrial societies a means of creating humane cities that are tailored to people, comparatively inexpensive, and are sustainable. The autoless city concept can also enable developing societies to attain the same positive outcomes and can help them bypass the expenses, environmental degradation, and pitfalls of today's modern auto oriented cities. This idea has the potential to contribute to these ends without sacrificing, but rather increasing standards of living. It is hoped that this idea will find its way to people who might some day be instrumental in turning it into reality. The construction of a brand new city, designed specifically without automobiles, will hopefully be the ultimate result of this book. It is also hoped that the first autoless city will be reproductive, and that numerous improved versions will multiply.

# GLOSSARY

- AUTO-CENTRIC** - Centered and dependent upon a high degree of automobile use and infrastructure.
- AUTOLESS CITY** - A city that functions without the mass use of the private automobile. It can be an existing city converted to an autoless nature or a brand new city built on undeveloped land. It is a city with characteristics that allow it to function without automobiles. An autoless city is not a vehicleless city. It contains a variety of transit, service, freight, and emergency vehicles.
- AUTOMOBILE, AUTO, CAR** – Used interchangeably.
- AUTOMOBILE INDUSTRIAL COMPLEX** – Businesses, industries, and government institutions that design, create, manufacture, support, service, monitor, and maintain the automobile transportation system, including direct, indirect, and partial involvement. For example, car manufacturers, auto repair shops, and paving companies are all directly involved with the automobile transportation system. Banks, insurance companies, law enforcement agencies, and judicial systems are partially involved because some (but not all) of their business is involved with automobiles. Hospitals and many medical facilities are indirectly involved because they take care of people injured in car accidents.
- AUTOMOBILE TRANSPORTATION SYSTEM** – The actual car and everything it drives on or parks on, plus all of the miscellaneous infrastructures and appurtenances that are necessary for the automobile to provide transportation. These include cars, trucks, roads, highways, bridges, retaining walls, signals, signage, striping, lighting, parking lots, parking structures, most storm sewers, and all other manner of automobilia.
- AUTOMOBILIA** - All things and all matters pertaining to and related to the automobile, including all infrastructures, businesses, and institutions just listed in **AUTOMOBILE INDUSTRIAL COMPLEX** and **AUTOMOBILE TRANSPORTATION SYSTEM**; plus cultural entities, including aspects of music, art, film, literature, advertising, and lifestyles.
- CENTRAL CORE** - What is often referred to as “downtown”; the center of the city; the area with the highest density of activity, the tallest buildings, and usually the most congestion.
- CLUSTER DEVELOPMENT** – Pedestrian oriented development centered around a transit stop. It exhibits compaction and consolidation of urban entities. The residential communities of Pedestria are cluster developments.
- COMPACTION (URBAN)** - Bringing urban entities within close proximity. In Pedestria this is accomplished primarily by eliminating the massive space used by automobiles and in part by reducing the amount of private open space through zoning of small lots, thus helping to allow an autoless city to function without automobiles.
- COMPREHENSIVE PLAN** - A planning document created by the primary developer of Pedestria, which establishes policies and guidelines for transportation, land use, utilities, housing, boundaries, and government entities. This plan is the foundation of the new city. It manifests the goals and aspirations of the city in its design and development. In some planning circles this is referred to as a “master plan”.
- CONSOLIDATION (URBAN)** - Stacking urban entities into multi-level buildings. In Pedestria this is accomplished by minimum height requirements (number of stories) and multi-use zoning requirements. This characteristic helps allow an autoless city to function without automobiles.
- ENVIRONMENTALLY BENIGN** - Having minimal adverse effects on all natural and human resources.
- FINAL OR ULTIMATE BUILDOUT** – The maximum density and highest land use for a given piece of property as per city zoning laws and the comprehensive plan.

**FINITE CITY** - A city that is limited in some way by premeditated design. Limiting physical size and population size are two of the best means for accomplishing this in an autoless city, thus allowing an autoless city to remain autoless.

**FREIGHT TAXI OR FREIGHT HAULER** - These terms are interchangeable. They are private or publicly owned licensed vehicles that are allowed to ply many of Pedestria's roadways. They are available 'for hire' to provide the general public with freight moving capabilities. Types of vehicles can vary from bicycle rickshaws and small electric vehicles to pickup trucks and large enclosed trucks.

**MINIMUM AND MAXIMUM HEIGHT REQUIREMENTS** - These are zoning development restrictions that force the number of stories and density of various properties within specific parameters (within a range of floors); related to "minimum density requirements".

**NEW CITY/NEW TOWN** - A brand new city or town designed and built from scratch. It can be a separate stand alone city or an adjacent satellite city.

**NEW TOWN MOVEMENT** - Refers to towns that were generally built after World War II and were purposely planned and developed to alleviate overcrowding in larger existing cities. These newly built towns were sometimes stand alone and self-sufficient; others were satellite communities built as part of a greater metropolitan area.

**OPEN SPACE** - Commonly referred to as "parks" or "park space". In Pedestria it can be categorized as natural, manicured, gardens and orchards, playing fields, and miscellaneous open space, such as golf courses and cemeteries. Other entities that can be considered open space are public plazas and open space within private developments.

**PEDESTRIA** - The hypothetical city presented in this book as an example of an autoless city.

**PEDESTRIAN ORIENTATION** - Urban design which is specifically tailored, scaled, and accommodating to pedestrians. This is another characteristic that allows an autoless city to function without automobiles.

**REPRODUCTIVE CITY** - A city that has the means to create another city. This includes the necessary legal and financial mandates, plus administrative resources (New City Bureau) to carry out this task. This is one of the characteristics that allows an autoless city to remain finite and autoless.

**RESIDENTIAL COMMUNITY** - In Pedestria this is an area where housing development predominates and surrounds a central transit terminal and a small central commercial area.

**SUSTAINABLE CITY** - An environmentally benign city with consumption rates of natural and human resources that can be renewed and/or maintained indefinitely.

**TRANSIT ORIENTATION** - Urban design that is specifically tailored to, and accommodating to, a mass transportation system. This is another characteristic that allows an autoless city to function without automobiles.

**TRANSIT SYSTEM** - A system of vehicles and infrastructure providing transportation services for a town or city. It can be a system consisting of various types of vehicles including buses, trolleys, light rail vehicles, heavy rail vehicles, overhead monorail vehicles, or subway vehicles. Pedestria's transit system vehicles are 60 foot long articulated buses.

**URBAN SPRAWL** - A low density and widely dispersed, repetitive development pattern that is characteristic of urban development relying on an automobile transportation system. Urban sprawl implies a negative connotation and should not be confused with the more positive terms of "urban growth" or "urban development".

# CHAPTER 1

## THE AUTOMOBILE - A BRIEF DISCUSSION OF ITS SUCCESS AND SHORTCOMINGS

### THE SUCCESS OF THE AUTOMOBILE

Before presenting an alternative to the automobile, I am compelled to acknowledge its extraordinary success. If sheer proliferation is a bench mark, then the auto has done very well. Massive numbers of automobiles in both industrialized and non-industrialized nations are obvious testimony to this fact. In 2010 in the United States, there were over 242 million<sup>1</sup> registered vehicles (1.27 people per vehicle<sup>2</sup>). The number of vehicles from 1950 to 2010 rose nearly 5 fold<sup>3</sup> while the population only doubled<sup>4</sup>. The number of miles driven from 1955 to 2010 rose over 6 fold<sup>5</sup>. In 2010, there were estimated to be over 1 billion vehicles worldwide<sup>6</sup>, including 600 million cars<sup>7</sup>. Over 50 million cars<sup>8</sup> were manufactured worldwide in 2010. These incredible numbers are only a small part of the automobile's importance throughout the world. The proliferation of the car in modern society has led to its overwhelming prominence economically, physically, politically, and culturally.



Cars, cars everywhere.

The automobile industrial complex, with all of its associated infrastructures and enterprises, is a major economic force. From the extraction of natural resources and the harvesting of raw materials, to all levels of manufacturing, to suppliers of parts and services, to sales and ownership, to financing and insuring, the automobile industrial complex and its myriad of associated businesses

and infrastructures represent a huge portion of the world's economy. In the U.S., employment in auto and auto-related businesses constitute nearly one in every ten workers<sup>9</sup>. The automobile and its infrastructures represent an enormous segment of local, regional, national, and global economies. Besides the cars themselves, consider the roads, highways, bridges, parking lots, parking structures, retaining and sound buffering walls, storm sewers, traffic signals, street lighting, street signage, and street striping all as products of large industries. Car sales, car insurance, car loans, advertising, maintenance, parts and repair, and government licensing agencies are also some of the larger auto support corporations and institutions. In addition, police, fire, ambulance, parking patrol, traffic court, emergency rooms, and even prisons have workloads related to the automobile. Collectively this array of local, national, and global enterprises represents an economic network possibly equal to or greater than the world's military industrial complex.

The process begins with extraction of natural

resources and their manufacturing into products used for the automobile transportation system. Raw materials are extracted and processed into products such as steel, aluminum, copper, lead, zinc, oil, aggregate, asphalt, cement, concrete, rubber, plastics, chemicals, glass, leather, lumber, paint, and textiles. Next is the actual design and engineering of these products into manufactured parts, then their assemblage into automobiles and infrastructures that make up the automobile transportation system as a whole. Cars are sold by dealers to owners, financed by banks, insured by insurance companies, serviced by dealers and repair shops, fixed by collision repair shops, cleaned and beautified by car-washes and detail shops, licensed and registered by government agencies; traffic enforced by law enforcement, courts, and penal systems;

protected by police, fire, and ambulance; and finally recycled by wrecking yards and recyclers. The scope and magnitude of all these companies and institutions involved in the automobile transportation system are simply staggering.

Politically the automobile industrial complex is, of course, very powerful. With enormous work forces,

payrolls, unions, capital investments, and government subsidies, its collective influence on political elections, government subcommittees, government lobbying, PACs, and appropriations committees is substantial. Auto related political groups represent not one, but many specialized aspects of the automobile industrial complex. Some of these groups are auto manufacturers, dealer associations, oil companies, tire companies, highway construction firms, and parts and service organizations. These voices are of the highest magnitude, and together are a tremendous political influence for promotion of the automobile.

The automobile has been successful in influencing our society culturally as well. In many respects we are the car we drive. The car is an extension of ourselves. For many the auto is their most prized possession, and for some their loftiest ambition is to someday own a fast, beautiful, and expensive car. For others of more modest means, the ownership of even an old car is a strong desire. In some neighborhoods we are more a society of vehicles than we are a society of people. We may seldom see our faceless neighbors except when their garage door automatically opens and their car with tinted windows drives away. As individuals we spend long hours behind the wheel. The average American spends over 100 hours per year commuting to work<sup>10</sup>. The average occupancy rate in the U.S. is 1.59 people per car on the road<sup>11</sup>.

We take great pride in owning, operating, and admiring these stylish powerhouses of mobility. An antique car or an unusually fine modern vehicle brings stares of admiration and words of praise as it passes by, much like a form of worship. For a teenager, obtaining a driver's license is a rite of passage, only surpassed in importance by the purchasing of one's first vehicle. Access and mobility have become everything. TV commercials show us driving everywhere, from pristine creek bed to inaccessible mountain top, then back to city street. Generations have been raised by a society born of the personalized private mobility of that marvelous



**All things automobile - Cars, roads, freeways, bridges, signing, striping, lighting, landscaping, irrigation, retaining walls, barriers, sound walls, and storm drainage; not seen in the photo: parking lots, parking structures, traffic signals, and auto oriented businesses.**

invention, the horseless carriage. We have long been a car culture.

Look at our media; it too is influenced by the car. From museum painting to photographs to sculpture to music, the car is common subject matter. Go to a movie, turn on the television, listen to the radio, open a magazine, read the newspaper, look through the yellow pages, or surf the web. The image of the automobile permeates all media. From commercials, advertisements, feature articles, postal mailings, billboard displays, and traffic news reports the promotion and allure of the automobile is pervasive. In popular music, songs are filled with rhythm and rhyme of shiny cars on neat streets cruising and bruising, speeding and racing down the highways of love and life. The image aimed at our minds is that of heavenly vehicular motion. Even our language has absorbed the words of the automobile; rush hour, freeway, gridlock, green light, red light, "fill her up", and "step on it" are common words and phrases that conjure up every-day images of our lifestyle with the automobile.

Close your eyes and listen to the sound of your city. Traffic is the overpowering sound in virtually every city. From background din to deafening roar, tires on pavement are echoing in our ears. Open your eyes and view your city. Of all the things you see around you, from any given place, in any given city, at any given time, how much of what you see is related to the automobile?

The automobile's infrastructures, industrial complex, and cultural manifestations are collectively the most widespread creation of mankind. Whether we view our city from street level or study aerial photographs, the dominant entity is the automobile and its many appurtenances. There are few aspects of modern life that are not directly or indirectly influenced by the car. The automobile and its manifestations represent mankind's most prolific enterprise. Indeed, the automobile has been very successful.



**A beautiful and expensive sports car - coveted by many, owned by few.**

The following is a cursory review of many automobile related problems facing our world today and our future tomorrow. It is not intended to be a complete study, but rather an attempt to simply inform the reader of the variety, magnitude, and extent of problems the automobile is solely or partially responsible for.

## THE AUTOMOBILE'S SHORTCOMINGS

With success has come problems. The automobile has given some of us the mobility that we have so desired, but there are prices to be paid and questions to be raised. The ability to travel from point A to point B quickly and inexpensively has been the automobile's main promise. Yet the dream of quick, unlimited, and convenient travel has only been a reality for a select few of the world's people. For a growing number of people, even in the U.S., the automobile is increasingly falling short of providing the cheap and rapid transportation on which its reputation has been built. Furthermore, the enormous environmental consequences created by the automobile transportation system are among the most serious we are facing today. The proliferation and success of the automobile may be



The car's promise of quick, unlimited, cheap, and convenient travel meets reality.

impressive, but the problems it bears are also pervasive and growing. There is one all-important question to ask ourselves regarding our heavy dependence upon the automobile: **Does the automobile, with its many infrastructures and accompanying lifestyle, represent a sustainable future for all of mankind?**

### URBAN SPRAWL

Urban growth is often considered good and equated with prosperity, but in the form of urban sprawl it can have significant downsides and negative characteristics. It is the nature of growth's ensuing pattern that can make it less than desirable. It is a major worldwide problem, and the automobile is a leading factor. Sprawl is the spread of low

density urban functions across the land accessed by an automobile transportation system. It is decentralized land use created in response to personalized mobility afforded by the automobile and by automobile scaled development (as opposed to human scaled development). The automobile is large and cumbersome. It needs lots of room and lots of roads to drive on, plus a parking space at the beginning and end of every journey. It also needs numerous businesses to keep it operating. All urban entities in an automobile oriented city must be sufficiently spread out to allow the movement of autos, their parking requirements, and the enterprises that accompany them. Without adequate space between urban functions, the city becomes clogged. All this necessary spreading out is the epitome of sprawl.

Urban sprawl is often characterized by development that is created by people making land use and development decisions as individuals rather than collectively. These development decisions are predominately based on the pursuit of maximizing personal or corporate monetary gains with little thought given to long range public consequences. Large scale holistic developments built with an emphasis on the common good have been rare. Most land development is haphazard and poorly planned. Urban sprawl has dominated automobile oriented societies, particularly the United States, since the end of World War II, but it has accelerated in recent decades in cities all around the world. In many of today's cities this type of development seems to reach outward in an unending fashion. The Los Angeles, California megalopolis is a prime example.

Sprawl is often associated with rapid growth, but its physical form is more often defined by the overwhelming inclusion of the automobile rather than by the speed of the growth. Because of the overwhelming dominance of the automobile, urban sprawl is distinguished less by its uniqueness than by its repetitive nature. Suburbs in Toledo look surprisingly like suburbs in Tacoma. Sprawl is also characterized by high per capita costs for basic services (public infrastructures, utilities, etc.). Utilities serving 1000 people on a large tract of land are much higher than if those same people lived on a small tract of land. Urban sprawl is very inefficient because of the vast numbers of vehicles constantly moving over great distances. It is also very inefficient in terms of human energy. A decentralized city expends more of our time, resources, efforts, and patience than a centralized city. It is also a type of land development that emphasizes private open space (individual houses with fenced yards) rather than public open space. This is true for most suburban development.

The automobile is not the only contributor to urban sprawl. Land use laws, tax structures, property development financing practices, population increases, and lifestyle changes can all encourage the rapid expansion of urbanity onto surrounding countryside. However, it is the automobile and the increased range of access that has made possible the great spreading out of our cities. A close examination will reveal that roughly 40% of all land within an American city is given over to the automobile<sup>12</sup>.



**Auto oriented subdivisions - spreading across the countryside (Mojave Desert).**

*Photo Credit - Pictometry International Corp.*



**Typical suburban single family houses on cul-de-sac with driveways and garages.**



*Photo Credit - Pictometry International Corp.*

**Typical suburban street development patterns: grid of arterial streets with commercial businesses and apartments; grid and serpentine residential streets with single family homes.**



**Typical modern auto oriented commercial district - shopping mall with its enormous parking lot and individual businesses, most surrounded by parking lots.**

*Photo Credit - Pictometry International Corp.*

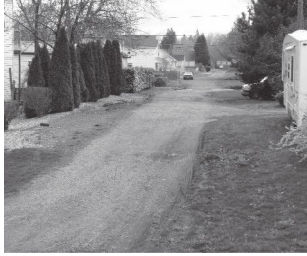
It is paved for the automobile to either drive on or park on, or it is specifically dedicated to the automobile, such as in the case of an auto oriented business. In portions of auto oriented cities (particularly commercial/retail districts) as much as 60-75% of the land can be dominated by the automobile. In other urban districts (residential) this figure may be in the 15-35% range. This quantity of automobile land use is prevalent in the majority of U.S. cities today. In older foreign cities these percentages can be less. Yet even in many foreign cities the contemporary development

pattern is predominated by low density sprawl that is associated with the automobile.

A typical sprawling suburban landscape usually consists of highly segregated land uses. This landscape is comprised of many homogeneous residential subdivisions accessed by grid or serpentine configurations of streets. Joining these residential areas is a grid of arterial streets, often bordered by small commercial strips and parking lots. Industrial and business parks, giant shopping malls, and big box stores are also located in varying groups throughout our cities. Accompanying these are more and



## VARIOUS TYPES OF URBAN STREETS



Residential street - gravel



Residential street - paved, with curbs, sidewalks, and planter strips



Small downtown street - low vehicle and pedestrian volume



Large downtown arterial street - high vehicle volume



Large cross town boulevard - with limited vehicle access and turning movements. Pedestrians are confined to small sidewalks and infrequent crosswalks.



Major urban freeway - no pedestrians or bicycles allowed.

bigger parking lots and/or parking structures, plus any number of frontage roads, access roads, and wide boulevards. Connecting everything together on a metropolitan level is a grid of freeways cutting enormous swaths through the urban landscape. These urban configurations repeat for miles and are the primary substance of our cities today.

As our cities spread outward they eventually join other cities - city upon city, spreading indistinguishably across the countryside. Cities grow to become metropolitan areas which grow to become enormous expanses of urbanization. These giant conglomerations of cities are



Photo Credit - Pictometry International Corp.

### Auto oriented development - repetitive sameness

often referred to as a megalopolis. Our cities have become boundless expanses stopped only by the most prohibitive of geographic features (such as bodies of water). With today's highway engineering and construction skills, even rugged mountain ranges have not thwarted urban expansion. Take, for example, Southern California's Los Angeles region. This megalopolis now extends basically from the Mexican border town of Tijuana up the coast 200 miles to north of Oxnard (with the exception of Camp Pendleton)<sup>13</sup>. The interior mountains had historically been a barrier to large scale development of the interior valleys and deserts. Today these mountain ranges no longer pose an obstacle to the spreading of the Los Angeles megalopolis. Bedroom communities are springing up in these distant places at an alarming pace. In the Mojave Desert, where the nearest town (Lancaster) is 70 freeway miles from downtown L.A.<sup>14</sup>, there has been a huge increase in population in recent years. Some workers in these communities are making automobile commutes of 75 to 150 miles per day<sup>15</sup>. The impetus for building in such distant places is primarily a function of housing affordability. The far urban fringes tend to have some of



Urban freeway - a huge swath that both connects and separates. The two tall buildings in this photo are over 670 feet apart.

the cheapest land prices and lowest new home prices. This outward migration is made possible by the mobility provided by the automobile. The people that buy in these distant communities are destined to spend a great deal more time and money, and to endure a reduced lifestyle, by choosing to live so far from their employment. The short range goal of securing an affordable home is often offset by the long range burden of commuting.

Automobile oriented cities have a number of characteristics that hinder other forms of transportation. Roadways provide avenues of access for those owning automobiles, but what about those who can't afford cars or are unable to drive? What about short trips, that are perfect for pedestrians and bicycles? In these situations our sprawling cities and their maze of automobile



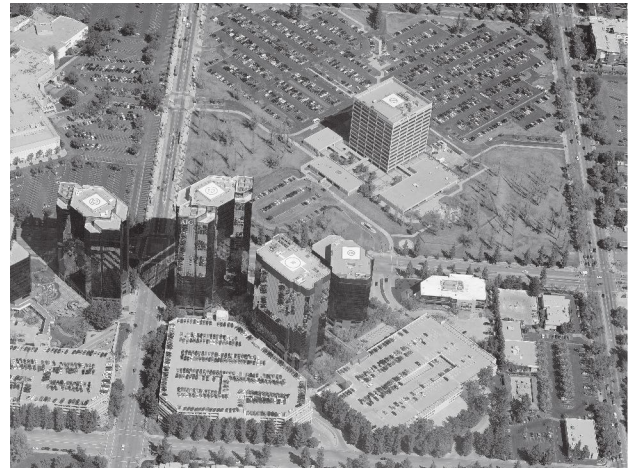
*Photo Credit - Pictometry International Corp.*

**An industrial/warehouse district with local and arterial access roads, some parking, and a considerable number of buildings occupied by automobile related businesses. Nearly all buildings are just one story.**



**A single corporate headquarters - taking up 193 acres of land, much of which is parking lot. All office buildings have a combined total of just over 2 million sq. ft. Conceptually, that amount of space could fit on a downtown lot of one acre (210 ft. x 210 ft.) in a single 46 story building.**

thoroughfares are an absolute hindrance. Some of the different types of automobile thoroughfares and development characteristics that adversely affect local pedestrian and bicycle access are long city blocks, cul-de-sacs, wide boulevards with medians or center turn lanes, widely spaced traffic signals, widely spaced crosswalks, freeways with few pedestrian overpasses or underpasses, traffic signals with short or inadequately timed pedestrian signals, streets with no sidewalks or narrow sidewalks cluttered with poles, meters and street side paraphernalia, and few or incongruent bicycle lanes. Urban features that are engineered to provide rapid and safe auto traffic over great distances are a hindrance and hazard for short trips of a pedestrian or bicycle nature. Our cities and neighborhoods are dissected and surrounded by dangerous lanes of speeding vehicles. Local destinations such as schools, shops, and churches are sometimes within walking or cycling distance, but because of dangerous traffic, the inconvenience of a serpentine route, or the lack of neighborhood connectivity, the automobile becomes the



*Photo Credit - Pictometry International Corp.*

**Modern office buildings - single or grouped buildings surrounded by parking lots and unused private open space or adjacent to parking structures, all accessed by a grid of large arterial streets.**



*Photo Credit - Pictometry International Corp.*

**The lack of connectivity - Here is a gated and walled in auto oriented subdivision. There is only one access in and out of this neighborhood for vehicles, pedestrian, and cyclists...and no access for outsiders who are not guests.**



**Modern commercial district (big box stores and mall) - with their necessary and accompanying mass of automobilia: roads, parking lots, signals, striping, storm drainage, lighting, security, auto businesses, etc.**

only choice for such trips. The automobile connects our neighborhoods and cities over the long haul, but at the same time creates barriers for the shorter distances. **The hundred mile commute is made possible, while the stroll to the neighborhood store is made difficult or impossible.**

#### URBAN SPRAWL EVOLUTION

At any given time in any city in America, there are a variety of construction and development plans being contemplated by city government and private developers. They may be urban renewal, development of vacant land, development of depressed property, and automobile transportation improvement projects. These can result in significant changes in local or regional traffic patterns and may have a domino effect on surrounding areas. These impacts will in some cases precipitate additional future public works projects in affected areas. Hence, there is a never-ending cycle of cause and effect between urban transportation and urban development.

Urban sprawl does not occur overnight. A city evolves over a period of time, with many possible permutations. As cities grow outward into the hinterlands, the property that is gobbled up often undergoes several conversions. A typical description of these evolutionary transitions is as follows: Pieces of farm or forest land on the periphery of the city are developed into residential units and subdivisions. As more farms are converted to suburban housing, the demand for local commercial enterprises rises. Crossroads and major existing roadways begin to spawn businesses of an ever increasing variety. As populations rise, the problems of traffic congestion and overcrowding of public facilities also rise. Two lane rural roads are then subjected to the burgeoning demands of urban traffic. Rural lanes are eventually reconstructed into arterial streets with complex traffic signals at major intersections. This traffic upgrading usually takes place over several decades as a variety of street improvement



*Photo Credit - Pictometry International Corp.*

**Remember, all urban land was once...**



**...rural or undeveloped land. Many steps were taken between then and now.**

projects. However, it may be done at once in a single grand redevelopment, depending on the speed at which the area is growing. Eventually, even large thoroughfares aren't enough. Super highways are cut across the growing urban landscape. As this landscape matures, infilling takes place. The remaining vacant land is finally developed, and higher density land uses are increasingly permitted. Apartments and shopping malls eventually replace some of the single family housing units and small shopping strips. Even the occasional high-rise apartment or office tower is to be seen. Manufacturing, warehousing, and industrial uses are located and grouped in this urban mosaic wherever permitted. Numerous succeeding zone changes are allowed as population densities increase (one land use after another, superseding previous land uses).

Residents who originally moved into these newly developed rural lands are eventually surrounded by an entirely urban setting. These people's reasons for remaining in their neighborhoods may be diminished by the fact that their neighborhood is no longer the quaint place it once was. For those who are compelled to continue seeking that rural/urban setting that exists on the fringes of development, there is a strong desire to move outward. New homogeneous homes in pastoral settings are a magnetic force for many. People are continually moving to the new frontiers of development and leaving behind many of the older neighborhoods. The automobile provides the ability to make such a move.

Commercial districts also experience attrition and evolution. As arterials replace country roads and as freeways supersede arterials, the changing patterns of travel can determine the viability of many commercial endeavors. Businesses that are sensitive to drive-by customers or businesses that are high profile and want to be visible are heavily influenced by changing patterns of traffic. Businesses come and go and relocate at an alarming rate as the urban fabric shifts from rural country side to inner city boroughs.



**Ever increasing traffic precipitated a widening of this major arterial, ruining this business's parking, causing them to go out of business, and leading to the demolition of this relatively new building and the construction of a brand new building with a newly configured layout.**

Our cities evolve and change over time because of a number of growth oriented forces. Some of these forces of change are the influx of jobs and people, the changing of land uses by both development pressure and by zoning variances, and the "pack up and move outward syndrome" made possible by automobile mobility. Fear is also an important factor in the abandonment of neighborhoods; fear of crime, fear of different kinds of people, and fear of falling property values are a few of the residents' motivations. The net result of these changes is a haphazard and random development pattern that leapfrogs across new countryside or alters existing ones. This gradual evolution of land uses begins with low density uses and rises to higher densities. It is generally an evolution of urban uses with no ultimate goal or plan in mind. The land uses we see in our cities today will in many incidences change to other uses in the future. Some land parcels never change, others change occasionally, and others change at a rapid pace. The succession of land uses of modern suburban real estate is brought on by the lack of long range development foresight and is facilitated by automobile mobility. In comparison to a city that is well preconceived and has ultimate density and land use goals (Pedestria), much of this urban evolution and change is needless, wasteful, and tears at the permanency of society.

## FUTURE CAR OWNERSHIP AND SPRAWL

If vast auto oriented sprawl is a reflection of the past 70 years of urban growth, then what are the prospects of a continuation of this phenomenon? Will the next fifty years see a continuation of this type of urban development? Several facts point to continued urban growth and automobile sprawl. The world's population continues to grow. Even in some developed countries, where the natural population growth rate is below the replacement level, there is an influx of immigrants to swell the population. Along with this increase in world population, there is a net increase in the percentage of urban residents. Rural to urban migration has been a phenomenon of profound proportions. Cities around the world, especially in underdeveloped nations, have mushroomed to enormous populations. Although all of these people are not automobile owners, a great many of them dream to be. Most of them settle in poor neighborhoods. However, without a major rise in income, the urban poor of underdeveloped countries do not represent a tremendous near future automobile market. There is, however, a growing segment of middle class people in some parts of the world who do represent a future automobile purchasing market.

The automobile/population ratio in rapidly growing developing nations is low. Yet the types of new settlement patterns in these nations are often low rise sprawl. They often consist of squatter settlements and low income, conventional auto style neighborhoods. These development patterns are haphazard and unplanned, emulating many automobile oriented communities. They usually are inefficiently arranged, lacking in public facilities, and have few desirable public amenities.

In some segments of the world's population, the number of automobiles per capita has been rising over the past several decades. Some reasons for this are increasing economic opportunities and higher standards of living<sup>16</sup>. Another reason is automobile oriented development increasing rapidly in proportion to the total area of urbanization<sup>17</sup>. Thus, the necessity of owning a car becomes greater for a larger portion of the population. An additional reason is that vehicles beget vehicles, and mileage begets mileage. The more cars there are, the more need for additional service vehicles such as tow trucks, tanker trucks, auto transport trucks, parts delivery vehicles, etc. This means an increase in the total number of vehicles in a given urban area, which leads to more pollution, congestion, and infrastructure wear and tear.

There are several large population groups around the world projected to have increasing automobile ownership in the near term. These are major markets with significant untapped potential for new car ownership. They are the people whose future car ownership will shape the future of vast urban landscapes. The BRICS nations (Brazil, Russia, India, China, South Africa)<sup>18</sup> and some Eastern European countries are strong candidates. With the advent of freer market systems and foreign investment, economic conditions are rising, as are the numbers in the middle

classes; thus, car ownership is increasing. Unfortunately, this will perpetuate and spread the negative influences of the automobile.

Lastly, urban growth and automobile sprawl will continue in the future because there are no good alternatives to the automobile. Yes, there is public transit available in many cities, and some cities even have excellent mass transit. But the automobile is still very present in these cities and has nearly complete domination in the suburbs. For most of the citizenry there is simply no alternative to the auto. Living without an automobile would be tantamount to losing access to the urban functions that enable us to survive and enjoy life.

### THE AUTOMOBILE'S USE OF NATURAL RESOURCES

The automobile and its accompanying transportation systems are massive consumers of natural resources. Oil is the primary natural resource that fuels our vehicles, and its prodigious consumption is widely recognized, even by non-drivers. In 2009 the United States consumed over 138 billion gallons of gasoline<sup>19</sup>. This averages to over 547 gallons per vehicle per year<sup>20</sup>. Petroleum is also the main ingredients in vehicle lubrication, specifically grease products and motor oil. Over 1.3 billion gallons of motor oil are consumed in the U.S. each year<sup>21</sup>. Oil is also the prime ingredient in the manufacturing of plastic products, of which 260 pounds are used in the average 2010 model car<sup>22</sup>. Another major user of petroleum derivatives is the asphalt industry. Millions of miles of roads and millions of acres of parking lots are paved specifically for automobile and truck use. There are approximately 1.38 million<sup>23</sup> gallons of oil used in the production of over 24.4 million<sup>24</sup> tons of asphalt each year in this country. There is a total of over 293 billion gallons of oil consumed in the United States per year for all uses<sup>25</sup>, most (71%)<sup>26</sup> of which is for transportation.

Only a finite amount of oil exists on our planet, and there is speculation about how long these reserves will last. Given the world's current rate of consumption, the existing

global reserves are expected to last until about 2059 (not including tar sands)<sup>27</sup>. Much economic and personal hardship will occur long before the last remaining reserves are exhausted. Price increases, oil shortages, economic and employment crises, political strife, and military conflicts will all be experienced and intensified as oil becomes a scarcer commodity.

Automobile fuel efficiencies have improved in the past several decades. This is partly due to legislative pressure on the auto makers, such as the Energy Policy Conservation Act of 1975, and partly because of consumer demands<sup>28</sup>. Yet these gains in efficiency have been more than off-set by an increased number of vehicles on the road and an increase in the total number of miles driven by each vehicle. In the U.S., the number of vehicles on the road increased from 49 million to 254 million between 1955 and 2009<sup>29</sup>. During this same time period, the total number of vehicle miles per year increased from 0.49 trillion miles to 2.63 trillion miles<sup>30</sup>. Simultaneously, average fuel efficiencies improved from 14.5 miles per gallon to 21.7 miles per gallon<sup>31</sup>. Still, the net results of these figures are that consumption of fuel increased during this period from 33.5 billion gallons to 121.3 billion gallons<sup>32</sup>.

Compounding the fuel efficiency and fuel consumption problems are the increasing numbers of sports utility vehicles (SUVs) and pickup trucks. These vehicles have poorer mileage in comparison to passenger cars. Sadly, most SUVs and pickups are being used as general passenger vehicles. Most trips do not include the frequently advertised scaling of mountains, fording of streams, or hauling of heavy-duty, rock-hard masses of macho material.

In addition to mass consumption of oil, there are a number of alternative fuels that are increasing in use. Some of these fuels are considered renewable, but most are not. Alcohol, ethanol, natural gas, propane, hydrogen, electricity, and synthetic fuel are some of these alternative fuels. They are either used in place of gasoline and diesel or in combination with them. Although they may have characteristics that make them desirable for replacing



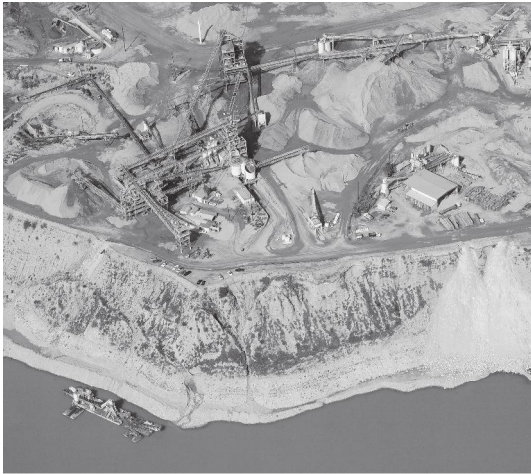
Photo Credit - Pictometry International Corp.

**Oil well and refinery, plus a tank farm - from well head to refinery to the gas pump or to other products. In the US, over 800 million gallons of oil are consumed everyday.**





**Construction of all our automobile infrastructure requires lots of resources, energy, equipment, manpower, and finances**



*Photo Credit - Pictometry International Corp.*

**Open pit mining for sand and gravel, most of which is used in the construction of automobile infrastructure - freeways, roads, parking lots, and parking structures.**

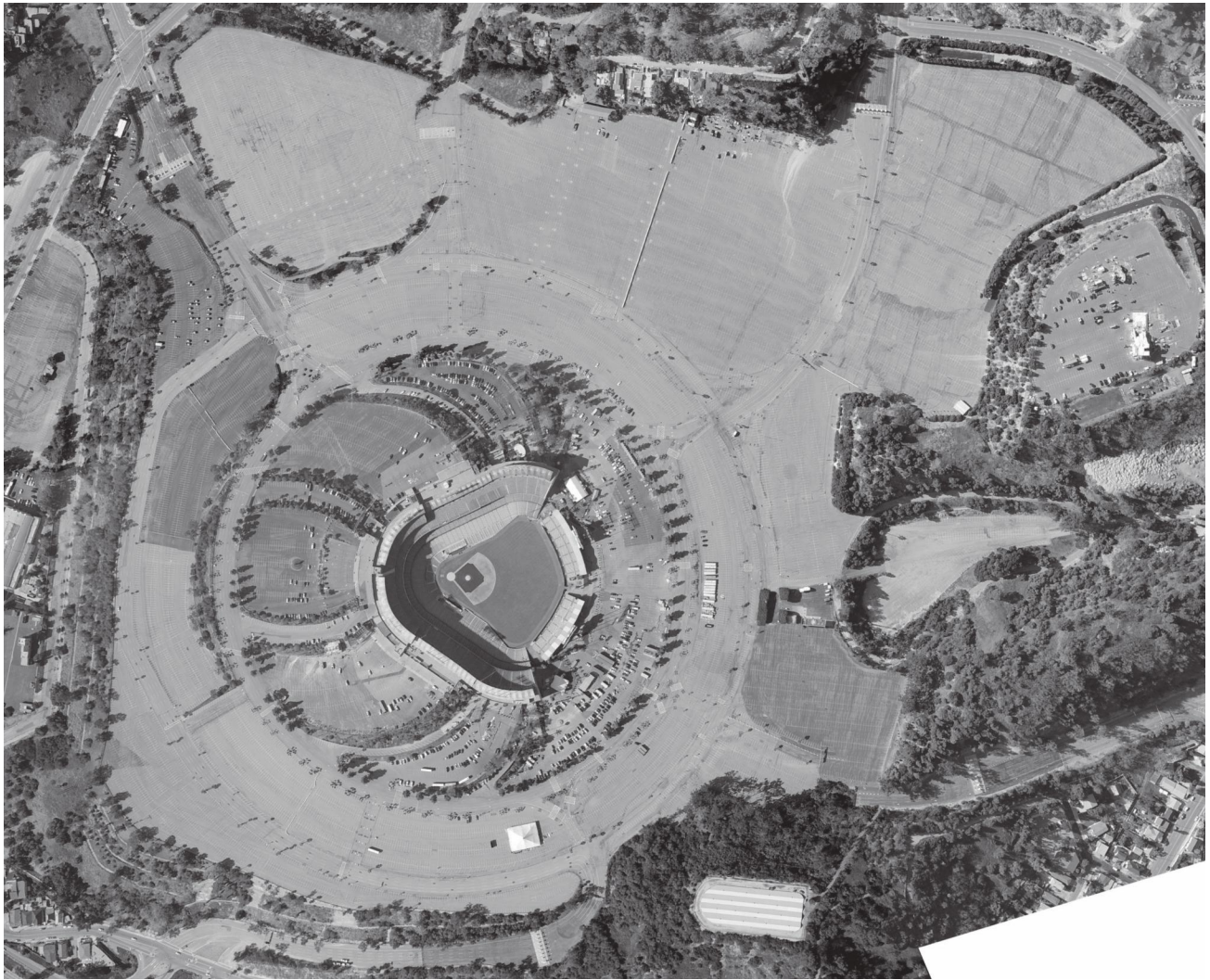
gasoline, they each have their own associated problems. Pollution, high cost, limited and finite supplies, vehicle conversion problems, safety issues, unproven technologies, lack of infrastructure, and public acceptance issues make these alternative fuels limited in their present use. If the automobile is going to continue in prolific numbers and continue being the leading means of transportation, then a major conversion to other fuel sources will eventually be required. Because of long term dwindling oil supplies, conversion will have to be started in the not too distant future. This is, of course, if our society continues to allow its domination by the automobile and refuses to encourage the replacement of the automobile transportation system.

Another class of materials that is massively consumed by the automobile is metal. The average automobile contains large quantities of metals: over 2,200 lbs. of ferrous metal<sup>33</sup> (steel and iron provide 69% of total vehicle weight<sup>34</sup>), over 250 lbs. of aluminum<sup>35</sup> (8% of vehicle weight<sup>36</sup>), over 55 lbs. of copper<sup>37</sup> (1% of vehicle weight<sup>38</sup>), and 39 lbs. of zinc<sup>39</sup>, plus significant amounts of lead, nickel, and other trace alloys. In addition to the large quantities of metals used in the manufacturing of the automobile, there are equally vast amounts used in the construction of the various auto infrastructures. This represents a large percentage of the world's total consumption of these metals. For example, bridges, highways, and parking structures contain structural steel and reinforcement bar. Metals are also used in lighting,

signalization, signing, and safety systems comprised of poles, mast arms, conduits, wiring, guard rails, and attenuators. Just in the United States, manufacturing of cars alone consumes 50% of U.S. ferrous metals (steel and iron)<sup>40</sup>, 27% of U.S. Aluminum<sup>41</sup>, and 80% of U.S. lead<sup>42</sup>.

There are several other natural resources the automobile also uses in great quantity. Rubber for tires is a prime example. In 2003, the U.S. consumed approximately 290 million tires<sup>43</sup>. Over 3 million tons of rubber tires, belts, hoses, gaskets, and other rubber car parts were produced for the U.S. automobile market<sup>44</sup>, using 62% of this country's rubber<sup>45</sup>. Of the nearly 21 million tons of rubber goods produced worldwide in 2005<sup>46</sup>, approximately 75%<sup>47</sup> was produced from natural rubber. Glass, plastics, textiles, and leather are other materials used widely in the manufacturing of cars. It is also a major consumer of a variety of chemicals: paints, waxes, solvents, preservatives, fuel and engine additives, hydraulic fluid, refrigerants, and antifreeze are some of the more well known. Wood and lumber products are also used widely by the construction industry in building bridges, parking structures, retaining walls, and other miscellaneous automobile appurtenances (usually as forms and support for concrete pouring). Automobile infrastructures are also a prodigious consumer of aggregate and cement. The millions of miles of roads, tens of thousands of bridges, and millions of parking lots and parking structures require copious amounts of rock and concrete. In 2009 in the U.S., over 2 billion metric tons of rock aggregate were used<sup>48</sup>, of which over 25% was just for highways<sup>49</sup>. In 2007, over 95 million metric tons of cement were used in this country<sup>50</sup>, with a large percentage going toward auto transportation.

An often overlooked aspect of automobile consumption is that of indirect energy use. Everyone is well aware of the energy going directly into their fuel tank. But what about the less apparent uses of energy, specifically for the manufacturing of automobiles and the construction and maintenance of its infrastructures? The burning of coal to produce steel, the generating of electricity to produce aluminum, and the burning of oil to heat, transport, and lay asphalt are all examples of the energy required to produce the parts that go into car manufacturing and to produce the roads and structures on which they drive. Another classic example is the energy required to obtain energy. In the U.S., over 16%<sup>51</sup> of the energy in crude oil is consumed from the time it is in the



*Photo Credit - Pictometry International Corp.*

**One sports stadium requiring a parking lot of enormous proportions and only used on game days. Think of the land, aggregate, pavement, drainage, striping, lighting, security, landscaping, financing, traffic on game day, air pollution, water pollution, street sweeping, and the walk people still have to make from and to their cars. Think of it all. In this example, there are 170 acres of parking for a 10 acre stadium.**



*Photo Credit - Pictometry International Corp.*

**Some parts of cities are more automobilia than anything else. Most of this picture is parking lots, parking structures, and roads. Less obvious are the banks and insurance companies in these buildings who do much of their business by financing and insuring cars and their infrastructures.**

ground until it is in your car's gas tank (well-to-tank energy use). This includes exploration, drilling, pumping out of the ground, transporting, refining, transporting to your local wholesaler, transporting to your local gas station, and finally pumping it into your gas tank.

One last area of resource depletion brought about by the automobile transportation system is the destruction of our land resources, "the paving of America". The paving of vast amounts of farm, forest, range-land, desert, and wetland properties is one of the automobile's extreme negative legacies, and the destruction of these landscapes is most often complete and irreversible. Once the flora and fauna are removed and the topsoil disturbed, the land rarely regains its former natural bounty. As mentioned earlier, approximately 40% percent of new urban growth in the U.S. consists of lands devoted to the automobile transportation system. Thus, 2/5 of the land in a city is consumed in order to access the other 3/5 of the land. This is a grossly larger number than is necessary for accessing urban entities. Between 1982 and 1997, roughly 1.6 million acres of land were taken over by urbanization each year (40% of which were strictly for the automobile)<sup>52</sup>. Prime agricultural and timber land are often prime urban development land. Agricultural and resource based land uses are gradually forced onto less productive land (less fertile, more expensive to farm, more prone to erosion, and still not safe from future urban development). Plant and animal species are also adversely affected by all this consumption of land as spreading urbanization is shrinking habitat and fragmenting remaining natural areas. This results in smaller populations and constricted gene pools. Plant and animal populations are increasingly subjected to pollution dangers, altered environments, and other human pressures. Increasing extinctions are a sad legacy of mankind's population numbers and our automobile lifestyle.

#### HEALTH HAZARDS CAUSED BY THE AUTOMOBILE

The automobile is a major health hazard. It is a hazard to human life on par with world war. In the United States in 2005, there were over 6.4 million auto accidents<sup>53</sup>, over 42,600 deaths<sup>54</sup>, and an estimated 2.9 million injuries<sup>55</sup> attributed to the automobile. The financial cost of these accidents was more than 230 billion



Car accidents kill and injure tens of thousands of people every year.

dollars<sup>56</sup>. Add to this the similar statistics from around the world, and you have a significant problem of global proportions.

These statistics reach every aspect of life in America. Rich or poor, majority or minority, male or female, young or old, there are no segments of society that go unscathed. The risk of death is so great that there is a 1 in 82<sup>57</sup> chance of an American dying from an automobile accident during his/her lifetime, and a 1 in 1.23<sup>58</sup> chance of any American being injured in an automobile accident during his/her lifetime. Family life, company production, and community bonds are all diminished by the premature extinguishing of lives and the maiming of our fellow citizens.

Nor are we safe outside of the automobile. As pedestrians, we are perpetually assaulted by moving vehicles. On sidewalks, in crosswalks, and in parking lots, the pedestrian and vehicle are constantly crossing paths. Generally the pedestrian has the legal right of way, but because of sheer mass, momentum, and numbers, it is a precarious advantage at best. For the bicyclist the odds are even worse. While the pedestrian and the vehicle cross paths, the bicyclist and the vehicle are most often on the same path. A slow cyclist on the edge of the road is no match for a high speed, heavy weight vehicle. A bicycle lane is a considerable help to the cyclist's safety, but in most cities their existence is sporadic at best. Fear of traffic is the number one reason why most people don't ride bicycles more often or at all<sup>59</sup>.

People are not the only creatures to be killed or maimed on our roadways and urban fringes. Pets, livestock, and wildlife fall victim by the millions. In the U.S., there are over 400 million animals killed each year along our roadways<sup>60</sup>. Numbers maimed are equally high. It is estimated over 1 million dogs are hit by cars each year<sup>61</sup>. Many die or are euthanized because of the severity of injuries or the overwhelming cost of veterinarian bills. With no instincts to guide them from this alien threat, pets, livestock, and wildlife litter our rural and suburban roadways by the millions. Wildlife fare the worst, as they have no human restraints such as leashes or fences to keep them from wandering. For wildlife, an injury caused by an automobile does not mean a trip to the veterinarian, but rather almost certain death due to debilitation.

#### POLLUTION CAUSED BY THE AUTOMOBILE

The automobile and the auto industrial complex also bestow health hazards in the form of pollution. People are directly exposed to a number of automobile produced toxins. We are also exposed indirectly through a polluted environment.

Throughout the world, automobiles are one of the largest polluters. The automobile and its vast array of appurtenances are responsible for several kinds of hazardous pollution: air pollution, water pollution, solid waste pollution, and noise pollution.



## Air Pollution

Air pollution is the most obvious and widely recognized form of automobile pollution. Belching smoke from car tail pipes is an everyday sight for most of the world's city dwellers. The automobile is not the only producer of air pollution; stationary point sources like manufacturing plants, electrical generation plants, and residential heating systems also produce air-borne toxins and particulates. However, the automobile is the largest non-point source, and in most regional airsheds it is the primary contributor.

The waste products of the car's internal combustion engine produce a number of toxic substances. Ozone, sulfur dioxide, hydrocarbons, nitrogen dioxide, carbon monoxide, carbon dioxide, and particulates are the primary evil substances. The manufacturing processes involved in producing the automobile and its accompanying infrastructures also contribute chemicals to our urban air and global atmosphere. Over 70% of the air pollution in the United States is attributable to auto and auto related sources<sup>62</sup>.

The accumulation of pollutants in the atmosphere poses a serious health threat. Depending on weather conditions, day of the week, and industrial output, the amount of air pollution can fluctuate dramatically. Everyone has stood on a street corner at one time or another and gotten a strong whiff of car exhaust. It is not a pleasant experience, nor is it healthy. As urban dwellers, we are exposed to these hazards from day to day in varying degrees.

On high pollution days, some cities issue public warnings for voluntary restrictions of physical activity. In the worst cities, the curtailment of school outdoor activities confines children to indoors on smoggy days. As air pollution worsens, the frequency of these restricted days also increases. However, for most people, outdoor activities continue unabated. Home and work responsibilities and personal schedules all require people to do activities as necessary. This results in many people

ignoring the public warnings and simply living with the pollution. Air pollution poses a particularly frightening threat to children's short and long term health. In cities all around the world, this is resulting in the deterioration of people's health and quality of life. Asthma, emphysema, and lung cancer are some of the afflictions that can be caused or exacerbated by polluted air. On a regional basis, air pollution blankets entire airsheds. Smog can cover entire metropolitan areas for days, even weeks. Air pollution is not just confined to the specific areas where it is created. Smog produced in the Los Angeles metropolis is often carried eastward into the California and Arizona deserts hundreds of miles away. Even the visibility/air quality in Grand Canyon National Park, 350 miles away<sup>63</sup>, can be severely affected at times by pollution from California. Pollution from northern latitude nations (U.S., Canada, northern Europe and northern Asia) frequently creates a swirling pall of smog that encircles the North Pole and the Arctic regions<sup>64</sup>. In 1991, the Kuwait oil well fires in the Persian Gulf at the end of the Gulf War created oily and chemical fallout hundreds and even thousands of miles away<sup>65</sup>.



Car belching smoke



*Wikimedia commons*

**Air pollution - an obvious reminder of the negative impact human activity is having on the local airshed and the global atmosphere. The majority of this pollution can be attributed to our auto dominated society.**

Acid precipitation is another manifestation of automobile air pollution and large power plant emissions that cause a myriad of negative results. Acid precipitation is produced when sulfur dioxide (SO<sub>2</sub>) and nitrogen oxides (N<sub>2</sub>O) react with water and atmospheric oxygen, producing a mild solution of sulfuric acid and nitric acid. SO<sub>2</sub> and N<sub>2</sub>O come from both natural and manmade sources, particularly from the burning of fossil fuels<sup>66</sup>. Acid precipitation in the form of rain, snow, or fog typically comes to earth hundreds or even thousands of miles from its source. Downwind agricultural crops are damaged by this precipitation and by other airborne pollutants. The chemical and particulate fallout from this pollution soils our clothes, buildings, and outdoor possessions. These acids eat away at our buildings and monuments, oxidize metals, and deteriorate a wide array of other materials. Some of the more notorious effects of acid rain are the deterioration of forests in both Europe and North America<sup>67</sup>. It contributes to a gradual killing of trees and other forest life. Acid precipitation is causing the destruction of aquatic life in thousands of lakes in Scandinavia, eastern Canada, and northeastern United States. Europe and North America are not the only places being affected. Forests and lakes around the world are feeling similar effects. This decline is a harbinger of worsening conditions for all species of life, including mankind.

Globally, the chemistry of our atmosphere is being altered by the burning of fossil fuels and the production of manmade chemical compounds. The automobile is a major contributor to this problem. Since the late 1970s, it has been documented that there has been a steady decline in ozone in the stratosphere and a larger springtime decrease of ozone over Earth's polar regions<sup>68</sup>. The atmosphere's ozone layer helps shield our planet from the sun's dangerous ultraviolet rays. This depletion is caused by the chemical reactions of chlorofluorocarbons (CFCs) and other chemicals in the atmosphere that break down and destroy ozone molecules<sup>69</sup>. This phenomenon is due in part to the refrigeration chemicals used in air conditioning units for buildings and automobiles. This phenomenon (ozone hole depletion) increased in severity until 1998<sup>70</sup>. The polar regions (Arctic and Antarctic), and even temperate regions, have experienced a decrease in upper atmosphere ozone levels (33% decrease of pre-1975 levels for the Antarctic, 3%-6% over the U.S.<sup>71</sup>). However, since 1998 ozone hole depletion has diminished. This is primarily due to the Montreal Protocol, an international ban on CFCs, that was signed in 1987<sup>72</sup>. Although the problem is gradually correcting itself, it is indicative of the magnitude of pollution problems that the automobile industrial complex can contribute to or create.

Globally, the earth's atmosphere is being changed in another significant and harmful way. The burning of fossil fuels in automobiles (along with other human activities) is adding to the global greenhouse effect. Although this phenomenon is still being studied intensely, the initial effects are already apparent. A number of greenhouse

gases are causing the earth to warm. Carbon dioxide (CO<sub>2</sub>) being the primary one. It is a byproduct of burning fuels, and the automobile is a leading culprit. CO<sub>2</sub> has increased from a pre-industrial revolution (1850) level of 278 parts per million<sup>73</sup> to a current (2014) 398 parts per million<sup>74</sup>, a 43% increase. The current rate of increase is 2.02 parts per million per year (2001-2010) and accelerating<sup>75</sup>. This significant change in Earth's atmospheric chemistry is predicted to have profound effects on the world's climate. A general increase in temperatures worldwide is being predicted, with the most significant increases in the higher latitudes. Also predicted are: significant changes in temperatures, rainfall, and snowfall; melting glaciers, permafrost, and ice caps; rising sea levels, coastal flooding, and increasing storm intensities.

Even the chemistry of the oceans is being altered by this rise in atmospheric CO<sub>2</sub> levels. The oceans are absorbing about 27% of the carbon dioxide being released into the atmosphere from burning fossil fuels and from deforestation<sup>76</sup>. This carbon uptake by the oceans is causing surface waters to increase in acidity. Since the beginning of the industrial revolution, the pH of the ocean's surface water has fallen 0.1pH units<sup>77</sup>. This represents approximately a 30% increase in acidity<sup>78</sup>, a phenomenon called ocean acidification.

The exact nature of these atmospheric and oceanic changes is still uncertain. The results and consequences in human terms and global biotic terms are even more unpredictable. However, it is certain that whatever changes may occur in the next decades and centuries will cause havoc for millions of people and most likely cause irreversible alterations to the natural environment. Besides the warming of the planet, there is also growing concern the atmosphere will soon reach a CO<sub>2</sub> saturation threshold, a tipping point at which point the natural process that helps keep CO<sub>2</sub> in check will break down<sup>79</sup>. CO<sub>2</sub> in high enough concentrations becomes detrimental to plant photosynthesis, a process that removes carbon from the atmosphere and adds oxygen. There is also the question of how much CO<sub>2</sub> the oceans can absorb.

All of these global atmospheric changes brought on in part by the automobile and mankind's prodigious use of fossil fuels have been referred to as a global chemistry experiment with little regard for consequences and no way to stop it if the experiment goes awry. And it is becoming increasingly apparent that it is going awry. This is truly a problem of global proportions and unfathomable consequences.

## Water Pollution

The automobile is also a heavy contributor to water pollution. There are two main kinds of water pollution, surface water (rivers, streams, and lakes) and ground water (aquifers). Past and present oil spills by large tanker ships or oil wells are the most widely known and publicized cause of water pollution. This type of catastrophe, whether

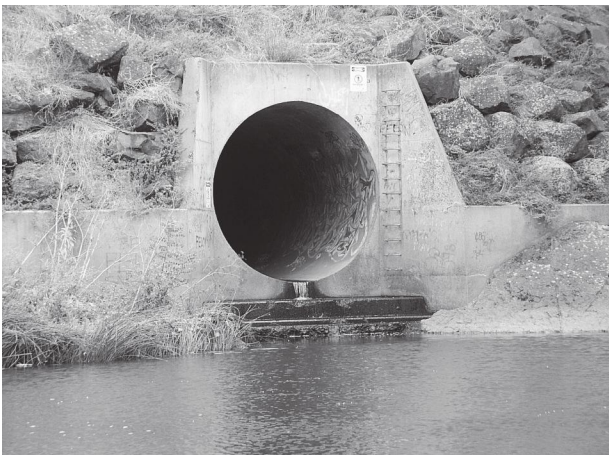
# URBAN STORM WATER



**Concrete lined storm ditch**



**Parking lot detention pond designed to filter out oils and grime. It is a future Hazardous Material Site in the making.**



**A huge storm pipe ready for that occasional downpour on a city that is overwhelmingly paved for cars.**

**All paved surfaces in our cities create huge storm water drainage issues. A great deal of our automobile infrastructure is designed and built to help handle this heavy load.**



**Someone's car leaked oil all the way down the street.**

**Everything that drips from our cars generally ends up as water pollution: oil, gasoline, antifreeze, brake and transmission fluid, brake pad and tire particles, snow removal salts, and car washing detergents. Plus much litter and debris accumulate on our paved surfaces and can end up in our waterways.**



**Inlet leading directly to streams and rivers.**

## Solid Waste Pollution

on lakes, rivers, or our coastlines, gets wide attention in the media, and rightfully so. These massive spills spoil vast areas of incredibly sensitive coastal or riparian zones. They cause incredible losses in terms of squandered natural resources, human effort expended to clean them up, and monetary losses to fisheries, tourism, etc. Oil spills on land are a regular occurrence, too. Rupturing of pipelines, train wrecks, tanker truck accidents, and refinery accidents and leaks occur, all too frequently. Of course, much of the oil that is spilled on land is eventually washed into our waterways and becomes a water pollution problem. In addition to major spills, there are millions of lesser spills. Oil lost from leaky engines, auto accidents resulting in spilled fluids, gasoline spilled by topping off the tank, or used motor oil being poured down a storm drain are the small spills and leaks that collectively add up. It is estimated that each year in the U.S. over 180 million gallons of used motor oil are dumped improperly on our land and into our waterways<sup>80</sup>. Many of the waste products from the manufacturing of the automobile and its infrastructure also end up as water pollutants. Even air pollution created by our cars eventually ends up being precipitated with rain or snow. This fouls our rivers and beaches, destroys recreation opportunities, kills fish and aquatic life, damages fishing industries, and creates health hazards.

In addition to surface water pollution, automobile caused contaminants find their way into underground aquifers. The pollution of aquifers is very insidious. Underground aquifers are deep within the ground, in essence invisible to us except with sophisticated tools. The exact nature and extent of an aquifer is difficult to determine. Measuring its cleanliness is equally difficult, time consuming, and expensive. Aquifers are essentially impossible to clean, for they cannot be excavated and washed. Often times an extremely long time is needed for pollutants to be flushed, and in some instances the pollutants can never be completely removed, only diluted. It is hard to prevent further pollution of our aquifers and surface waters in an automobile oriented society. With millions of people owning and operating potential pollution sources (cars), it is impossible to prevent all accidental and deliberate spills of oil and chemicals.

In the United States, approximately 50% of the drinking water comes from underground sources<sup>81</sup>, the other half from surface waters. These supplies of water are increasingly at risk from contamination. The chemical pollution of our industrialized world, much of which comes from the automobile industrial complex, is creating a human health and environmental problem of grave magnitude. In many parts of this country and around the world, potable water sources are very limited. When these are made unfit, entire communities suffer. The world is becoming a place of ever greater clean water scarcity, and the pollution of water resources is a disheartening cause.

Another type of pollution that the automobile contributes to is solid waste. The automobile industrial complex supplies the greatest abundance of consumable goods ever produced by mankind. This tremendous volume of goods (automobiles and their accompanying infrastructures) eventually become aged and non-functional, so old cars and their products are discarded. The result is an enormous volume of refuse. The auto wrecking or recycling yard provides inexpensive parts for car owners, epitomizing the fact that the automobile is a short lived consumer item that is long on discarded waste. Recycling of old automobiles is a major industry in its own right. Yet separating the various components of an automobile (the metal, plastics, glass, textiles, etc.) adds to the expense of recycling. This often leads to the less expensive option of simply throwing the vehicle away into a landfill or abandoning it. In the United States in 2005, over 17 million vehicles were purchased<sup>82</sup>. Of these, only about 10 million can be expected to be recycled<sup>83</sup>, with many of the remainder being discarded.

Tires are another disposal problem. In 2003, nearly 290 million tires were discarded in the U.S.<sup>84</sup>. Markets now exist for roughly 80% of all the discarded tires<sup>85</sup>, but the remaining millions are a disposal nightmare. Many landfills don't want old tires and require stiff fees or limitations on their disposal.

Modern urban automobile landscapes are constantly rebuilding themselves. Unfortunately, most new construction means destruction of previous land uses, creating large volumes of refuse. Concrete, asphalt, contaminated soils, base rock, reinforcing steel, and myriad highway accessories are all auto related refuse items. Each has its own special disposal and recycling problems.

Toxic substances are also a tremendous disposal problem. Some of the manufacturing processes of the automobile industrial complex produce toxic waste such as antifreeze, engine additives, batteries, used mufflers and catalytic converters, motor oil, brake fluid, and paint and oil solvents. Some of these used substances and parts can be and are recycled, but not all of them make it to the



Millions of automobiles, their accompanying products and services, plus all automobile infrastructures, gradually deteriorate and wear out and become refuse.



Photo Credit - Pictometry International Corp.

**Acres and acres of junk cars - Pieces and parts may find new life, but most will need recycling, and the process will begin anew.**

recycler. Many find their way to landfills or just into the environment. Some are discarded in large enough quantities to warrant their disposal in special high containment sites, which adds to their disposal expense. Neutralization, another alternative for some wastes, is also expensive. These toxins may also pose a significant threat to our environment and health due to illegal or accidental dumping.

Another chemical disposal problem that has global significance is the exportation of toxic substances. Most industrialized nations of the world have stringent regulations regarding the disposal of these substances. It has become increasingly cost effective for clandestine export of some of these wastes to underdeveloped countries with few or no regulations. This problem adds significantly to the environmental woes of the recipient nations and puts the health and well being of local residents in jeopardy. Many of these toxic substances are produced by the automobile industrial complex.

The number of landfills in the United States has declined considerably in the last few decades. In 1979, there were approximately 18,500 landfills in the United States<sup>86</sup>. In 2006, there were only 1,754<sup>87</sup>. Although the number of landfills has declined, the overall capacity of those remaining has stayed steady or even increased. In the U.S., there is currently about a 20 year disposal capacity<sup>88</sup>, with the northeast region having the least capacity and the western states having the most. The disposal of all waste, toxic or benign, will continue to be a burden on society in the future. The automobile and its accompanying infrastructures contribute to this problem on a large scale.

### Noise and Visual Pollution

Another type of pollution that the automobile contributes to is noise pollution. The dominant sound in our cities is that of transportation vehicles. Cars, trucks, trains, and jets create the majority of the noise in a typical city. Because of their sheer numbers, automobiles create the most noise, including the familiar sounds of revving

engines, squealing tires and brakes, honking horns, and car alarms. A general background din is created by engines running and tires on asphalt, bombarding the urban dweller day and night. Homes next to freeways and busy thoroughfares are seldom considered prime residential



**Rubber on asphalt means noise, which causes diminished property values and requires noise mitigation such as sound walls.**



**Our automobile roadways are often a cluttered mess.**

property, resulting in depressed real estate values. Noise pollution is not a direct health threat, but it does add to the stress in our modern society, which has adverse health consequences. It is a menace to our quality and enjoyment of life.

A final type of pollution that the automobile contributes to is visual pollution. Visual pollution is the cluttering of the urban landscape with a collection of appurtenances that are visible to the motoring public. For the automobile transportation system to operate properly and safely, enormous amounts of signing, striping, and signalization are required. In addition to this, many businesses in our auto oriented cities attempt to catch the eye of the fast moving motorist. This requires large signs and billboards, resulting in a conglomeration of visual stimuli plastered throughout the major arterials and commercial strips. This phenomenon is not harmful to people, but it does detract from the beauty of our cities. Much of this roadside clutter is very similar from one city to the next, and thus reduces any individuality. Visual pollution represents a deterioration of the quality of urban living.

#### THE COST OF THE AUTOMOBILE

The automobile is not cheap. If it was inexpensive to purchase, operate, and maintain, many more of the world's people would own them. **If the automobile was inexpensive and harmless to the environment, it might represent the future direction for mankind's transportation needs. But the automobile is not harmless to the environment, nor is it inexpensive.**

The economies of industrialized countries and even many underdeveloped countries are heavily based upon the



Some people have as much invested in their vehicles as they do their dwelling.



This home is as much for vehicles as people.

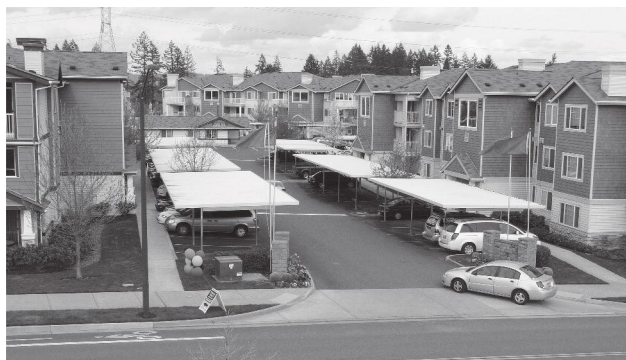
automobile industrial complex. In 2001, one in ten U.S. workers was employed directly or indirectly in motor vehicle related jobs<sup>89</sup>. Of the top 100 companies in the U.S.<sup>90</sup>, 15 are directly involved in automobile business, 14 are indirectly related, 6 or more are slightly related, and all of them have at least some component that is auto related. At the very least, every company, its employees, and its customers need parking or are users of the automobile transportation system. In other words, their mere existence generates traffic and demand for automobile infrastructure. These companies, their employees, and the economies they support are all, in varying degrees, dependent upon and users of automobile transportation. All economic



Single family dwelling with huge driveway and double car garage.



The backs of townhouses, each with a garage.



Apartment complex with covered parking provided.



**Cars - A necessary expense in an auto oriented city.**

transactions related to the automobile transportation system are a cost to society as a whole. One man's income from the automobile is another man's expense, in comparison to an autoless society, where these costs are totally unnecessary or vastly reduced.

The total cost of owning a private automobile and paying one's public share of the automobile infrastructure is made up of many different costs. The following "cost of the automobile" matrix (see next page) attempts to compile all the different types of costs that collectively constitute the total cost of the automobile and its accompanying infrastructures. Each type of cost is looked at relative to individuals, businesses, and government agencies, all of which make up society as a whole. The matrix is also broken into two parts, direct costs and indirect costs.

Direct costs are the tangible costs easily recognizable as necessary to own, maintain, operate, and enjoy the benefits of an automobile. Examples like purchasing a car,



**An office building and its accompanying parking structure. The parking structure's volume nearly matches that of the office building it serves.**

fueling it, and servicing it are obvious direct out of pocket costs associated with driving.

The indirect costs range in scope from tax payer funded infrastructures to small portions of home ownership expense to more unapparent societal expenses such as school busing and national foreign policy.

School busing costs and urban sprawl/poor planning costs are generally not considered a result of automobile dependence. But in Pedestria, where there is no school busing and where good comprehensive planning is inherent from the city's onset, these can be comparatively attributed to the automobile and its shaping of our cities.

Indirect costs, such as national foreign policy, balance of payments, government regulations, and auto related research and development, will not go away even if one or several autoless cities are built. However, any number of autoless cities that do get built will have a very significant effect on lowering the cost of living for individuals and the overall society within these cities.

The "cost of the automobile" matrix gives a complete overview of all pertinent costs associated with automobile ownership. For more specific numbers on the automobile's cost, there are a variety of ways and sources for calculating such a number. A specific dollar amount can be estimated by adding up all the various expenses of an average car. This number is difficult to obtain because some of the intangible costs are hard to estimate (i.e. individual shares of public automobile infrastructures). Another means of calculating the cost of the automobile is



**This apartment building has underground parking - literally, a buried cost passed on from developer to building owner to tenants.**

<b><u>COST OF THE AUTOMOBILE</u></b>	Individual	Businesses - Company cars & Fleet/Pool cars	Government - Local, State, & Federal agencies - Fleet/Pool cars
<b>DIRECT COSTS</b>			
<b>Purchase price or leasing cost or depreciation</b>	X	X	X
<b>Financing</b> - one time charge or fee (not applicable if purchased outright)	X	X	X
<b>Interest</b> - over the life of the car loan (not applicable if purchased outright)	X	X	X
<b>Auto Insurance</b> - premiums, accident deductibles	X	X	X
<b>Vehicle registration and vehicle taxes</b>	X	X	X
<b>Drivers license fee</b>	X		
<b>DEQ requirements</b> - testing fee, adherence (maintenance)	X	X	X
<b>Fuel costs</b>	X	X	X
<b>Scheduled maintenance</b> - oil, filters, tune-up, brakes, tires, batteries, etc.	X	X	X
<b>Unscheduled maintenance</b> - body repair, engine & misc. repair	X	X	X
<b>Miscellaneous extras</b> - seat covers, floor mats, washing, detailing, customizing	X	Rarely	Rarely
<b>Citations</b> - parking tickets, moving citations, legal fees/court appearances	X		
<b>Administrative costs</b>		X	X
<b>Miscellaneous costs</b> - parking fees, highway and bridge tolls	X	X	X
<b>INDIRECT COSTS - AS COMPARED TO PEDESTRIA</b>			
<b>Garage and driveway costs</b> - based on percentage of home value (approx. 2-4%). Associated costs: home price, mortgage fees, interest, property taxes, insurance, and maintenance. Note: Not all homes/residences have a garage or driveway, nor do all garages serve as vehicle shelter (i.e., storage, utility, shop). These and related costs may also apply to apartment buildings.	X		
<b>Parking lots and parking structures</b> - for both employees and customers. Associated costs: land, financing, design, construction, maintenance, property taxes, insurance, security, lighting, striping, landscaping, and handling of storm water.		X	X
<b>Public automobile infrastructure</b> - paid for by taxes (property, sales, income, gas, excise, etc.) and some user fees. Agencies: city, county, local, state, and federal. Infrastructures: freeways, highways, roads, bridges, retaining walls, guardrails, landscaping, storm sewers, storm water detention facilities, signing, striping, signals, and lighting. Associated costs: land/right of way purchases, financing, design/engineering, materials and construction, maintenance, utilities, and administration.	X	X	
<b>Public safety</b> - police, fire, and ambulance (automobile and automobile infrastructure related responses only).	X	X	
<b>School busing</b> (not necessary in Pedestria, except for out of town trips)	X	X	
<b>Congestion costs</b> - lost time and delays	X	X	
<b>Accident costs</b> - damage to vehicles and property, bodily injury or death, health care/rehabilitation, lost work/income, and insurance premiums/deductibles (auto and medical).	X	X	
<b>Research and development</b> - highway safety, improved materials, fuel efficiency, alternative fuels, alternative highway designs, pollution mitigation, etc.	X	X	
<b>Urban sprawl and poor urban planning costs</b> - increased lengths of utilities (sewer, water, gas, power, and communications); redundant utilities due to poor planning and increasing densities; increased lengths of non-automobile infrastructures (i.e., sidewalks, lighting); multiple businesses branch offices required for sufficient coverage of an urban area; diminished real estate values due to shifting land uses and associated traffic	X	X	
<b>Government regulations</b> - pollution abatement costs, development, and impact fees	X	X	
<b>Externalities</b> -not paid for by out-of-pocket costs, but rather by diminished quality of life: local and global air pollution; ground, surface, and ocean water pollution; noise and visual pollution; solid waste pollution (landfills & illegal dumping).	X		
<b>Balance of payments</b> - foreign debt (import/export imbalance)	X	X	
<b>National foreign policy</b> - necessary to protect our country's interests around the globe and to help maintain the smooth flow of the world's oil supplies; diplomacy and military defense.	X	X	





Photo Credit - Pictometry International Corp.

**Fleet of company vehicles. The more sprawled the city, the more vehicles may be necessary.**



**Traffic and parking citations are an inconvenience, worry, and expense for drivers.**

**They are also a major responsibility and expense for state and local governments. Enforcing all the traffic laws and vehicle regulations can be a huge monetary drain on all levels of government.**



**School busing - a huge financial drain on school districts (fleets of buses, drivers, maintenance, and administration), the necessity for which is mostly due to cars enabling sprawl. Distances have become too great, and streets have become too busy and dangerous for most children to walk or bicycle to school.**

on a cost per mile basis. This number is estimated and extrapolated over the average number of miles driven in a year's time or over the life of an average vehicle. This number may be given on a per car basis, an individual basis, or for an entire household. The household estimate tends to be more realistic across the full spectrum of society as non-car owners and non-drivers (children and elderly) are averaged in. There are a number of sources for this type of information. For instance, the U.S. Bureau of Labor Statistics estimates transportation expenditures at the household level to be approximately 18.9%<sup>91</sup>. The American Automobile Association publishes an annual "cost of driving" calculation, and the 2010 edition estimated the cost of driving an average car at 47.6 cents per mile<sup>92</sup>. Although this "cost per mile" statistic is informative, it is not easily understood by a lay person as it

relates to a household unit or a national average. This number is more meaningful if translated into a percentage of household income. Also, as a percentage rather than a specific dollar amount, it has more lasting value over time and is not affected by inflation.

In order to convert the 47.6 cents per mile into an average percentage of household income, other statistics must be used and a calculation made. 47.6 cents per mile is multiplied by an average number of miles (13,475<sup>93</sup>) driven per vehicle per year; this is multiplied by the average number of vehicles per household (1.92<sup>94</sup>) and then divided by the average income per household (\$51,914<sup>95</sup>), equaling 23.7%. Even this number has room for interpretation. Using numbers from different sources and different years, this number can vary greatly<sup>96</sup>. For all practical purposes and general discussion, it is realistic and safe to say the average American household spends approximately 15-25% of their

income for automobile transportation. This number will vary widely among households, with a higher percentage for the lower middle class, a lower percentage for the wealthy, and a far lower percentage for the extremely poor (as they are less likely to own cars). This amount, averaged to 20% (1/5), does not take into account all the indirect costs as compared to Pedestria. Hence, this number compared to Pedestria could be construed as overly conservative and is likely to be an under-estimation. However, for simplicity's sake this number (20%) will be used throughout this book as the average amount an American household spends per year on automobile transportation.

Besides individuals and households, businesses also incur costs that are associated with our automobile transportation system. Many of the costs are similar to those incurred by private individuals. Rather than give a detailed itemization of costs with actual dollar amounts, a list of each potential cost is given along with a short



Photo Credit - Pictometry International Corp.

**Auto oriented business - Pictured is an auto dealership taking up many acres and located between a freeway and a large boulevard.**



**Sprawling cities require more vehicles; more vehicles beget bigger freeways and structures; bigger structures require more resources.**



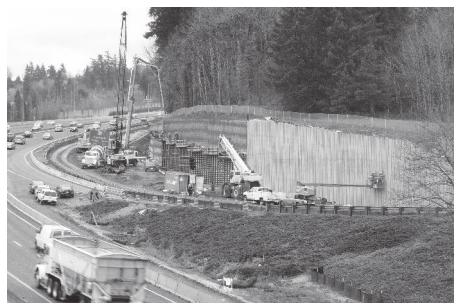
**Gigantic advertising - trying to catch the eye of the fast moving motorist; often a necessary business expense in an automobile oriented city, plus it adds to visual pollution.**



**Double-decker interstate freeway bridge through town - huge in size, huge in price. We all share in the expense.**



**Purchasing a brand new show room luxury vehicle = sticker shock.**



**Widening a freeway in hill country via huge earth works and retaining walls.**



**Large church parking lot - used only on Sunday**



**Automobile infrastructures are deteriorating all the time. The elements and wear and tear take their toll. Maintenance and up keep are a continuous chore for city, county, and state governments, and even for private citizens in regard to driveways and garages.**



**Inclement weather - The more roads and vehicles in a city, the greater the expense for snow removal and spreading of gravel and deicer (salt). Don't forget the high incidence of accidents.**

discussion of each. This discussion will refer to the costs businesses incur for their own fleet of company cars and for collective costs of being in an automobile society.

Many businesses have their own cars and/or fleets of cars. These vehicles are used by company employees for business related purposes, and are generally not for personal use. These vehicles are either purchased or leased. If purchased with a loan then finance charges and interest are incurred. Insurance costs and administrative costs for the employees' use of the vehicles are additional expenses. The operation of these vehicles also has its expenses (fuel, scheduled and unscheduled maintenance, parts, tires, miscellaneous extras, fees, and licensing).

Like the driveway and garage of the home owner, businesses also need a place to park or store their vehicles. Customer, employee, and fleet parking all take up space. Besides the footprint of the actual building, parking lots and parking structures are a major expense for many businesses, as these facilities also include striping, lighting, drainage systems, landscaping and security. Businesses also incur government regulation costs, pollution abatement costs, development fees, impact fees, and property and income taxes (some of which finance auto infrastructures). An additional cost that businesses incur is the cost of needing multiple branch offices or store outlets to serve and compete adequately in a sprawling metropolitan area. In a more compact city, like Pedestria, fewer branch offices would be needed to provide the same level of coverage.

Government agencies also have their own cars and vehicle fleets. The following are local government bodies that own fleets of vehicles and motor pools: park districts, port authorities, city municipalities, county governments, and local special districts (i.e., police and fire districts, water and sewer districts, etc.). These vehicles have the same associated costs as mentioned with private business vehicles (i.e., operating costs, maintenance, parking, etc.). Local governments also own, operate, design, construct, and maintain a variety of automobile infrastructures: roads, highways, bridges, signing, striping, signals, street lighting, public parking lots/garages, retaining walls, guardrails, highway landscaping, storm sewers, and storm water detention facilities. They also must maintain and sometimes purchase additional right of ways. Other costs assumed by local governments are for the staff necessary to provide all of these services. Added expenses include school busing costs for hauling school children through sprawled neighborhoods and through dangerous, automobile filled streets. For protection and roadside assistance, local governments provide police and traffic enforcement services, parking patrol services, judicial services, incarceration services, and fire bureau and rescue services for their communities, all of which serve the large automobile component of our society.

For example, an automobile accident can result in the summoning of rescue units, fire bureau units, and police units. If a citation is given, an insurance claim made, or a law suit started, then numerous public and private enterprises may come into play, including private and



**More money spent for highway expansion will eventually lead to more cars and more automobilia.**



**Increasing numbers and increasing complexity of signals are a result of ever increasing numbers of cars.**



**More roads and highways mean more signage to increase safety and help keep us from getting lost.**

public attorneys, judicial departments, and prison/incarceration facilities. Enforcement of our traffic laws is a tremendous consumer of our local government resources. Significant amounts of our police, sheriff, and fire department budgets are appropriated for traffic law enforcement and accident response.

A percentage of taxes and fees that individuals and businesses pay to local governments goes toward funding these automobile infrastructures and auto related services. These local government agencies have various means of raising funds for their budgets, including property taxes,



**Vehicles beget vehicles. The more automobiles there are, the more accompanying vehicles there are: car haulers, tow trucks, tanker trucks, and all manner of highway construction equipment and materials haulers**

income taxes, bond measures, user fees, special fees, etc. Local government agencies spend significant segments of their budgets on automobile transportation related expenses.

Similar to local governments, state and federal governments also have automobile related expenditures. They have their own motor pools that have associated costs. The state and federal highway systems, most of which are administered and maintained by the states, require large influxes of money. The state and interstate highway systems both have considerable miles of urban roadway. These urban roads and highways, plus parking structures and other auto transportation entities, have associated costs with regard to their administration, design, construction, and maintenance. State operating budgets must account for these urban automobile related transportation needs. There is a wide variety of sources of funds available for automobile infrastructure. These include private, local, state, and federal moneys. They are in part derived from private development fees, city and county property tax, state income tax, gas tax, and, in some cases, even sales tax. Most federal aid moneys are derived from gas tax and are placed in the Highway Trust Fund. This fund is administered by the Federal Highway Administration (FHWA). Its funds are awarded to various projects that are overseen by each state's Department of Transportation. The funds are ultimately spent by local jurisdictions on all manner of highway and related projects.

State and Federal governments also allow tax credits, deductions, and depreciation on some auto related expenses. For example, the automobile may be used as a business expense, with depreciation, mileage credits, and parking expense deductions. These allowable exemptions reduce the amount of revenue received by government bodies. This special treatment afforded our automobile transportation system reduces revenue collections. If revenues collected from automobile

related enterprises do not pay for all auto related expenses, then other revenues have to subsidize this shortfall.

State and Federal governments also have regulatory costs that are related to our society's dependence on the automobile. The following is a partial list of such agencies: Department of Motor Vehicles, Department of Environmental Quality, Environmental Protection Agency, and the Superfund waste clean-up program. These departments are involved in the regulation and licensing of vehicles and drivers, and also the safety and cleanliness of our automobile transportation system as it pertains to our environment.

Another cost associated with our automobile society that is incurred by our government is the growing responsibility of policing and protecting the international nature of the automobile industrial complex. The increasing interdependence of the world's economies, coupled with our country's growing dependence upon the automobile, is making it a requirement that we become more involved internationally to protect our economic interests and our automobile based lifestyle. The United States' heavy dependence on the automobile and oil (particularly foreign oil) has made this country vulnerable to disturbances abroad. 71% of this country's petroleum consumption is by transportation<sup>97</sup>, the majority of which is for the automobile and its associated infrastructures. In 2005, U.S. oil imports peaked at 60%. In 2010, about 50% of the petroleum consumed by the U.S. came from foreign sources<sup>98</sup>. It is predicted that by the year 2035, oil imports will decrease to 36%<sup>99</sup> as our domestic consumption decreases slightly and our domestic sources increase, due primarily to fracking of existing oil bearing formations. Whether these predictions come true or not, foreign oil producers will still have a strong influence on our economic security and social well-being far into the future. Foreign intervention, either through diplomatic channels or through military operations, will continue to play a role in this country's future foreign policy,

especially if we continue our ever increasing dependence on the automobile.

The United States' involvement in the Persian Gulf War in 1991 and the Iraqi War of 2003 are classic examples of this kind of foreign policy. Although it was stated that the primary reason for our involvement in 1991 was upholding the sovereignty of Kuwait (a monarchy), it is Kuwait and the Persian Gulf's vast oil reserves that were paramount to our interest in this region. U.S. Military expenditures were estimated to be \$7 billion, including the cost of replacing lost equipment<sup>100</sup>. In the 2003 Iraqi war, 20,000-35,000 military lives were lost (all sides, 464 coalition forces) and over 100,000 civilians were killed<sup>101</sup>. Although this war was more than just attempting to stabilize an oil rich region, the human and economic cost must, at least in part, be considered when evaluating our reliance upon the automobile and its thirst for oil.

There has also been a considerable concern during the last several decades about this country's balance of payments. We are spending more on foreign goods than foreigners are spending for our goods<sup>102</sup>. The United States is currently the world's largest debtor nation<sup>103</sup>. A considerable share of our foreign spending is for automobile related goods. Foreign auto makers supply Americans with 54% of the cars sold in this country<sup>104</sup>. Oil is the other major foreign resource for which we spend heavily. This country spent \$188.5 billion in 2009 for foreign oil (\$617 for every single U.S. citizen)<sup>105</sup>. As worldwide oil reserves diminish and global consumption rises, we will be spending more of our hard earned dollars on foreign oil. All this debt and its interest payments are a burden on this country and can be partially attributed to our huge reliance on the automobile.

Another group of costs associated with the automobile is for research and development. There are many people, businesses, and government agencies that are trying to improve our automobile transportation system. These costs are paid for indirectly through taxes and the prices we pay for purchasing automobile goods and services.



Numerous manhole and valve covers - an indication of all the hidden utilities beneath this intersection



For safe and functional roads and highways, striping is a necessity. It is often repainted every year.

The alleviation of problems caused directly by the car, and the hope of improving the overall system, are two main approaches being pursued. Some areas of research and development are as follows: alternative vehicles, engine efficiency improvements, alternative fuels, pollution control devices, alternative pavements, alternative highway design and construction techniques, computerized vehicle navigation, and computer controlled vehicles (smart highways and smart cars). These areas of research and their cost must also be included when evaluating our reliance upon the automobile.

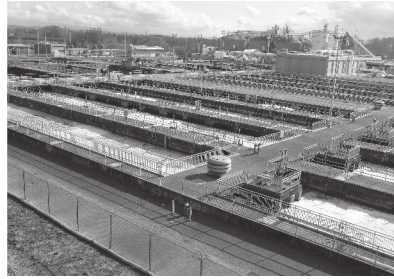
Other miscellaneous expenses in our automobile oriented cities are the high cost of utilities and certain miscellaneous urban amenities. These are partially a result of the nature of our automobile cities. As mentioned earlier, urban sprawl and low density development mean higher costs per capita for urban infrastructures. Some of these utilities are storm and sanitary sewers, gas lines, water lines, and power and communications lines. Other miscellaneous transportation amenities that are increased (spread thinner) by sprawl, and thus have a higher per capita cost, are signing, striping, lighting, sidewalks, bike



Premature demolition of a viable building, which was replaced by a parking lot.



**Electrical substation**



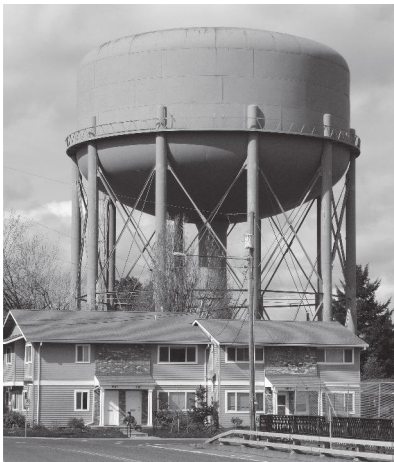
**Sewer treatment plant**



**Gas meters**



**Disruption of traffic by utility repairs.**



**Water tower**



**Street lighting - generally all paved surfaces in cities are lit every night, including all roads, parking lots, and parking structures.**

**Public and private utilities of all types follow urban development. Low density urban sprawl spreads these utilities over greater distances than an equivalent amount of high density development, thus increasing costs per capita.**

lanes, roadside landscaping, and storm water runoff treatment.

Rapidly growing urban sprawl and rapidly changing land uses impart their own costs on society, including premature demolition, displacement of people and businesses, and adverse impacts on surrounding properties. These expenses are partially the fault of poor urban planning. Yet, it is the automobile that enables urban sprawl to exist and hence facilitate rapid succession of changing land uses. The wasteful turn-over of land uses would be unnecessary or vastly reduced with permanent long range planning.

The indecisiveness over an ultimate urban build-out of our cities leads to perpetual real estate uncertainty. From farm to subdivision to apartment to commercial to industrial to high rise, every city has pieces of property that have undergone many iterations, and still there is no guarantee more changes will not take place. The ever changing makeup of our urban fabric lends itself to a host of permutations that cost money and waste a variety of resources. Although some change is always inevitable, the amount and pace of change should be more manageable. Tearing down or removing viable buildings or infrastructures before their intended life expectancy (due to

rapidly changing urban land use patterns) is the best example of this problem.

Pollution caused by the automobile also generates a variety of costs. The filth and waste generated has its clean up expenses. Emission controls on automobiles add cost to the automobile and reduce its fuel efficiency. Smokestack emission controls for auto industrial manufacturing also add to the cost of cars and related products. We pay higher health costs because of pollution's health hazards. We pay higher cleaning and maintenance costs for the filth and chemical deterioration wrought by air pollution from the car. Attempts to abate acid rain, ozone depletion, and global warming incur a cost on our society. Local airshed pollution abatement programs, such as those administered by the South Coast Air Quality Management District and the California Air Resources Board, incur costs for their local regions. Similar programs to curb water pollution, extend landfill life, control urban growth problems, and abate noise (freeway sound walls) also incur costs on society.

Another automobile related cost that is increasing and getting more media attention is the cost of vehicle delays.

Traffic congestion is becoming a problem of frightening proportions. New urban roads and highways are no longer being added at the pace they were a few decades ago. The interstate highway system is essentially complete, and few new miles are anticipated<sup>106</sup>. Meanwhile, the number of additional vehicles on our roads continues to increase<sup>107</sup>, and the number of miles driven per vehicle is also increasing<sup>108</sup>. This is leading to intense traffic congestion on our highways and streets. It is estimated that by the year 2025 in Los Angeles, the average highway speed will be 16 miles per hour<sup>109</sup>. A 2009 study found traffic congestion cost the U.S. almost \$87.2 billion<sup>110</sup>. The economic costs of traffic congestion have increased 63% over the past decade<sup>111</sup>. Rush hour traffic is no longer just an hour in the morning and evening; it's now multiple hours at a time. **This means that more people will spend more time burning more fuel and polluting more air while being stuck in more traffic.** These traffic delays not only waste energy and create worse smog problems, they also rob people of precious and productive time. This problem is increasing all across America and in many other auto oriented countries. People are spending more time behind the wheel of their cars and less time at home with their families, less time at leisure, less time volunteering for community services, and potentially less time at their jobs. Business and commerce also suffer. The movement of goods and services in our metropolitan areas is constricted by traffic delays. Because of vehicle delays, our society is poorer and less competitive.

For years the media has been filled with stories about this country losing its edge to foreign competition. Business competition is becoming more intense and more global. Many companies and jobs have left this country for better opportunities elsewhere. There are those who believe that America's quality of workmanship has slipped, and certainly that our labor costs are far too high. It is said that our labor force does not have the work ethic or educational skills of many other countries; this country does not spend enough money on research and development; there is not enough capital expenditure on modernizing and upgrading; and there are far too many environmental regulations constricting business. Each of these impediments to our economic well-being are in part true. In addition, this country's almost exclusive dependence on an automobile transportation system is also contributing to our losing ground to foreign competition.

**As a nation and as individuals we spend far too much time producing far too much pollution, spending far too much money, and consuming far too many resources, all for the ability to move from point A to point B in a car. Any nation or any individual that is not as dependent upon the automobile for mobility has an immediate economic and cost of living advantage over us.**



**Pedestrians, bicyclists, automobiles, and motorcycles all vying for space.**



**The conflict between automobile and pedestrian is an ever present danger.**



**There are so many cars that they encroach on other types of space. Here a sidewalk is completely covered by them, and people are forced to walk in the street.**



**A trash strewn freeway - a quality of life issue.**

### A BETTER ALTERNATIVE

For the United States and other auto oriented countries the automobile has become a way of life. It has become an absolute necessity. Today's need for owning a car is predicated on the fact that as a society we have owned cars and built our cities specifically with cars in mind for the past 70 or more years. Our cities have grown to be more for cars than for people. Today's need for owning a car is also predicated on the fact that there has been very weak support for alternatives to the car, and no actual attempts at replacing the automobile entirely. We have made auto dependency a way of life that now holds us hostage. Today we absolutely need automobiles because we have owned them for so long, and our cities reflect that dependence.

Automobile mobility and access have become paramount in the design and development of our cities. Mobility and access for the car have been given priority



**A traffic back-up - wasting our time, wasting our money, wasting our environment, and diminishing our joy of life.**

over other forms of passage (pedestrian and transit). This catering to the automobile, over many decades, has helped foster an attitude in car owners that if their vehicle can be driven somewhere, then under no circumstance should they be denied that right. Many drivers feel that automobile mobility is a God-given right. When something or someone gets in their way, they may display behaviors of contempt and aggression. This attitude of not wanting vehicular progress to be impeded in the slightest has become very widespread in automobile societies. Driving can encourage expressions of ill feeling and hostility. In our private, sheltered, cocoon-like vehicle, we are able to anonymously honk, gesture, and shout at our roadway adversary. Crimes toward one another on our highways are becoming more commonplace. Road rage and freeway shootings are a manifestation of the kind of emotions that driving is capable of producing. We are a mass of individual drivers expecting ample driving space and a minimum of inconvenience.

In America today, frustrations with our automobiles and our driving circumstances are equally prevalent. There are numerous hassles that we can encounter on any given day. The hours spent behind the wheel on a long commute or the cumulative hours spent for shorter trips, rob us of our most precious commodity - time. Add to this the occasional accident, parking ticket, mechanical breakdown, and traffic citation, not to mention the rigors of trying to pay for all of this automobilia, and frustrations are bound to rise. Awaken in the middle of the night from the roar of a squealing car. Feel your blood pressure rise from the incessant ear piercing wail of a car alarm. Lock your keys in your car. Have your car broken into. Take a big loss when selling that car you paid so much for. As a society we accept these inconveniences and hassles as our way of life, a part of the way we do business. They represent a part of the quality of life we consider normal. We have learned to love the things the auto giveth, and we have learned to accept the things the auto taketh away. We learn to adapt to the side of the auto that detracts from our quality of life, for what alternative do we have?

Our quality of life is both improved and deteriorated by the automobile. The prolific success and need for the car are real. Yet the problems and failures of the car are also numerous. This chapter has presented a cursory review of the automobile's successes and shortcomings. Hopefully it makes clear the notion that the automobile and its accompanying infrastructure and lifestyle do not represent a permanently sustainable global future for all the world's people. The pollution, the cost, the numerous environmental problems, the injury and loss of life, and the hassles of car ownership make the automobile a menace to individuals and even a threat to our Earth.

There are some basic human needs and rights that all people of the world should be granted, but are not provided by our automobile society. Some of these needs, by which all people should live, work, play, and raise a family, are:

1. To live in a non-polluted environment.
2. To live in a society where a decent lifestyle is affordable to all willing to work.



3. To live in a society where a variety of opportunities are available to anyone desiring them.
4. To live in a safe and relatively hazard free environment.
5. To live in a sustainable society, that does not sacrifice the well-being of future generations.

Our automobile society may provide some of these opportunities and human rights to some people some of the time, but it does not and can never provide all of these to all people all of the time. Pedestria and its unique design address all of these human rights issues to varying degrees.

At the beginning of this chapter, in *THE SUCCESS OF THE AUTOMOBILE*, a number of economic, political, and cultural aspects of our society's commitment to the automobile were mentioned. They showed the widespread influence the car has upon us and our way of life. Indeed, if one views the automobile as our standard of transportation, as our normal mode of operation, and there exists no good alternative, then our car culture can be regarded as being beneficial and virtuous. It is therefore the lifeblood of modern society. Of course, this assumes no other viable means exist for eliminating the automobile. It therefore seems contradictory to consider the automobile as bad. For example, the use of such things as the slide rule, type writer, and the horse drawn carriage were for many years the norm and standard for modern society. New improvements and new models were constantly being developed. Not until a true alternative was developed did their abrupt replacement commence. Continued use of these items then seemed wasteful and unnecessary, foolish, and even backward.

The fact that this book presents an excellent alternative to the automobile suddenly changes the perception of the automobile's usefulness. If a complete elimination of the private automobile in an urban setting is realized, and all of society benefits, then our current automobile dependence can be thought of as unnecessary. Its continued usage in the development of new urban areas can be regarded as negative and counterproductive. What is now considered our urban life blood suddenly becomes an encumbrance. Of course, existing auto oriented cities and rural areas will continue to have a definite need for the car. **But for those people living in a future autoless city, use of the auto will seem backward, futile, and a burden.**

## A CONCLUSION RESULTING FROM THE AUTOMOBILE'S SHORTCOMINGS

Because of the increasing problems associated with the automobile and all its accompanying infrastructures, there is an urgent need for a viable alternative. A comprehensive alternative would function efficiently, conveniently, and economically. It would be non-polluting, permanently sustainable, human in scale, and would represent hope for a better future for all people, not just a wealthy minority. The human species is increasingly reaching Earth's limitations and carrying capacity. There is a huge need for ideas that hold the promise of solving or reducing a multitude of major problems without creating new ones or worsening those that already exist.

In many of today's cities there are few alternatives to owning and driving a car. If someone opted not to own a car, they would be severely limiting themselves. Our automobile oriented cities have few opportunities for those who do not own a car or cannot operate one. The few existing alternative forms of transportation are minimal. Carpooling and ridesharing are limited primarily to journeys to work. Taxis are extremely expensive for frequent travel needs. Local transit systems are limited in the locations they serve and are equally restricted in their schedules. Walking and bicycling are only of limited use in our enormously sprawled and functionally segregated cities. It is time for a viable choice other than the automobile.

Urban sprawl, depletion of natural resources, health hazards, pollution, spiraling costs, and the spreading of the automobile lifestyle to underdeveloped countries are all problems afflicting the world today. The rising global CO2 level causing global climate change is reason alone to pursue a comprehensive alternative. Many of the car's associated problems are irreversible and are intensifying. There is indeed a great need for a comprehensive solution to abate these many urban ills.

One conclusion resulting from the automobile's problems is that there must somehow be a replacement for it, an alternative, a way of doing without the automobile. **There must be a way for a city to function in all the ways a city is meant to function, but without the car. There must be an alternative to the car that is more than just a mere replacement, but an actual improvement. There desperately needs to be a city without cars --- An Autoless City!**

# CHAPTER 2

## PEDESTRIA - AN OVERVIEW

### WHAT IS AN AUTOLESS CITY?

An autoless city is any city, old or new, large or small, that has adequately functioning transportation systems that do not utilize the private automobile. It is a city that purposely limits the use of the private automobile within its boundaries. It can be an existing city or a future proposed city whose residents can go about their daily lives without the need of a car. An autoless city harbors a society and culture that develops, prospers, and evolves without the automobile.

An autoless city is compact, and transit and pedestrian oriented. Out of necessity, it must be thoughtfully designed with other means of transportation having preeminence. It must exhibit compact cluster development directed toward pedestrian access and mass transit. Consequently, people in this city will walk frequently and ride mass transit often.

An autoless city is not without vehicles. Buses, trucks, service, delivery, and emergency vehicles exist within its boundaries. It is simply devoid of private automobiles and most of the accompanying infrastructure associated with them. Private automobiles constitute roughly 85-92%<sup>1</sup> of all vehicles in an automobile oriented city, and roughly 40%<sup>2</sup> of all land is dedicated to the automobile transportation system. In comparison, an autoless city will have approximately 10% of the vehicles<sup>3</sup> of a comparably sized auto oriented city. Also, an autoless city will only have about 15% as much vehicle related infrastructure<sup>4</sup> as a comparably sized auto oriented city.

An autoless city can manifest itself in various ways. It can be an older city that has been bypassed by the automobile era (i.e., Venice, Italy). It can be an existing city that establishes a policy to gradually displace the auto with another means of transportation, gradually changing its auto oriented land use patterns into more transit compatible arrangements. Conversely, it can be an entirely new city completely designed with the intent of being and remaining autoless. (Thus far, these last two examples are only hypothetical scenarios.)

There are currently very few autoless cities in existence. Venice, Italy is the best example of an entire city functioning without the mass use of the automobile. It is uniquely autoless because of its history and geography. Yet even Venice has numerous cars in parking structures in its Santa Croce district. Elsewhere in the world, there are districts, small towns, and neighborhoods within cities where autos are excluded. A few of the more noteworthy are Fez, Morocco (medina of Fez el Bali); Zermatt, Switzerland; and the central district of Siena, Italy. There are no new or modern cities that

have been developed entirely and specifically without the mass use of the private car. **In short, an autoless city is a city that is designed specifically to function, and function well, without the mass use of the private automobile.**

### WHY REPLACE THE AUTOMOBILE WITH A NEW CITY?

The autoless city proposed in this book is a new city built from scratch on totally undeveloped property. It is designed as a comprehensive single unit, built and occupied in the blink of an eye compared with the slow growing process which has led to most other existing cities. It is a new city that greatly reduces automobile-related ills.

The greatest attraction of building a brand new city from scratch is that it carries the promise of new development unaffected by the past. There is no previous urban configuration or infrastructure to design around. There are no failures from the past to correct and no existing agenda to satisfy. There is little existing bureaucracy to deal with. There is no citizenry to negotiate with or to compensate for adverse and conflicting interests. There is no segment of society out-voted and disgruntled with the decision to build a new city. The process of designing a city from scratch is made immensely simpler by the absence of existing human urbanity. With no more complexity than existing topography and natural geography, the task can be focused on the proposed variables and complexities of the new city. In theory, and to some degree in reality, it is a clean slate on which the planners can create a vision. Of course, an ill-conceived vision will not be elevated to grand success simply by the absence of existing urbanity. There are a variety of new towns and grand urban schemes that have experienced varying degrees of success and failure.

One option to creating an autoless city is to convert an existing city into a properly functioning autoless configuration. Although this may be possible, it is a most formidable task and not advisable for a fledgling idea. To convince a sufficient majority of citizens to make drastic and costly changes to the basic framework of their city, based upon an unproven idea, would be nearly impossible and foolhardy. Building an autoless city from scratch is a simpler and better idea. If the first completed autoless city is successful and gains wide acceptance, then it might be appropriate to consider converting an existing city to an autoless arrangement.

The idea of building a city on virgin land is by no means unfamiliar. New towns and cities have been built in

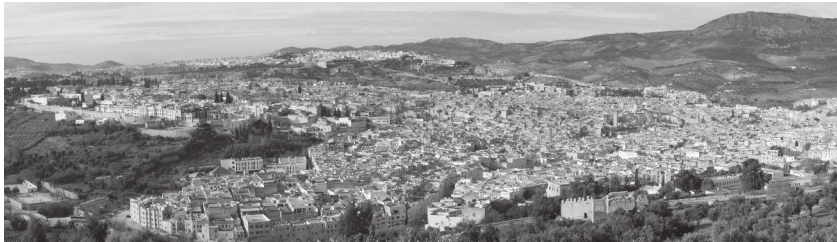
many parts of the world during various times and ages, ranging from small villages to large modern cities. They have been built by kings, corporations, and governments. Some company owned towns have flourished, then gone out of business and been completely abandoned. Others have grown to become larger cities. Some have simply become satellite communities or part of a larger metropolis.

New city developments have been built for various reasons and with many different goals in mind. Slum

removal, urban renewal, alleviation of poverty and overcrowding, social and economic revitalization, opening up of wilderness areas, providing for new seats of government, building company towns for resource extraction, creating housing for large public works projects, profit motive, and commercial speculation are a few of the past reasons for building new cities.

A new autoless city could be built for any of these same reasons. Additional reasons for building a new autoless city could be that it is environmentally benign, a sustainable development, affordable to build, and it provides an inexpensive lifestyle for its citizens; its high quality of life for everyone may be scarce or non-existent in other cities.

Many different design ideas have been incorporated into new towns and cities: garden cities, garden suburbs,



*Wikimedia commons*

**Fez, Morocco - an ancient city. An autoless city, because of its tiny streets.**



**Venice, Italy - The world's largest and foremost autoless city. A unique blend of geography, culture, and history.**



*Wikimedia commons*

**Valingby, Sweden**



*Wikimedia commons*

**Canberra, Australia**



*Wikimedia commons*

**Brasilia, Brazil**



*Wikimedia commons*

**Nay Pyi Taw, Myanmar**

linear cities, modular cities, and automobile grid cities, to name a few. The location of new cities has also varied. Most past new cities fall into one of the following types of locations: totally separate cities, semi-autonomous satellite cities, peripheral suburbs, or central city urban renewal.

Building the first autoless city from scratch is by far the most effective way to validate this concept. For a very complex goal, it is the simplest foundation from which to start. If the concept is sound and plausible, if a concerted effort is made without special interest malice, with a bit of luck the concept will hopefully flourish. Success of a prototype will lead to more attempts at autoless cities and possibly to the eventual retrofitting of existing cities.

## WHAT IS PEDESTRIA ?

Pedestria is a hypothetical example of an autoless city. It is an experimental design which illustrates the various ideas and components that make up the autoless city concept. It is an example of a proposed new city development, built from scratch, which is purposely designed without the mass use of the private automobile. It is a rendition of a proposed city on a fictitious site with invented geography. Its design is based upon current knowledge, common urban planning practices, and basic engineering principles. Pedestria was created for the purpose of illustrating, explaining, and aiding the conceptualization of an autoless city. It is a visionary proposal for a future city. Plans and maps of Pedestria are provided to help the reader visualize the concepts put forth in this book. Along with these graphic representations, there are photographs, statistics, and calculations. There is also discussion of design features and theoretical aspects pertaining to autoless cities. All of this documentation is meant to give validity and proof that an autoless city can be created and can better serve mankind than our existing urban developments.

Pedestria is only one of many possible designs. There are many variations feasible for an autoless city. Throughout this book there are some discussions about possible design variations, particularly with regard to transportation systems and urban configurations. The reader is invited to contemplate and consider other options and scenarios that are not included in this book.

The purpose of this chapter is to give an overview of Pedestria and to familiarize the reader with its general layout and workings. The reader will be introduced to this theoretical city and prepared for more detailed discussions to follow. Most of the descriptions of Pedestria are given as if the city were beyond its early developmental stages and a fully established city.

The reader should refer to the supplementary maps provided. It is the primary focus of this chapter and this book. The illustrations on the map are drawn at various conventional English scales (feet, inches, etc.). Each side of the map has an accompanying legend.

## GENERAL CHARACTERISTICS OF PEDESTRIA (see side 1 of supplementary map)

Pedestria is distant and separate from other cities. It is designed and built from scratch on a totally undeveloped piece of property and is meant to represent a stand alone city rather than a satellite city. Therefore, it is relatively far from neighboring cities of significant size. Small towns and rural communities exist within a few miles.

The predominant land uses in the vicinity of Pedestria are agriculture and timber land. The land ownership around Pedestria is a mix of mostly private land (agriculture) and some public land (timber and miscellaneous).

For illustration purposes Pedestria is located within a state and a county. However, as part of its establishment it has been granted autonomy from the surrounding county government. This is in an effort to eliminate duplication of city and county bureaucracy. It does have legal provisions and financial arrangements with surrounding property owners and the county and state governments. Pedestria is a municipal corporation by a home rule city charter granted by the state legislature.

Pedestria's overall shape (its outer boundary) is that of an irregular circle. It has a rectangular, donut shaped central core (downtown) in the middle of the city. The central core is surrounded by 90 residential communities and an assortment of miscellaneous urban entities (airports, golf courses, cemeteries, etc.) The city's central core surrounds Central Park and is in turn surrounded by Perimeter Park. The central core is separated from the residential communities by this park buffer. Most of the residential communities are separated from each other by park space, and the entire city is separated and buffered from the surrounding countryside by a small strip of open space.

The overall arrangement of Pedestria is that of a central hub with radiating spokes, similar to a bicycle wheel. The central core is the hub of the wheel; the residential community groups with their connecting roadways are the spokes.

Another description of Pedestria's design is that of a polycentric, polycircular design. It is a design with many centers and many circles. The central core and the residential communities are centers of urbanization and human activity (polycentric). The transportation system, that serves the core and the communities, consists of several different types of circles or loops (polycircular). These different loops consist of:

**-Transit Loops:** central core loop, 15 residential community loops, and 1 airport loop.

**-Freightway Loops:** both inner and outer central core loops and the residential community loops.

**-Bicycle Loops:** both inner and outer central core loops and a variety of residential community bikeways.

Pedestria's population is predetermined at approximately 500,000 people. This is based on an

## **DIMENSIONS, AREAS, AND STATISTICS**

(see side 1 of supplementary map)

**Total land area** - 37.61 sq. miles; 24,070 acres

**Population** - approximately 500,000 people

**Population fluctuation range** - 475,000 to 525,000 people (500,000+/- 25,000)

**Population density (estimated)** - residential community average: 50 people per developed acre (32,000 per sq. mile).

Estimated average population density per residential building: 1 person per 500 sq. ft. total residential building floor space. Population density for all developable lands (residential communities and central core): 45.89 people per acre (29,369 per sq. mile). Population density for the entire city, including all open space, both airports, and landfill: 20.8 people per acre (13,293 per sq. mile).

**Diameter** - approximately 6.25 miles, north-south, and east-west

**Central core population** - approximately 66,380 people

**Central core width (Central Park to Perimeter Park)** - 2,800 ft. (0.53 miles) west, south and east sides; 4,800 ft. (0.91 miles) north side

**Central core area** - (developable land, excluding park and lake) 96,899,554 sq. ft. (3.48 sq. miles; 2,225 acres).

**Central Park size & area** - 4,500 ft. per side (0.85 mile); 20,250,000 sq. ft. (465 acres).

**Perimeter Park width** - approximately 2,000 ft. (0.38 mile)

**Residential communities** - 90 total: 15 community groups, each consisting of 6 communities. Community groups are labeled clockwise, A through O. Individual communities are of various shapes, sizes, and configurations.

**Residential community sizes, areas, and estimated population** -

Small sized communities (generally nearest the central core) - approx. 70 acres (1,760 feet squared), 1/3 mile square; 3,556 people, based on average of 50 people per acre.\*

Medium sized communities - approx. 100 acres (2,112 feet squared), 1/2.5 mile square; 5,120 people.\*

Large sized communities (generally farthest from the central core) - approx. 160 acre (2,640 feet squared), 1/2 mile square; 8,000 people.\*

All residential loops, except loop G, consist of 6 communities (3 small, 2 medium, and 1 large). Loop G has 6 communities, all the same size.

**Residential community loop average population** - approximately 28,908 people

**Open space** - 54.7% of Pedestria's total land area is public open space, 13,166 acres total, 0.026 acres per person.

This includes Central Park, Perimeter Park, and lands between residential communities. It also includes quasi-open spaces such as golf courses, cemeteries, amusement parks, etc. It does not include additional open space within the central core or residential communities.

**Miscellaneous features** - 1 international airport, 1 small local airport, 1 landfill and recycle center, 1 waste water treatment plant, and 1 water works facility.

average population density within the residential communities of 50 people per acre (433,600 total for all 90 residential communities). This leaves a balance of 66,400 in the central core. This is based on a residential building density of 1 person for every 500 sq. ft. of total residential building floor space. Pedestria's population will vary over time. The 500,000 figure is only a target population. Its population will actually vary around that number within a specific range.

### **TOPOGRAPHY**

(see side 1 of supplementary map)

The general topography and natural geography of Pedestria is fictitious, but will help illustrate a number of points throughout the book. Pedestria is located in the middle latitudes in an area of naturally mixed conifer and deciduous forests (an area similar to many of the northern regions of the United States or southern regions of Canada). Much of the surrounding countryside is currently under agricultural use, and the natural topography is flat to gently rolling with some higher hills. Soil conditions are

suitable for construction of large buildings and easy grading and excavation. Some bedrock and rock outcrops exist, particularly along water courses and on hill tops.

Pedestria has a small non-navigable river running east to west through it (Wet River). The city's sanitary waste treatment facility is located at the downstream end of the Wet River, on the lowest land within the city. A small dam (Downtown Dam) has been built to produce a lake in the heart of the city (Center Lake). There are also three small streams flowing through the city toward Wet River (Crown Creek, Eagle Creek, and Fanno Creek). There are several small man made ponds and lakes on these creeks. There are a few natural or man made marsh areas within the city boundary. Most notable are the man made lake and wetlands in the Central Park Arboretum. The city's water works facility is located on the south edge of the city along Crown Creek.

The southwest quadrant of the city contains a small hill (Blue J Hill). Blue J Hill is the northern terminus of a heavily forested ridge that extends southwest out of the city. This ridge (Wet River Ridge) is primarily National Forest Land. Blue J Hill rises approximately 400 ft. above

the surrounding city. The other three quadrants of the city (N.W., N.E., and S.E.) are generally flat or rolling terrain with some steep slopes and bluffs along creeks and the Wet River.

The natural forest cover is still predominant in the southwest quadrant of the city, the Blue J Hill area. The rest of the city had been previously cleared for agricultural use and hence has little remaining forest. However, natural regeneration and human-assisted regeneration of open space areas within the city will enable small patches of forest to once again flourish within the city boundary.

The climate for Pedestria is temperate. Precipitation amounts are sufficient to support a naturally mixed forest. Light to moderate snowfall amounts do occur each year. The natural prevailing winds and fog have been influential in the location and configuration of the 2 airports.

#### TRANSPORTATION NETWORKS (see sides 1 and 2 of supplementary map)

The transit system in Pedestria is a conventional rubber tired bus system. Pedestria's buses travel on both exclusive and shared roadways. There are two types of transit buses: articulated passenger buses and airporter buses. Both types are customized slightly to help facilitate large numbers of passengers or the carrying of both luggage and passengers. Both types of buses are 60 ft long, 8.5 ft wide, and articulated. The passenger bus has a crunch carrying capacity of 170 passengers. The airporter bus crunch capacity is considerably less due to luggage constraints.

In addition to buses, the transit system is comprised of transit roadways and transit stops. The general layout of these roadways is that of a central loop that accesses the city's central core, and 15 outer loops, each accessing a residential community group and one airport loop. The central core loop is exclusively for buses and emergency vehicles. The residential community loops are shared roadways for buses, emergency vehicles, and freight and service vehicles. Each of the fifteen residential community loops and their community group are labeled with a letter of the alphabet (A through O). The airport loop is not labeled with a letter. Each residential community group contains six communities, each with one transit stop. Every bus route serves an entire community group and the entire central core. The transit stops in each residential community group are numbered clockwise 1 through 6, while transit stops in the central core are numbered clockwise 1 through 9. In total, there are 15 transit stops per bus route. The airport bus route has 10 transit stops, 9 in the central core and 1 at the airport. The airport loop serves only the airport and the entire central core. Loops I, J, and the airport loop are linear rather than circular and have a small circular turn-around at their terminus. The airport loop shares most of its distance with F loop. Most of the community groups form an actual loop of 6 communities. Others like A, H, and O loops are part linear and part circular.

Pedestria's transit loop system is bicircular or a figure 8 pattern of 2-way roadways. The route that a bus takes is around the central core loop and then out and around its assigned residential community group. Half of the buses assigned a particular residential loop will travel clockwise around both loops, and the other half of the buses will travel counter-clockwise. This results in bidirectional transit service. In other words, at any given transit stop buses will be coming or going in either direction.

Pedestria is an autoless city, yet it is not a city without vehicles. It is a city that has eliminated the mass use of the private automobile, including 85-90% of all vehicles that would exist in a comparably sized auto oriented city. In addition to transit vehicles, Pedestria has a variety of emergency, freight, and service vehicles. These vehicles are not custom made or sized for Pedestria. They are common models and types of vehicles that can be seen in any of today's auto oriented cities. These vehicles travel on the shared roadways with buses and on roads which are specifically for non-transit use.

Non-transit roadways are referred to as freightways (streets used by non-transit vehicles). These freightways are usually built with sidewalks and occasionally with bike lanes. The central core has a number of freightways. There is an inner and an outer freightway loop and a number of connections between the two. These freightways access the central core for the movement of goods and services, and for emergency help. In addition, there are other streets and right of ways within the central core that have limited access to non-transit vehicles (local access freight streets). These minor side streets are primarily for pedestrians, but limited access for vehicles is allowed. Most of the large downtown office buildings tend to have their loading docks facing these smaller streets.

Within the residential communities there are also freightways and limited access thoroughfares in a variety of configurations. Residential communities have either shared lanes or exclusive transit lanes under their commercial districts, and all have a single transit stop in their center. Most communities have an exclusive freightway surrounding their commercial district. There are also limited access roads in all residential communities, particularly near the perimeter of each community in the predominately residential area. There are also some freightways that connect adjacent residential communities. For instance, loops C and D are connected well outside of the central core. They share a common transit/freightway loop out of the central core and through Perimeter Park, but loops D and E do not. Therefore, loops D and E have a freightway connection between them.

Where traffic volumes are heavy (central core), there is separation of transit and freight roadways. Where traffic volumes are lighter (most residential loop roadways), buses and all other vehicles share the roadways. This eliminates unnecessary duplication of roadways.

Railroad freight and passenger service exist in Pedestria. There is a single rail right of way coming into the city from the north with inbound and outbound tracks.

Rail passenger trains come directly into the central core and stop at a station directly adjacent to central core transit stop #2. Freight trains come directly into the central core rail yard on the north edge of the central core. From this switching yard there are feeder lines and spur tracks throughout the northern portion of the central core (industrial district).

Pedestria has two airport facilities, the international airport and the municipal airport. They are located at the northeast and northwest edges of the city, respectively. The international airport is accessible to the city by its own separate bus route. The local airport does not have a separate bus route or transit stop. Instead, it is accessed to the city by a road to the 5th community in loop A. Shuttle service is provided between this community and the local airport. Both airports are buffered and distanced from residential communities by large urban usages of open space (i.e., golf courses and cemeteries).

Pedestria also has access to the outside world via several highways. These highways are for all types of traffic, including conventional automobiles. They enter the city from the southwest, the southeast, and in the same large right of way as the railroad lines from the north. They enter extended auto zones within communities L3, I6 and C5. All non-automobile vehicles (freight, service, emergency, and transit) are allowed to enter the city and go about their travels on Pedestria's freightways and transitways. However, there are restrictions on autos coming into the city. All automobile traffic and some non-automobile vehicles are not allowed to go beyond the extended auto zones without a special permit. There are check stations at each of the city's highway entry points, and autos and some non-autos are required to end their journey at this point. There are facilities for these cars in the extended auto zones, typically service stations, parking and storage facilities, repair shops, and car rental companies. They are for all types of vehicles, including private automobiles. Facilities for Pedestria's trucks, buses, and service vehicles may also exist within the city's industrial areas.

Bicycling is an important part of life in Pedestria. Bicycle paths and bike lanes are common throughout the entire city. An extensive network of bike facilities connects communities with each other and the central core. There are two major bikeways/promenades within the central core. One circles the inner edge of the central core, while the other circles the outer perimeter of the central core. There are a number of bicycle access routes between these two loops and the surrounding residential communities. Bicycle facilities are sometimes built in conjunction with the transit and freight roadways. Other bicycle facilities are separate bike/pedestrian paths.

Like bicycling, walking is also an important part of life in Pedestria. Sidewalks, foot paths, exclusive pedestrian streets, and covered streets are common throughout the city. An extensive network of pedestrian paths connects communities with each other and the central core. There are numerous streets and right of ways that are exclusively for pedestrians, both in the residential communities and in the central core. Walking is by far the

most common means of short distance travel. This is due to Pedestria's compact and consolidated design. Distances between many urban entities are quite short, so a very large percentage of people's everyday trips are within easy walking distance, making pedestrian trips commonplace.

In addition to this widespread pedestrian network, there are also mechanical aids for pedestrians. Public escalators are common throughout the city wherever there are sufficient numbers of pedestrians needing to make grade/level changes. There are public escalators and elevators at all transit stops. Moving sidewalks are also common throughout the city. These pedestrian conveyor belts radiate out from all of the central core transit stops and some of the residential transit stops. Moving sidewalks assist large numbers of people to move quickly and easily away or toward the transit stops. Moving sidewalks typically extend out from transit stops for several city blocks.

## RESIDENTIAL COMMUNITIES

(see sides 1 and 2 of supplementary map)

The 90 residential communities in Pedestria are of roughly three sizes: small - 70 acres, medium - 100 acres, and large - 160 acres. They are also of various shapes: square, pentagonal, hexagonal, octagonal, round, and irregular. The size of the largest communities is limited by design so as not to exceed the comfortable walking distance of the average pedestrian. For most people a reasonable walking distance to an important destination is approximately ¼ to ½ mile (approx. 1,300 to 2,500 ft.). The greatest distance to a transit stop and commercial center for people living on the furthest perimeter of the largest residential communities is roughly 2,000 to 2,300 ft.; but for the average residential community dweller, their distance from home to the local transit stop and commercial center is approximately 600 to 800 ft. Pedestria's residential communities are sized and configured with these reasonable pedestrian distances in mind.

Residential communities are configured in groups of six. Together they constitute a community group (labeled A thru O). Each community group is connected by a common transit/freight roadway and a shared common bus route. Typically the smaller communities in each group are located nearest the central core, with the larger communities toward the perimeter of the city. The residential communities are arranged in a variety of configurations. Most are separated from one another by open space. However, some communities are adjoining (F), some are arranged geometrically (C) and symmetrically (G), while others are asymmetrical (A) or irregular (H). There are also community groups that are linear in arrangement (I & J).

All of the residential communities in Pedestria contain similar land uses with similar arrangements. At the heart of each community is a below ground bus transit stop. Above the transit stop is a mixture of commercial and business endeavors, medium rise apartments, and public community space. There is a two story minimum height

restriction within this commercial area. Surrounding this is the residential section. Nearest the commercial district are low rise apartments of 2 and 3 stories. Beyond these, near the perimeter of the community, are single family houses, row houses, and other low density housing. Required building heights are greatest near the center of the community and reduced toward the edges. This assures that population densities increase toward the community center.

The predominate housing units in the residential communities and throughout Pedestria are apartments. They include rentals and condominiums, both low rise and high rise. Approximately 80% of Pedestria's population lives in apartment units or condominiums. Single family detached homes and row houses are fewer in number and are typically on rather small lots. They house roughly 20% of Pedestria's population.

Most communities have an elementary school along their outer edge. Each community group has a high school or primary school located in one of its 6 communities, usually near the geographic center of the group.

The first community in group C is shown in detail on side 2 of the supplementary map; this drawing is called the "Residential Community Detail #C1 (Garden Village)". Chapter 4 gives a written explanation of this community.

#### OPEN SPACE

(see sides 1 and 2 of supplementary map)

Approximately 54% of Pedestria is considered public open space. This is non-developed land outside the central core and residential communities. Within this 54% there are three main areas of open space: Central Park, in the heart of the city; Perimeter Park, which surrounds the central core; and the residential community parks, which surround and intertwine the communities. The vast majority of this land is publicly held. However, there are privately held and privately operated open spaces, i.e., golf courses, cemeteries, etc. There are six basic categories of open space: manicured park space, unmanicured or natural park space, playing fields, gardens and orchards, amusement/activity park space, and miscellaneous space such as golf courses and cemeteries.

Central Park is 4,500 ft. square, plus an additional portion for Center Lake. Perimeter Park is generally 2,000 ft. wide. The open space between most residential communities is typically 500 ft., but the distance varies widely among different communities.

There is also public open space within the residential communities and the central core. Examples of this type of open space are plazas, squares, large pedestrian streets and sidewalks, and planted strips within roadway right of ways. There is also private open space within the residential communities, such as private yards and apartment complex grounds.

All parts of the city are within walking distance of many kinds of public open space. This abundance exists due to adherence to the principal of minimizing private open space and maximizing public open space.

Minimizing private open space is accomplished by restricting yard sizes and emphasizing the zoning of multifamily dwellings rather than single family houses. The restriction of large yard sizes also contributes to the compaction of the city. This is contrary to most auto related suburban development with its emphasis on single family dwellings and private yards. Pedestria's configuration and abundant open space are based on the philosophy that all citizens should have easy access to many quality recreation and open space opportunities.

Open space is shown in detail at the edges of the Central Core Detail and the Residential Community Detail #C1 (Garden Village) on sides 1 & 2 of the supplemental map.

#### CENTRAL CORE

(see side 1 of supplementary map)

The central core is a rectangular donut shaped area of intense urban use. It is a concentrated and compact version of what is commonly referred to in conventional cities as "downtown". It surrounds Central Park and is in turn surrounded by Perimeter Park. The central core contains a number of concentric rings of different types of transportation right of ways: the central core transit loop, the inner and outer central core freightways, and the inner and outer central core bikeways. There are also various pedestrian streets and combination streets. These varying avenues of transportation provide excellent access for individuals and commerce.

The central core has three predominate land use zones. These zone differentiations are based on compatibility, but the boundaries of these zones are not absolute; they intersperse and overlap. They are generalizations only, and act as guidelines for the utilization of the central core land. The three zones or districts are: the heavy industrial/warehouse district, which lies north of Central Park; the business, commercial, and retail district, which generally surrounds all 9 of the central core transit stops; and the residential districts, which are generally near or adjacent to Central Park and Perimeter Park.

Zoning restrictions in Pedestria's central core allow considerable flexibility in the location of specific urban land uses. The primary emphasis is on mixed land use and/or close proximity of compatible uses. For instance, a single building may have commercial space at the ground floor, and/or office, business, and residential space on floors above. In many parts of the central core there are multiple use requirements. These are instrumental in assuring a diversity of land uses within close proximity.

Density and minimum height restrictions are also of paramount importance in Pedestria. They are instrumental in maximizing space in a limited size central core. Density and minimum height requirements are always highest near transit stops and lowest near Central and Perimeter Parks. There is a minimum height restriction of 3-10 stories on the outer edges of the central core (see Central Core Section, side 1, for an illustration). Adjacent to the transit stops minimum height restrictions are as high as 25 stories.



Pedestria contains utilities as well as miscellaneous amenities. The actual utility lines are not shown on any of the supplementary map drawings. However, utility corridors are shown on some of the cross-sections in Chapter 3. All of the typical modern utilities are present in Pedestria. Throughout the central core and residential communities, most utilities are restricted to special corridors within designated public right of ways. High traffic right of ways (transit loops, covered streets, and freightways) have as few utilities within them as possible, to eliminate many of the disruptions caused by utility work.

Pedestria also has a water works facility where it purifies its drinking water. This facility is located on the edge of town where Crown Creek enters the city. Conversely, on the edge of town where the Wet River leaves the city is the sewage and storm water treatment plant. Pedestria also operates a recycle center and landfill just beyond the municipal airport.

It is envisioned that Pedestria is a culturally diverse and dynamic city. A wide variety of cultural, economic, social, and lifestyle opportunities are promoted within the city. The designers, planners, and builders of this city will be instrumental in creating a basis from which people will establish a community. The initial design and building of the city will influence its cultural development. More importantly, the initial settlers of Pedestria will have the greatest influence on establishing the culture and flavor of the city. Pedestria is designed for a population that will exhibit many of the characteristics of and maintain a standard of living consistent with a modern 21<sup>st</sup> century city.

#### A FINITE AND REPRODUCTIVE CITY

There is no inherent requirement that an autoless city be finite or reproductive. Yet, to be sustainable over an indefinite length of time, it is mandatory. Pedestria is finite by design. It has the legal mandates, the means for revenue collection, and the administrative resources to establish and maintain its finite character. Its criteria for

limiting itself are based upon physical size and population size.

The city's physical size is limited primarily by the establishment of a permanent city boundary (growth boundary). The city's population size is limited by a combination of economic disincentives and possibly some new resident restrictions. The city's permanent boundary is established at its inception. The legal mandates for this boundary state that Pedestria shall not expand or incorporate properties outside of this permanent boundary. The economic disincentives and resident restrictions for stabilizing its population are implemented as the city's growth approaches its population target. As the city's population fluctuates around this target (500,000), disincentives and restriction will be suspended or continued accordingly.

Pedestria is also a city capable of reproducing itself. In the event that Pedestria is successful and there is an over abundant demand upon its limited living space, it shall, by mandate, create another city similar to itself. This accommodation of excess growth will be handled by the city's reproductive bureau (New City Bureau). This bureau will begin start up procedures very similar to those that were initiated during Pedestria's own development. Lessons from Pedestria's own development and growth should add valuable experience to subsequent autoless city developments. Each new city will carry with it the mandate of reproduction. Continued success of Pedestria may prompt it to develop more than just one new autoless city.

## CHAPTER 3

# PEDESTRIA'S TRANSPORTATION SYSTEMS

Pedestria's transportation systems are at the heart of its design. Elimination of the automobile and replacement with other systems are the fundamental design considerations in an autoless city. Pedestria's transportation systems fall into three categories: the transit system, alternative modes of transportation, and non-transit vehicles. The main transportation system is the public transit bus system, which serves the entire city. It is conveniently located throughout the city and has a very high degree of frequency. The second category of transportation is the alternative modes: walking, bicycling, and a few miscellaneous modes. In reality, walking is the most prevalent means of travel, particularly for short trips. However, it is included as an alternative mode because of its short trip nature, small infrastructure requirements, and classification as alternative transportation in current planning circles. The third transportation category is non-transit vehicles, specifically emergency, freight, and service vehicles, which provide for the movement of goods and services. This category also includes some transportation modes linking Pedestria to other cities (rail, airplane, etc.). All three of these categories fulfill the transportation needs of Pedestria's citizens, without the use or need for private automobiles.

### TRANSIT SYSTEM

Pedestria's main transportation system (its public transit system) is the skeleton and foundation around which all other urban design elements are built. It is the life blood of the city.

There are numerous types of mass transit systems to choose from when designing a new autoless city: buses, light rail, subway, monorail, people movers, and trolleys. These are most of the conventional transit systems that are currently in operation in various cities of the world. Any of these systems or combination of systems could be designed into an autoless city.

A conventional rubber tired bus system has been chosen for Pedestria. This may seem simplistic and backward in the age of high-tech vehicles, since the bus system may not be as energy efficient or have the passenger to vehicle ratios of larger rail systems. Yet, because of its simplicity, flexibility, and lower initial cost, buses are the system of choice in Pedestria. Overall operating costs of the bus system should be very competitive with more sophisticated transit systems.

Bus systems are a proven technology and are common throughout the world. They have greater maneuverability than rail systems, where a stalled vehicle or obstruction on the tracks can mean serious delays. Rubber tired vehicles are capable of avoiding obstacles or finding an alternate route. Buses can also share roadways with trucks and service vehicles. This versatility results in less space required for all the city's transportation needs. Conventional buses can operate on conventional roadways. Subways, monorails, people movers, and most rail systems all need special structures or special accommodations for their operation, and they can not share these structures with trucks or service vehicles. Because of the availability of conventional buses, and the fact that they don't need special accommodations and can share facilities with other vehicles, the initial costs for a bus system can be lower than more sophisticated systems. For these reasons, a conventional bus system is being employed in Pedestria.

### PEDESTRIA'S ARTICULATED BUSES

The main buses used in Pedestria are 60 ft. long articulated passenger buses. They contain 60 seats and have a crush capacity of 170 passengers. They are capable of freeway speeds and can easily average 25-30 miles per hour between transit stops. These buses are designed to accommodate up to two wheelchairs per bus, which should be adequate given the frequency of buses. The buses can also accommodate people with small carry-on bags or



Articulated bus - similar to those used in Pedestria.

rolling luggage. They are not designed or intended to accommodate people transporting large goods, freight, or bicycles.

Compared with conventional bus seating, Pedestria's buses have fewer seats, (less than 1/2 of the bus floor space contains seating), thus allowing for more standing passengers. This increases the overall passenger capacity.

Pedestria's buses are low emission vehicles and are powered by natural gas to reduce pollution. This is particularly important at enclosed transit stops.

Wheelchairs on board (maximum 2 per bus) will decrease space for standing passengers and will slightly reduce overall capacity of the buses. Total crush capacity on the buses is 170 passengers; with two wheelchairs on board the crush capacity is reduced to 156.

Loading platforms at all transit stops are at bus floor height. This eliminates the need for stairwells and reduces the space necessary for adequate doorway and stairway safety clearances. It allows for increased overall bus capacity and decreases necessary time for loading and unloading passengers. It also eliminates need for special lifts for wheelchair passengers.

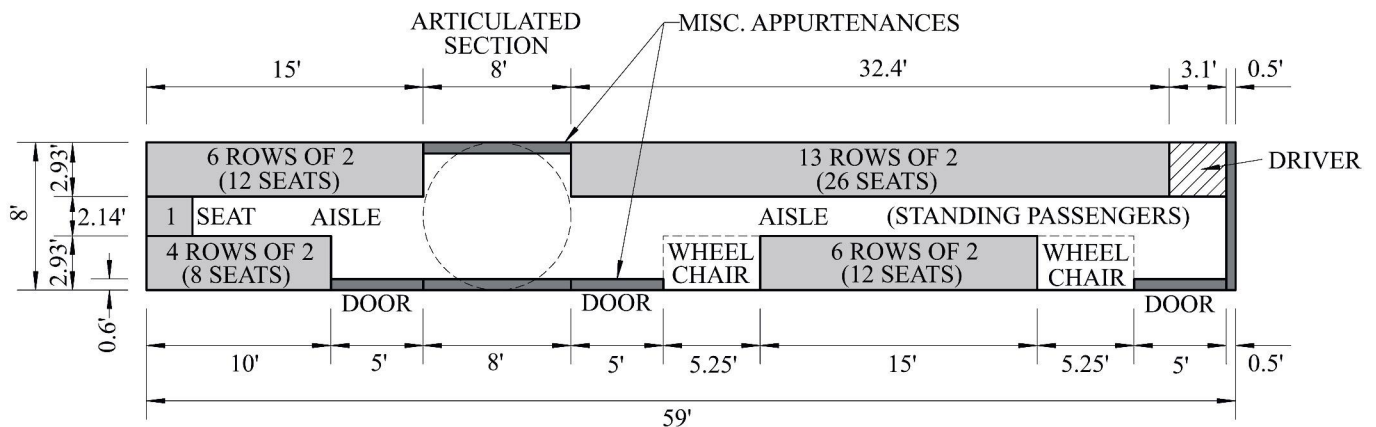
Each bus has three 5 ft. wide doorways, all on the left side. Each doorway has a mechanical floor panel that extends out to the platform when the bus stops. These

make a flush contact with the platform and allow small carts, wheelchairs, and unobservant passengers to board safely. Pedestria's buses must pull in relatively close to the loading platforms. All three doors of each bus must be sufficiently close (within approximately one foot) in order for mechanical floor panels to reach the platform and make flush contact.

Bicycles are not allowed on city buses in Pedestria. They are, however, accommodated in some other cities bus systems, via the use of bicyclist operated racks (front or rear). Similar provisions could be made in Pedestria and might actually be made in a real autoless city someday. Yet, in Pedestria, bicycles are denied bus access because of the safety problems of securing bikes onto or within the buses. Bicycles would add to the problems of frequent crush capacities and tight time schedules. Non-accommodation for bicycles can also be justified by the fact that Pedestria has a wonderfully complete city wide network of convenient and safe bicycle paths/lanes. Further justification is the compact nature of the city and the resulting short bicycling distances.

Another type of transportation service that is not permitted on Pedestria's buses is the hauling of large, awkward, or hazardous items. Small packages and small carts are allowed, but there are necessary limits. Because

## PEDESTRIA'S ARTICULATED BUSES (FLOOR PLAN)



The above dimensions are for the inside of the bus. Outside dimensions are 60 ft. x 8.5 ft.

### ARTICULATED PASSENGER BUS SPECIFICATIONS:

Type of bus - articulated passenger

Outside dimensions: 60 ft. x 8.5 ft.

Inside dimensions: 59 ft. x 8 ft. (472 sq. ft.)

Space allotted for driver: 9.44 sq. ft. (2%<sup>1</sup> of 472 sq. ft.)

Space allotted for misc. appurtenances (poles, partitions, doorway safety clearances, etc.): 23.6 sq. ft. (5%<sup>2</sup> of 472 sq. ft.)

Space allotted for seated passengers: 217.12 sq. ft. (46.0% of 472 sq. ft.)

Total number of seated passengers: 59 (3.65 sq. ft. per seated passenger<sup>3</sup>, divided into 217.12)

Space allotted for standing passengers: 221.84 sq. ft. (47.0% of 472 sq. ft.)

Total number of standing passengers during crush capacity: 111 (2.0 sq. ft. per standing passenger<sup>4</sup>, divided into 221.84)

Total number of passengers during crush capacity (with no wheelchairs on board): 170

Total number of passengers during crush capacity (with 2 wheelchairs on board): 156

of safety issues, crush capacities, and the need to expedite bus schedules, cumbersome items are not allowed. Hired freight haulers or freight taxis are the solution for these situations. Policing is done by drivers or special transit employees stationed at bus stops. City police officers may also apprehend persons with oversized items trying to board buses. For example, items that are so large and cumbersome that hand trucks, dollies, or two or more persons are necessary to carry them would definitely not be allowed on transit buses.

In addition to articulated buses, Pedestria has several other types. The airporter buses are modified versions of the city's standard articulated buses. They are equipped for baggage storage among the seated and standing passengers. This allows people to board an airporter bus with their baggage in tow. Baggage check-in and passenger security is handled at the airport much as it is today.

There is also the possibility of having special buses for citywide door to door handicap shuttle service. Although the transit buses are designed to accommodate wheelchairs, there may still be a need for door to door transport if sufficient numbers of people in wheelchairs or with disabilities are unable to use the regular buses. This service could be provided by special city buses or by franchised private carriers. A fee may be necessary. Specially equipped freight haulers might also be allowed to provide this service.

Another special type of bus in Pedestria is the school bus, which is found on a very limited basis. Most schools are centrally located within their respective districts so that all children can walk, ride bicycles, or use the transit system. However, there is a need for school buses for special school field trips, both in and out of the city. High school athletic teams, school bands, and other large school contingents may also use school buses to get to their events. Chartered buses may be used for in or out of city trips.

Pedestria also has private charter buses and hotel shuttles in limited numbers, as well as private chartered tour and intracity buses. Churches, private sports teams,

assisted living homes, and convention center participants might be some of the groups occasionally hiring these vehicles. Private hotel shuttles and other miscellaneous shuttles may also exist in Pedestria to fulfill special transportation needs.

Pedestria's transit buses follow a very simple pattern. There is a central core loop, 15 residential loops, and 1 airport loop (see drawing next page). Each bus route contains the central core loop and one residential loop. All transit bus routes in Pedestria, including the airporter bus route, follow a figure 8 pattern. The central core loop and a residential loop are the two circles of the 8. Each bus route serves a community group (six communities) and the central core. The buses on each route alternate directions; the first bus travels the two loops of the figure 8 in a clockwise direction, and the following bus travels in a counter-clockwise direction. This provides each community group and the central core with alternating directional service. For linear community groups I and J, the pattern is slightly different. In order to provide alternating directional service, the first bus stops at all six communities on its outbound trip and returns to the central core non-stop. The next bus is non-stop on the outbound trip and makes stops on the inbound trip. Each bus travels in different directions around the central core. The airporter buses follow a similar pattern; around the central



**School busing - Not necessary in Pedestria, except for certain special events and out of town field trips.**



**Private tour buses and charter buses will be allowed in Pedestria for both in and out of town tours.**



**Public transport for the handicapped - Often found in auto oriented cities. It will be an option in Pedestria.**

core, they alternate direction and only make the one additional stop at the airport. Airporter buses do not stop at any of the residential communities.

The distance for each bus route varies considerably. The total distance around the central core loop is 5.81 miles. The shortest distance around a community loop is 4.86 miles for group K. The longest distance for a community loop is 7.99 miles for group J. The average distance for all 15 community loops is 5.83 miles. The average total distance for the central core loop and the community loop is 11.64 miles. This is for a complete trip around the figure 8.

The average stopping time at each central core transit stop is 45 seconds, and the average stopping time at each residential community stop is 30 seconds. With 3 doors per bus and a flush connection between platform and bus, 30 and 45 seconds allow sufficient time for loading and unloading of even the slowest passengers (including the elderly and those in wheelchairs and strollers).

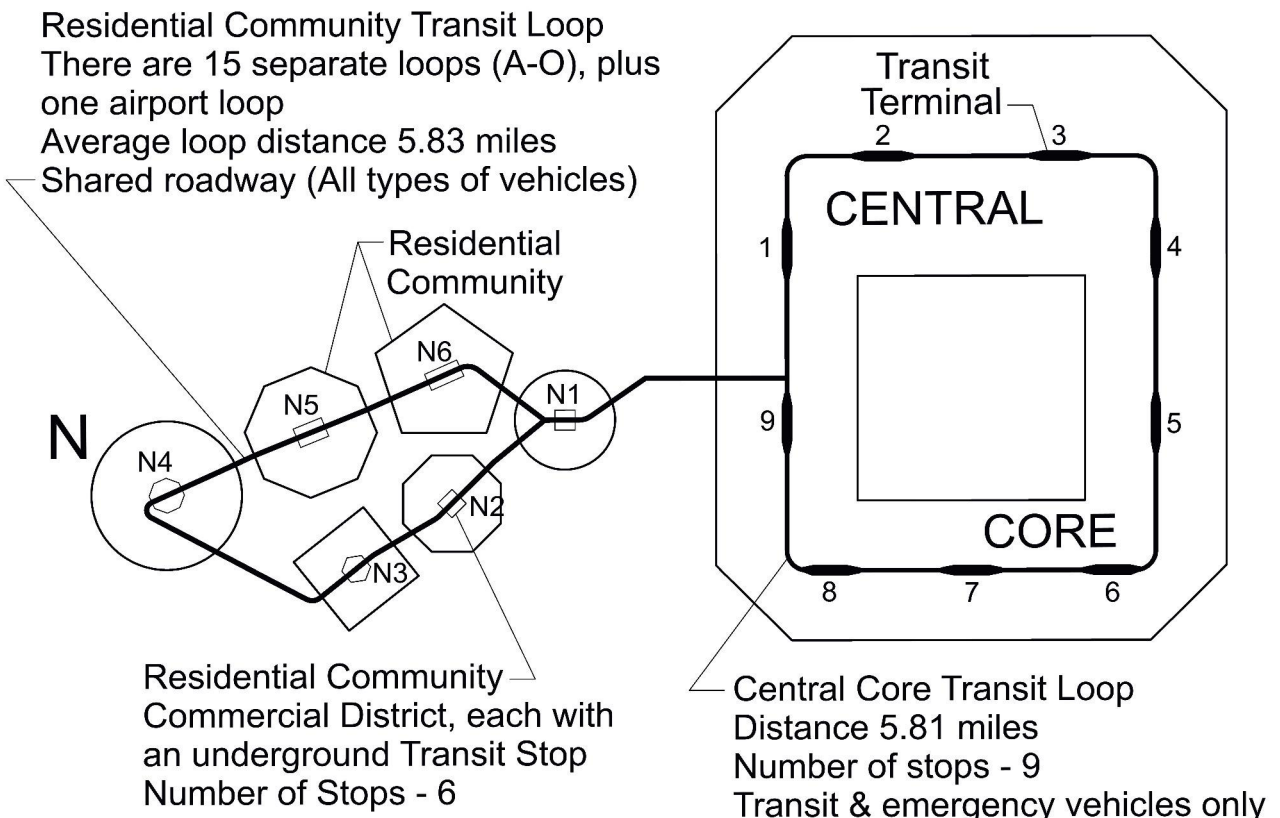
The average transit bus frequency for the peak hour (5-6 pm) in the residential communities is one bus every minute and 46 seconds. This frequency of buses in all the residential community groups produces a rate of buses in the central core loop of one bus in each direction (clockwise and counter clockwise) every 14 seconds. The

number of articulated passenger buses necessary to maintain this frequency of service during the peak loading hours, for the entire city, is approximately 321 buses plus 6 airporter buses. With an additional 40% for standby and maintenance, the entire city's fleet of articulated buses numbers 458.

The specific details and numerical breakdown of Pedestria's transit system are shown in the appendix, pages 164-166. A number of key tables and graphs are given. Tables 1, 2, and 3 show, among other things, a detailed break down of bus intervals in the residential community groups and central core, plus the number of buses required for the entire city. In addition to Tables 1-3, there are 2 graphs illustrating bus speeds and hourly transit demands.

Crush capacity on the buses is calculated to be 170 people. At that capacity, these are very crowded buses (packed like sardines). Rush hour crowding on the buses is estimated to occur during two intervals on weekdays (mornings 7-8:30 am and evenings 3-6 pm). However, crush capacity on the buses is only for a very short distance and duration. (see "Hourly Transit Demands...", page 166, for more details). During evening rush hour, maximum crowding usually occurs between the last central core stop and the first residential stop. Crowding diminishes quickly once buses have made several stops in

## PEDESTRIA'S TRANSIT SYSTEM CONFIGURATION





**Private people movers or shuttle buses - for businesses like hotels, retirement homes, golf courses, municipal airport, etc. A possibility in Pedestria.**

the residential loop and passengers have begun to disembark. Conversely, in the morning rush hour, the worst crowding occurs between the last residential stop and the first central core stop. This may amount to a duration of approximately 3-5 minutes with maximum crowding. Other occasional times of crowding are immediately after large events or performances, when a wave of people disperse to a transit terminal.

During non-peak hours, crowding is much reduced. For the majority of the day, and for the majority of each bus's figure 8 loop, the number of passengers is at a more comfortable level. However, because of the relatively small number of seats on the buses (59), some standing passengers will be the norm for parts of each bus route throughout most of the day. Even for passengers who stand throughout their entire ride, travel time is relatively short. Pedestria's compact nature and nearly obstruction free transit system means bus rides are over quickly. In today's cities, bus rides can be extremely time consuming, often very distant and slow. They usually travel the frequently signalized and congested streets alongside automobiles, making frequent stops (as often as every 2 blocks), and often taking circuitous routes to access scattered neighborhoods. In Pedestria, if overcrowded buses become a chronic problem, there is some leeway to increase the bus frequency and reduce crowding. Bus frequency could be increased by approximately 15%, which would reduce passenger numbers by approximately the same percentage. This bus frequency increase would, however, put more pressure on the central core transit terminal capacity and would increase the chances of occasional problems with buses becoming backed up in the terminals.

On average, during the peak rush hour of the day (5-6 pm), one bus arrives at each central core transit terminal, from each direction, every 14 seconds. The central core transit terminals and roadways are designed to accommodate this peak frequency of buses (see "Central Core Transit Terminal #9 and Major Intersection Detail" on side 1 of map, or similar detail on page 60 for further illustration). A description of the flow on one side of the



**Novel people mover - Something of this nature could be allowed in Pedestria for special businesses or events (i.e., an amusement park, fair, etc.)**

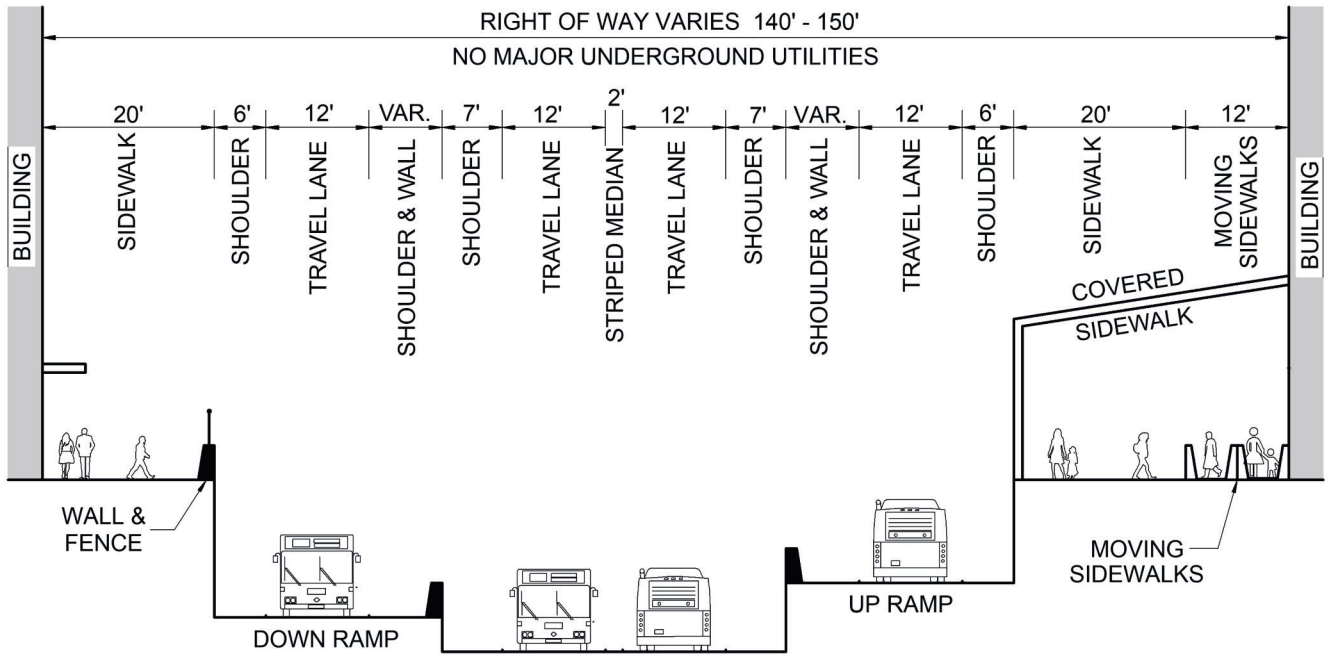
transit terminal is as follows: Assuming that one bus arrives every 14 seconds during the peak interval and assuming that buses arrive in sequence of bus stops (stop #1, bus route A, then stop #2, bus route D, then stop #3, bus route G ...etc.), by the time bus route B arrives at stop #1, 70 seconds will have elapsed since the arrival of bus route A. Meanwhile, bus route A would have left stop #1 after 45 seconds, thus creating a 25 second gap between bus route A and bus route B at stop #1. Under the same assumption, similar gaps would exist between buses at all of the stops (#1 - #5). During non-peak hours this interval between buses would increase (see Table 3, page 172). If this interval was maintained, the passenger loads of the buses would decrease well below the crunch capacity. This would make the crowding situation on the buses more tolerable during non-peak hours.

Bus stop #6, exclusively for the airporter buses, would have a schedule completely independent from other bus routes. Its frequency at peak hours would be approximately once every 7.5 minutes. It would spend longer at each terminal because it would be picking up and dropping off passengers, many of whom would have luggage.

#### TRANSIT ROADWAYS - CENTRAL CORE LOOP

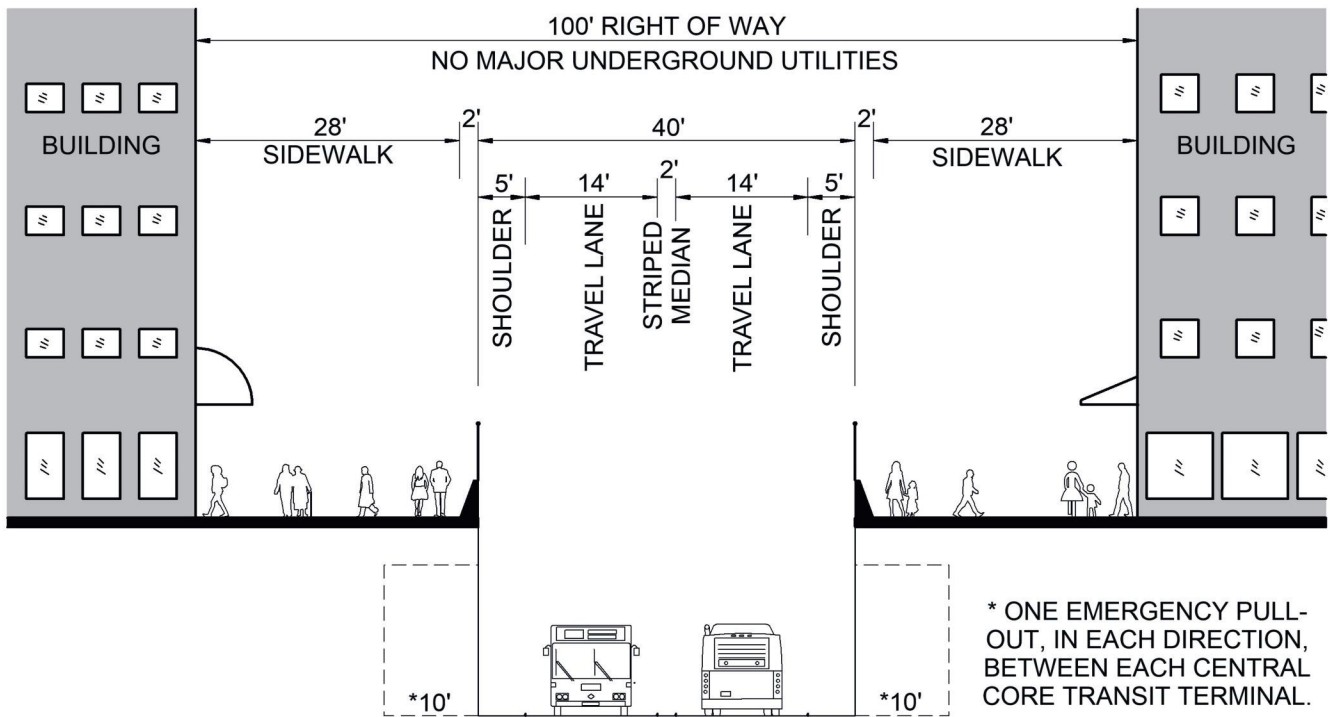
Transit system roadways in Pedestria are very similar to expressways or limited access roadways in conventional auto oriented cities. In the central core they are exclusively for transit type vehicles and emergency vehicle use; all other trucks and service vehicles are prohibited. Outside the central core the bus system roadways are generally shared with all other types of vehicles.

Transit system roadways in the central core are designed to facilitate the rapid and safe movement of transit buses. There is two-way traffic around the central core loop. The entire central core loop (transit roadway) and transit terminals are below grade, and all transit terminals are covered. The transit roadway between the terminals is open to the air except for an occasional bridge. See "Central Core (Section C-C)" and "Central Core



### CENTRAL CORE (SECTION C-C)

Not to Scale



### CENTRAL CORE (SECTION D-D)

Not to Scale

(Section D-D)” on page 47. Below grade facilities eliminate conflicts between transit vehicles and other forms of transportation (pedestrians, bicycles, and trucks), and increase safety and efficiency. Between the terminals the roadway section consists of two 14 ft. wide travel lanes, one in each direction. There is a 2 ft. wide striped median between these lanes for added safety. There is a minimum 5 ft. wide shoulder on the outside of each lane for a total roadway width of 40 ft. In addition to the 5 ft. shoulders, there is one 10 ft. emergency pull out, long enough to accommodate at least one bus and several service vehicles. There is one pull out between each central core transit terminal in each direction. The right of way for this roadway is 100 ft. in width, which is ample room for the bus system and for at grade pedestrian oriented space.

All right of way widths throughout Pedestria's transit system are sufficient in size to allow for some future alterations of transit facilities. Upgrading to a different, more sophisticated transit mode (i.e., light rail or monorail) is always a future possibility. However, such a change would be very disruptive during the interim. The limited growth nature of this city and the adequately sized transit system minimize the possibility that future changes will require enlarging the transit roadway and/or right of way.

There are speed limit restrictions posted in the central core loop (45 mph between terminals and 25 mph in the terminals). The roadway is engineered for a maximum design speed of 60 mph. Due to the spacing of the terminals and the acceleration characteristics of buses, it is unlikely that buses would exceed this design speed. The posted speeds are intended to create safe driving conditions, yet allow the buses the ability to gain time on their schedules if necessary. Weight restrictions are not a problem because transit roadways are specifically designed to handle bus capacity weights and their traffic volumes.

Except for a few emergency entrances and exits, the only access to the central core loop is 7 residential community loop intersections. These intersections allow for non-stop right turn movements on and off of the transit loop. The rest of the intersection's traffic movements are signalized. For a plan view of one of these intersections, see the "Central Core Transit Terminal #9 and Major Intersection Detail" on side 1 of the supplementary map.

It is desirable that the transit roadway be constructed of durable material that will minimize ongoing maintenance and will not need reconstruction for an extended length of time. High grade reinforced concrete, similar to that used for modern interstate highways, is the desirable choice for Pedestria. It is also desirable that the transit roadway be constructed as a utility free zone, thus minimizing potential maintenance or repairs within the roadway.

**The transit system is the life blood of Pedestria.** It is extremely important that the free movement of buses be maintained at all times, because delays or stoppages within the system would result in serious consequences. Maintenance and repairs to the transit roadway should be done at off-peak hours when

possible. Should repairs necessitate the use of equipment on the transit roadway, there is adequate space to use this equipment and still maintain two-way bus traffic. The use of temporary coning and reduced speeds is necessary during these operations.

Emergencies, such as accidents and snow removal, are other potential causes for delay within the transit system. It is important that the city have highly trained and adequately equipped crews (emergency response teams) to quickly remove and clean up these and other emergency problems.

## TRANSIT ROADWAYS - RESIDENTIAL COMMUNITY LOOPS

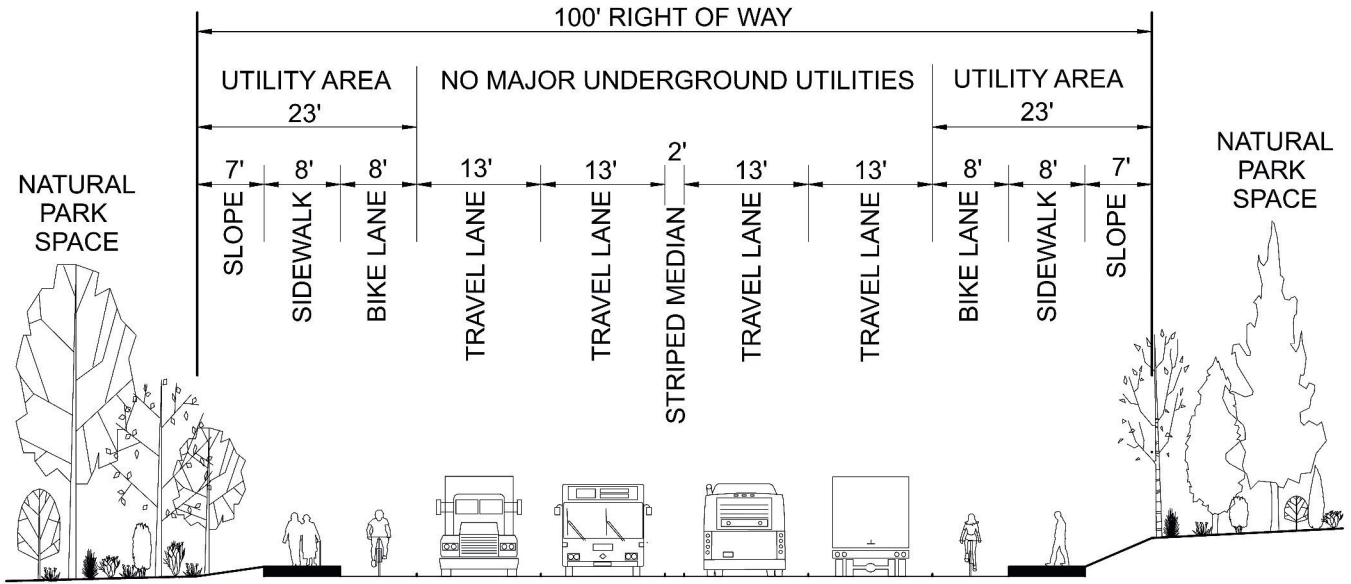
Transit roadways outside the central core loop are somewhat different than the central core roadways just described. Radiating from the 7 main signalized intersections of the central core transit loop are the residential community loop roadways. These roadways branch out and serve all community groups and the airport. They are used by transit vehicles, trucks, and emergency vehicles. The roadway widths are generally of two sizes; see “Residential Community (Section A-A)” on side 2 of the supplementary map, and “Residential Community (Section C-C)” and “Central Core (Section E-E)” on the next page. From the central core loop intersections outward the roadway is comprised of 4 travel lanes, two in each direction. Bicycle lanes and sidewalks also merge with the roadway, either within the central core or on the outer edge of the central core. From here outward, past a minimum of two residential communities, the roadway continues to be four lanes. The roadway eventually narrows to two lanes, due to a diminishing volume of truck and service vehicle traffic toward the perimeter of the city; see “Residential Community (Section H-H)” on page 58. The right of way widths also vary according to size of roadway and size of bicycle lanes and sidewalks.

Unlike the central core transit roadway, community loop roadways are generally on grade rather than below grade. This reduces the expense of below grade facilities. More importantly, it is on grade because of its multiple uses. Transit vehicles, trucks, emergency vehicles, bicycles, and pedestrians all use this right of way. Due to the numerous access points, below grade facilities would be difficult to access and overly expensive to build.

There are posted speed limits for the community loop roadways. Between residential communities speed limits are as high as 45 mph, but within residential community commercial districts speeds are posted at 25 mph. There are also lane restrictions near residential community commercial areas (for example: "No Left Turn" and "Keep Right"). These restrictions keep trucks and buses separated at important locations (within community transit terminals), and are meant to enhance vehicle safety.

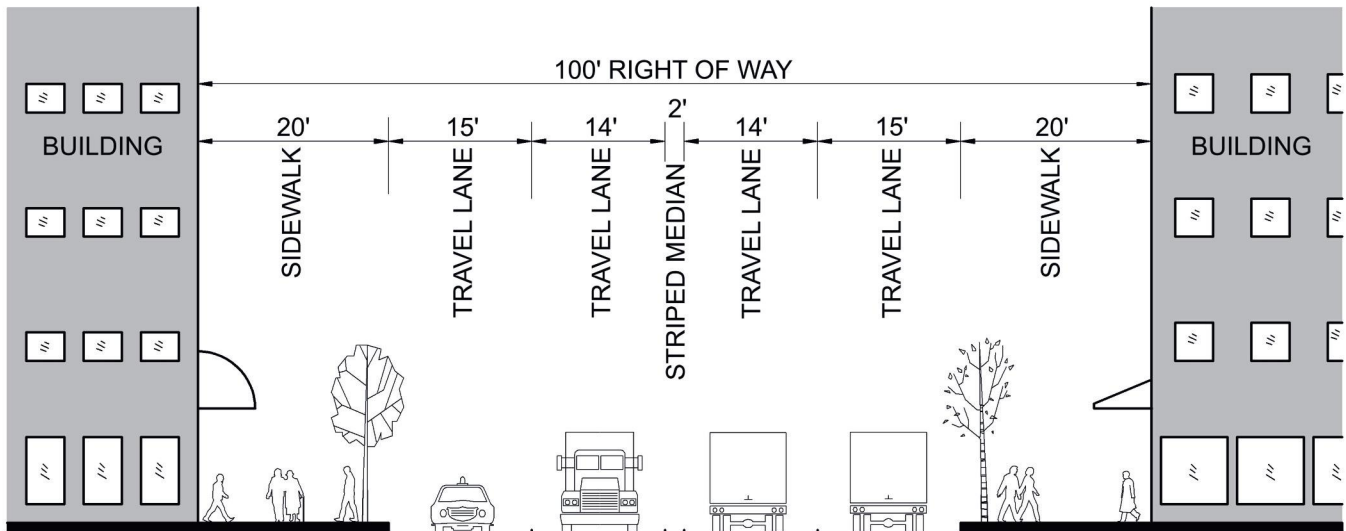
Roadway maintenance, snow removal, and accident clean up are handled as they are in the central core loop. Quick removal and clean up are imperative. It is extremely





## RESIDENTIAL COMMUNITY (SECTION C-C)

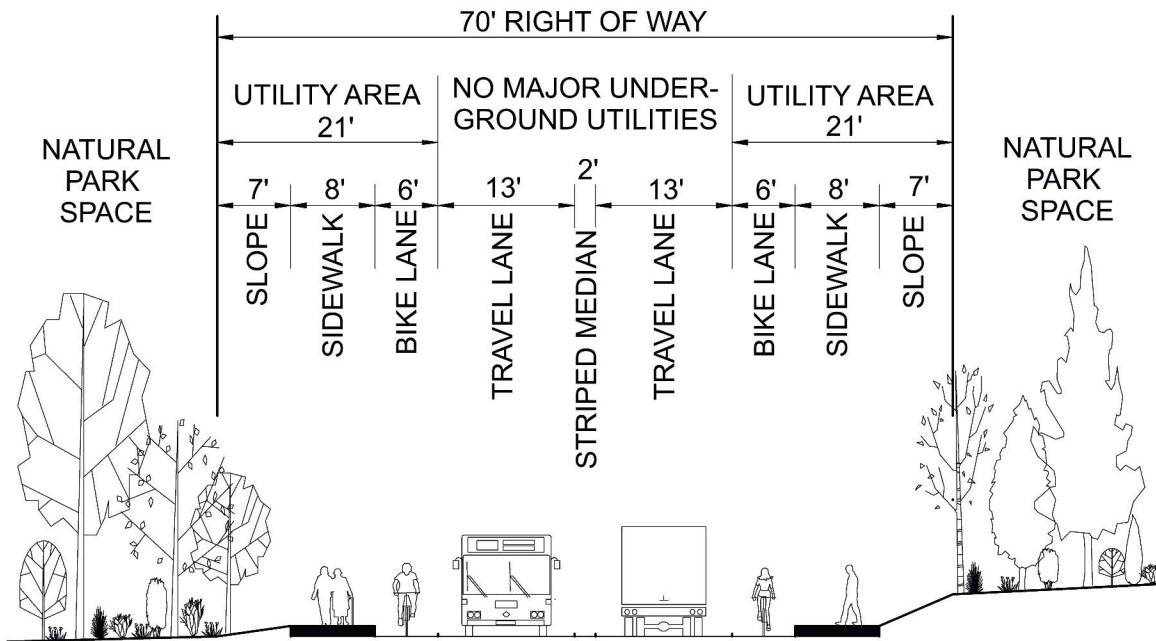
Not to Scale



NO MAJOR UNDERGROUND UTILITIES

## CENTRAL CORE (SECTION E-E)

Not to Scale



## RESIDENTIAL COMMUNITY (SECTION H-H)

See transit loop "C" on "Pedestria Overall Map" on side 1 of supplementary map.

Not to Scale

important that the free movement of vehicles, goods, and services be maintained at all times.

Roadway surfacing and future expansion possibilities are similar to those of the central core transit loop. Reinforced concrete is the preferred material because of its durability. It is also desirable that community loop roadways be constructed as utility free zones to minimize future maintenance or repairs, both of which would disrupt the smooth flow of traffic.

### CENTRAL CORE TRANSIT TERMINALS

There are nine terminals on the central core transit loop. These terminals are spaced at intervals of 2800 ft. and 3600 ft. Central core transit terminals are designed to accommodate hundreds of buses per hour and tens of thousands of people per hour. For a section view, see "Central Core (Section B-B)" on page 59. For a plan view, see "Central Core Transit Terminal Detail" on page 60 and "Central Core Transit Terminal #9 and Major Intersection Detail" on side 1 of the supplementary map.

All nine transit terminals consist of an on grade terminal plaza and a below grade loading platform. The transit terminals are set in 200 ft. wide right of ways. The terminal plaza is a large covered or partially covered pedestrian mall that serves as a distribution area for pedestrians exiting the transit terminal and heading into the various right of ways radiating into the central core. The terminal plaza also serves as a congregation area for pedestrians entering the transit terminal, descending to the



Subway transit terminal - similar to what might exist in Pedestria



Transit loading platform - Pedestria's is very similar, except for a serrated edge and buses rather than rail trains.



Transit stop with a serrated curbline/loading area similar to ones used in Pedestria's central core transit terminals.

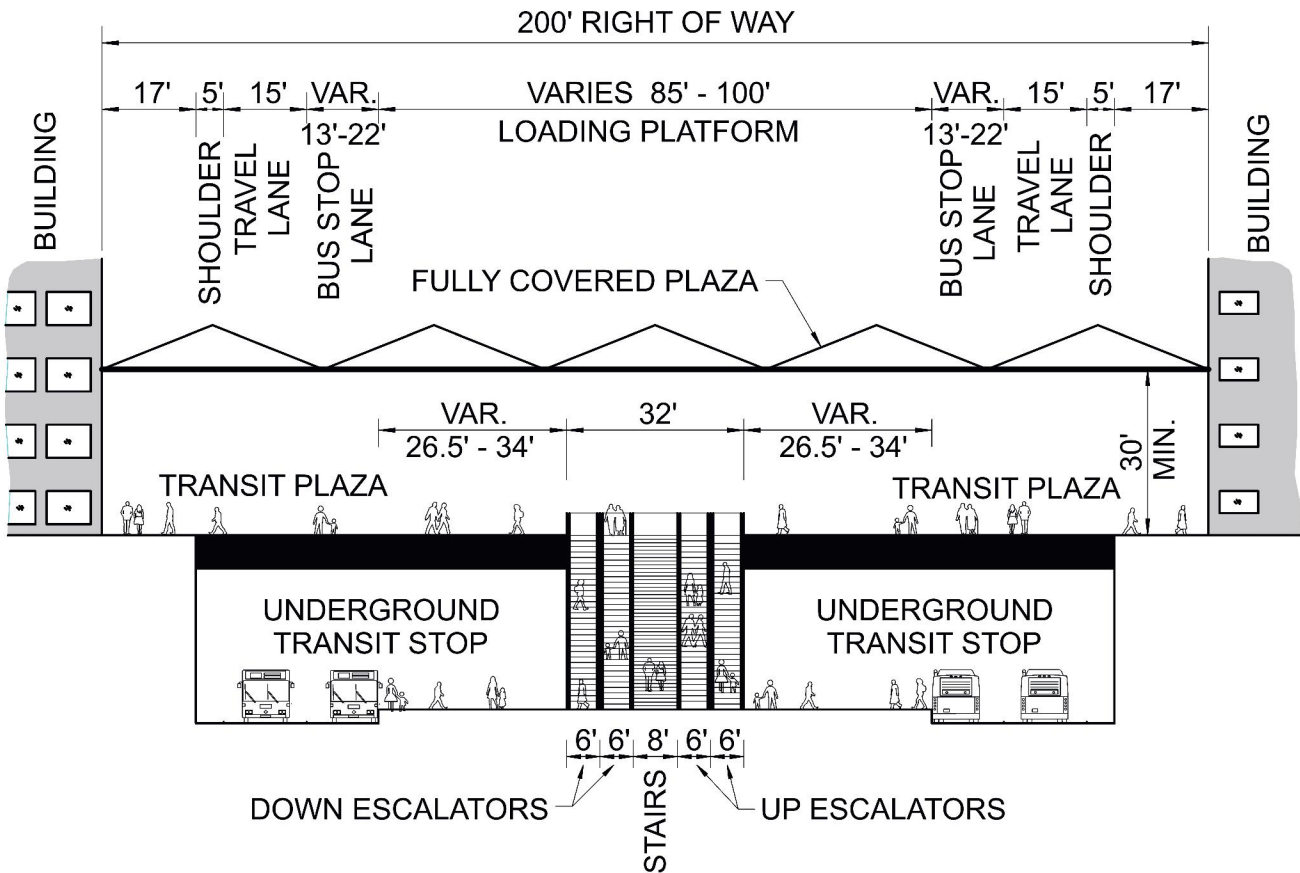
loading platform, and ultimately boarding buses. The space also serves as a general purpose public plaza available for a variety of public events (i.e., festivals, exhibitions, gatherings, etc.).

One level beneath the terminal plaza is the actual heart of the transit terminal. It is an 85-100 ft. wide by 640 ft. long loading platform. Buses travel in opposite directions

on either side of the platform. Both long sides of the platform contain 6 bus stops. The bus stops are configured in a serrated arrangement, thus reducing the distance between stopped buses and reducing the overall length of the loading platform. Five of the 6 bus stops on each side of the platform are for buses from the 15 residential community loops. Each of these 5 stops serves three adjacent bus routes. The sixth bus stop on each side of the platform is for the airporter buses only.

The width of pavement on either side of the loading platform is 33-42 ft. It is divided into a 13 ft. parking lane next to the platform, a 15 ft. passing and turning lane (turning into and out of the serrated configuration), and a 5 ft. wide shoulder (for additional turning space and safety space). This is ample maneuvering space for the number and frequency of buses entering and exiting transit terminals.

During the peak hour of the day (5-6 pm), over 500 buses stop to load and unload passengers at each central core transit terminal. Buses then proceed to the next terminal or to their respective community loop. That amounts to over 250 buses passing through each terminal in one direction. For a high volume transit system to work smoothly and efficiently, coordination and control are



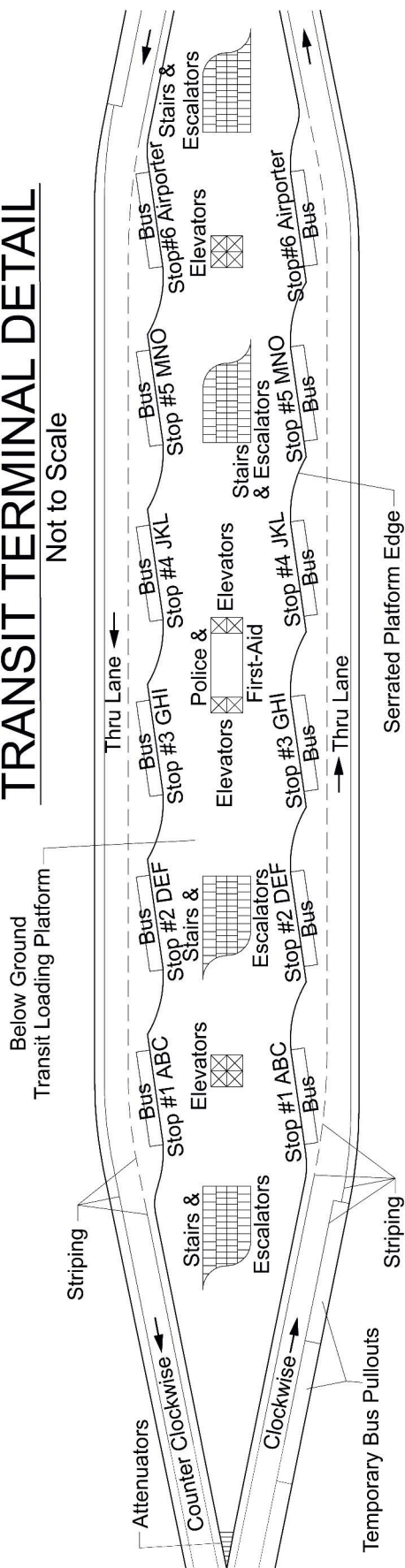
NO MAJOR UNDERGROUND UTILITIES

## CENTRAL CORE (SECTION B-B)

Not to Scale

# CENTRAL CORE TRANSIT TERMINAL DETAIL

Not to Scale



necessary. Due to an approximate 45 second pause at each stop, three bus routes using the same stop, and only space for one bus at each stop, there is a critical need for traffic control. Pedestria's transit system maintains a modern computerized command center for control and coordination of its bus fleet. Buses are equipped with modern technology to communicate with the command center. The transit system is equipped with sensing devices to remotely monitor the location and progress of all buses. There are also internal signaling devices within each bus, and external devices within the terminals and along the bus routes. These devices are used to communicate instructions to drivers and to otherwise control the flow of vehicles. This traffic control system is very much like modern subway controls, and to some extent like modern air traffic control systems.

An effective means of maintaining adequate spacing of buses destined for the same stop is to develop realistic bus schedules and maintain adherence to them. However, there are many times when adherence to tight schedules is not possible and other means of maintaining spacing are necessary. The command center can signal buses to slow down or speed up, maintaining proper spacing.

For a short distance, the roadways entering and exiting the transit terminals consist of a single travel lane and are one way. These approaches have an extra waiting lane for buses to pull over and wait in case two buses bound for the same stop are within 45 seconds of each other (the transit command center is constantly monitoring the distance and time between buses). Electronic sign boards (between central core terminals) and dashboard controls indicate to drivers if spacing or precautionary situations exist. This system prevents the impeding of buses and maintains smooth flow of the transit system, even at the most crowded times of day. If a bus does enter a transit terminal before its destination stop is cleared, it will be in the way of other buses entering and exiting the terminal. Adherence to tight bus schedules, monitoring of bus progress, and availability of waiting lanes allow buses in Pedestria to maintain safe, effective, and uncongested travel throughout the city.

Beside hundreds of buses per hour, the central core transit terminals must be able to accommodate large numbers of passengers. During the peak hour of the day (5-6 pm), thousands of people may pass through a single transit terminal. The transit terminal loading platforms are accessed from buses and from the terminal plazas via 4 groups of stairs and escalators. Each group consists of 4 escalators (2 up and 2 down), one large stairway, and 12 elevators. Because of the large numbers of people using the platform at all hours of the day, obstructions and impediments to the smooth flow of pedestrians should be kept to an absolute minimum. Physical barriers such as pillars and walls are avoided, and activities such as private vendors' solicitation of goods and services on the platform are strictly banned. There are limited amenities on the loading platform itself. There is some seating in low traffic areas for children, the elderly, or persons with disabilities. There are some miscellaneous amenities, such



**An exclusive street for buses - Pedestria will also have an exclusive roadway for transit, namely the central core transit loop.**

as drinking fountains and trash receptacles. The platforms contain electronic message boards, bus route information signs/maps, and a public address system. The platforms also contains a police/security and first-aid office, a transit authority office, and cleaning and maintenance storage rooms. The entire loading platform is covered for protection from the elements, however, it is not heated or air conditioned.

Transit terminal loading platforms are built at the same height as the floor of the buses, thus allowing expedient passage on and off buses. Another physical aid in promoting efficient free flow of pedestrians within the platform area is striping and directional arrows painted on the floor at various high volume locations. This is most useful at the top and bottom of stairs and escalators.

The terminal plaza immediately above the loading platform contains a far greater number of public amenities than the loading platforms. Shelter, seating, restrooms, drinking fountains, trash receptacles, street information signs, phones, artwork, and ample display and event space are all included. Each transit plaza is the hub of pedestrian activity in its portion of the central core. These gigantic



**Simple transit amenities make traveling easier and more enjoyable. Amenities include: good map displays, striping and signage for maintaining good pedestrian flow, public address systems for information and alerts, seating, security, restrooms, elevators, escalators, and trash receptacles.**

covered plazas are dynamic centers of urban activity. It is here at platform and plaza levels where transit and pedestrians meet, and where much of the city's human interaction takes place.

## RESIDENTIAL COMMUNITY TRANSIT TERMINALS

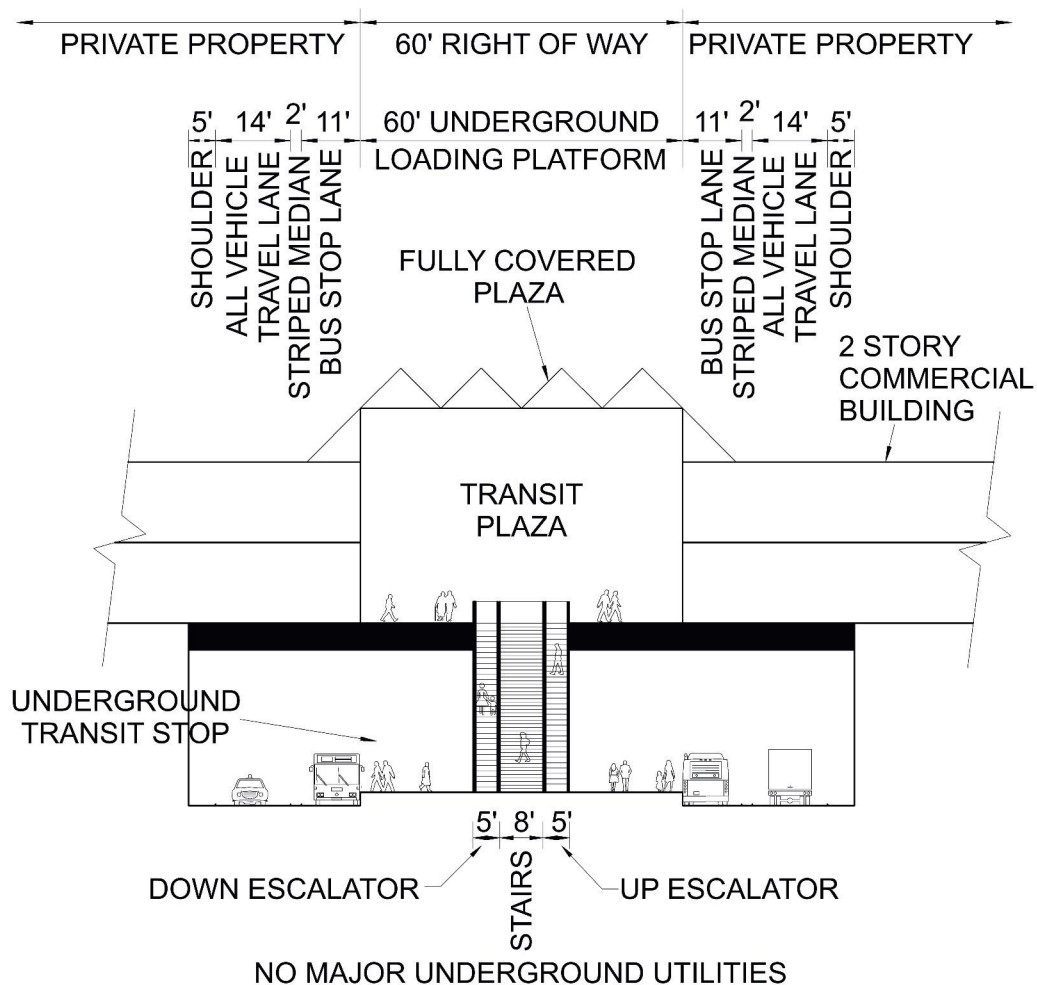
Residential community transit terminals (RCTTs) are similar in design and function to the central core transit terminals. The primary difference between them is the size of the facilities. Plus the residential transit terminals don't have serrated bus stops like the larger central core terminals. Community terminals are designed for a smaller volume of buses and passengers (for plan and section views, see side 2 of the supplementary map and page 62).

All 90 RCTTs are located in the center of their communities, at or near the center of each community's commercial district. This centralizes transit, commercial, and social activities. There is one transit terminal per community. (Note: some communities are adjoining and may appear as one very large community with 2 terminals.) The distance between residential transit terminals varies depending on configuration and spacing of communities, and ranges from 2260 ft. to 3535 ft.

RCTTs are designed to handle a maximum of 2 buses at a time, one from each direction. Many of the community terminals have a total of 4 lanes of traffic passing through them, 2 lanes in each direction: one inside lane for buses, and one outside thru lane for trucks and other vehicles. The residential terminals toward the perimeter of the city where traffic volumes are lowest have only 2 lanes passing through them (one in each direction). However, in these terminals there is a pull-out lane for the buses at the loading platform that enables buses to load and unload passengers without blocking through traffic. Most community terminals are below grade facilities.

The transit terminal in Garden Village (see map) is a below grade 4 lane facility. The loading platform is 50 ft. x 60 ft. It is raised to the floor height of the buses. Because only a single bus stops on either side, there is no need to have a serrated platform configuration. The platform is accessed via buses and by escalators, stairs, and elevators at either end of the platform. The loading platform is situated between lanes of traffic. The roadways on either side of the platform are 32 ft. wide. They consist of an 11 ft. stopping and traveling lane for buses (adjacent to the platform), a 2 ft. striped median, a 14 ft. travel lane for trucks and other vehicles, and a 5 ft. shoulder. There is room for one bus on either side of the platform. Bus intervals through the terminal are as often as one bus every 1.76 minutes (106 seconds) during the peak hours of 5-6 pm. Unlike transit terminals in the central core, residential community terminals do not have a waiting lane on the approaches. These are unnecessary because of the reduced frequency of buses in the communities.

Most of the RCTTs are beneath the local commercial buildings. Therefore, there is very little room for



## RESIDENTIAL COMMUNITY TRANSIT TERMINAL (SECTION VIEW)

Not to Scale

expansion of facilities except through major reconstruction. However, the need for such expansion is negated by the city's limited growth nature. This transportation facility is designed to accommodate any size crowd that such a community could generate.

### OWNERSHIP OF THE TRANSIT SYSTEM

Pedestria's transit system is entirely publicly owned. It is a publicly financed government agency responsible for providing transit service to all citizens. This system is operated and administered by a transit authority that has the legal authority to levy taxes, issue bonds, or even charge user fees (if there is a justifiable need to do so). Through these means, the transit authority can finance 100% of its operating and capital expenses. The transit authority can also seek state and federal revenues or grants to help subsidize its operating and capital expenditures. The transit authority purchases, operates, and maintains all

transit vehicles. Construction, maintenance, and repair of transit roadway infrastructure is done by the city maintenance bureau or by commissioned private contractors. The transit authority has financial agreements with the city maintenance bureau to subsidize or fully pay for these maintenance and improvement projects.

The transit authority and city government are two separate government agencies. There are, however, financial and legal agreements between them. Most of these agreements define specific jurisdiction, administrative, legal, and financial responsibilities for each. The transit authority negotiates directly with labor unions for its employees' wages and benefits. This is similar to most transit authorities in cities across the United States.

An entirely publicly owned transit system is not the only ownership option available to autoless cities. It is possible that a private corporation(s) could be allowed or franchised to provide transit services. Privatization could



Large outdoor bus stop in an auto oriented city.

be as decentralized as different private carriers for each residential group or even individual bus owners operating on assigned routes. No matter what level of privatization, a coordinated and centralized command is necessary. A public service as vital as transportation should be extremely well run and as efficient as possible. A public or quasi-public transit authority should manage and coordinate any degree of privatization.

It is also possible there may not be a separate transit authority. The operation of all facilities of the transit system could be administered by a department of the city government. This could eliminate some duplication of responsibility and staffing. It could also help maintain a more centralized control of this vital service. However, in Pedestria, a separate transit authority is in control of the transit system. This is deemed effective because it allows for a more specialized and responsive transit system.

#### PAYMENT OF TRANSPORTATION SERVICES

Revenue collection by the transit authority is accomplished through taxation, passage of bond levies, and pursuit of outside grant monies. The transit authority's general operating expenses are typically financed by a percentage of the city's levied property tax. Capital



Transit ticket machine - In Pedestria these machines are unnecessary due to an entirely fareless system.

expenditures for new buses, miscellaneous equipment, and infrastructure upgrading is typically financed via bond levies and outside grant monies.

Although Pedestria's transit authority has the legal ability to charge a user fee (a bus fare), this option is not exercised in Pedestria. A user fee is an equitable means of charging for transit services; people's transportation expenditures are in direct proportion to their usage of transit services. However, there are reasons for not using this means of finance. A fare system requires considerable additional transit infrastructure and administrative costs, and reduces the overall efficiency and convenience of the system. The additional infrastructure consists of an assortment of fare boxes, ticket and pass vending machines, monthly pass sales outlets, and restrictive turnstiles, plus maintenance personnel and facilities to maintain this equipment. The additional administrative costs incurred because of a fare collection system are primarily the extra personnel needed to handle the sales, cash collection, and accounting duties required by a such a system. There are also personnel needed for fare inspection. Losses of efficiency and convenience caused by a fare system are numerous. Purchasing of passes and payment of fares by the entire citizenry requires time and effort. A user fee (pay as you go) fare system is cumbersome and inconvenient in comparison to a "free system" where the citizenry pays primarily through property taxes. Transportation for all is made very simple.

In existing automobile oriented cities public transit systems are often financed by both fare collection and taxation. Types of taxation that are commonly used are property tax, income tax, business tax, and/or sales tax. Because of this taxation of the general public it can be argued that non-transit users (automobile users, usually a majority) are unfairly subsidizing a transportation system they do not use. Although it can be argued that these non-users reap the benefits of less congested roads and cleaner air, many would prefer not to pay for this unused service. In Pedestria this argument about one segment of society subsidizing another is not valid. Universal usage of Pedestria's transit system by its citizens assures that property taxes (both direct and indirect) are a comparably equitable means of payment.

Use of any of these types of taxation methods is a possible way for Pedestria to finance its transit system. There are pros and cons for each type of taxation. The goal is to have the most equitable form of payment possible where expenses for the system are incurred, in part, by everyone.

It can also be argued that if vertical travel within our cities (elevators and escalators) is free, why can't horizontal travel also be free? Pedestria's public transit system fulfills this goal. With Pedestria's "free" transit system, there is no payment required upon boarding, unlimited usage of the system, and few or no restrictions on travel. **Anyone in the city can travel anywhere, anytime, quickly and conveniently,**

**as often as they like with no charge.** What an absolutely exemplary system!

## **ALTERNATE TRANSPORTATION**

### **WALKING AS A MAJOR MEANS OF TRANSPORTATION**

As Pedestria's name implies, walking is a major means of transportation in the city. It is conceivable that citizens will make more walking trips than transit trips. Pedestria's compact nature and its pedestrian and transit orientation guarantee that the average citizen will make several walking journeys daily. Urban compactness, along with centralized nodes of activity, minimizes walking distances throughout the city. Thus, a very large number of meaningful destinations are within easy walking distance for everyone.

All people living in Pedestria are pedestrians on a regular basis. This is the nature of life in an autoless city. In auto oriented cities a large percentage of short trips are driving trips. In Pedestria these same journeys are accomplished by walking. The longer trips in Pedestria are transit trips, which all begin and end with walking. Some longer trips may also be by bicycle.

Average walking speeds among the general populace vary greatly, according to physical condition, health and age. Walking speeds range from 5.0 ft. per second for fast walkers to 4.0 ft. per second for slow walkers. For simplicity, a single average walking speed will be used for all walking examples in this book; that is 4.5 ft. per second, which is 270 feet per minute or about 3 miles per hour.

The distance an average person is willing to walk to a destination varies considerably. Many factors determine willingness: age, sex, physical condition, health, time schedule, and weather conditions. The motivation for a trip is important; is this a leisurely stroll or an important appointment one has to make? Natural conditions experienced during a walking trip can also determine a person's willingness to make that trip. Weather conditions, both bad and good, are very important factors. The amount of daylight and its affect on safety, both real and perceived, are important. The natural or manmade surroundings of the walking route are also a factor; is this a walk through a pleasant natural setting or through a crime ridden, dilapidated neighborhood? The walking surface, its topography, convenience, and accompanying amenities are also influences.

A commonly used range of distance people are willing to walk to reach useful destinations under average conditions is from 1/4 mile to 1/2 mile (one way). In Pedestria the majority of people's useful destinations are within this range from their homes. The walking distance from an average home to the transit stop in a mid-sized residential community is 600 to 800 ft. This represents a walking duration of about 2 to 3 minutes. In the central

core the walking distance from a transit terminal to an average destination is about 900 ft. This represents an average walking time of 3 to 3 1/2 minutes. Average destination distances are measured from the center of the transit terminals to the mid-point of minimum building density, as measured in cross-section. Because building heights and densities are greatest near the terminals, the average distance is less than half the distance from the terminals to the edge of the surrounding park space.

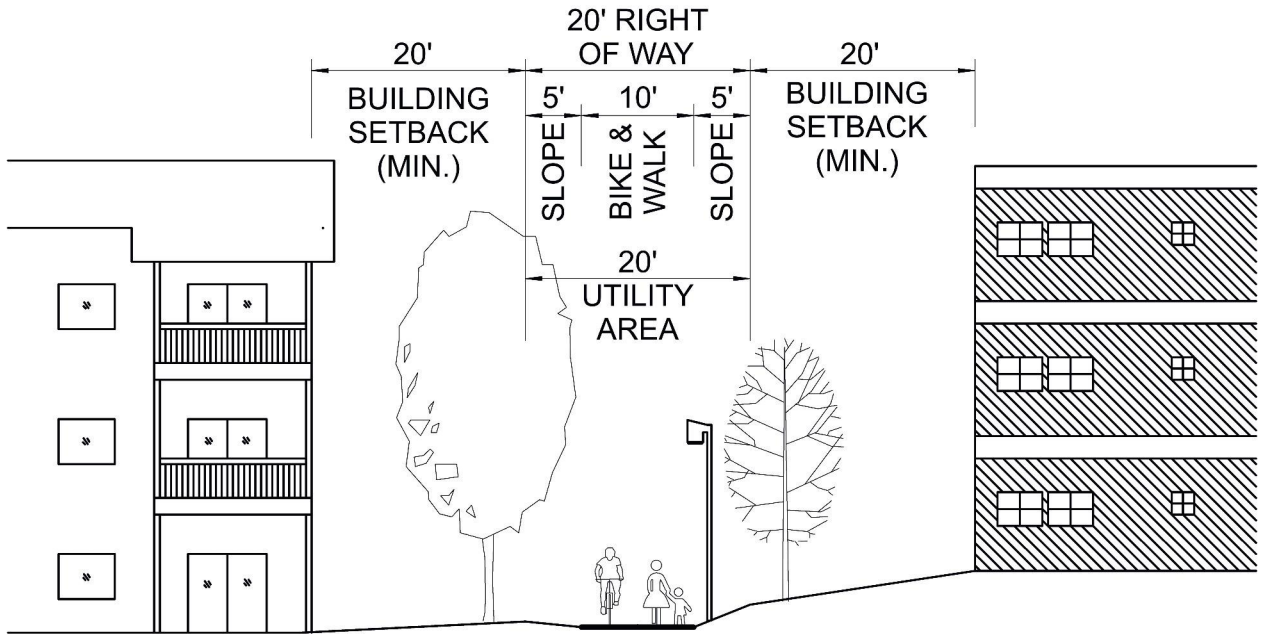
Pedestria is designed with pedestrian orientation in mind. It is not only a necessity, but a result of numerous factors. Pedestria's land use/zoning patterns and its density requirements produce a great many urban entities within small areas. This compactness means many people live and work within close proximity to vast numbers of urban entities (far more entities than would be close in an automobile city). This close proximity to the necessities of urban living make walking an integral part of people's lives. The city is full of sidewalks, footpaths, trails, promenades, covered and uncovered streets, exclusive streets for pedestrians, sky-bridges, moving sidewalks, escalators and elevators, as well as a host of amenities that accompany this pedestrian environment. The design of the city emphasizes direct routes for pedestrians and quality pedestrian infrastructures.

Walking safety is of prime importance. There are three areas of concern regarding pedestrian safety: safety from other transportation vehicles, safety from the elements, and safety from crime.

Safety from vehicles is evidenced by various types of separations. The transit system is separated from pedestrians and other types of vehicles in the central core by grade separation. The transit roadway is approximately 35 ft. below grade and is not accessible to pedestrians. In the residential communities the shared transit/freightway road is usually grade separated as it passes beneath the commercial district. The other thoroughfares in Pedestria that are for both vehicular and pedestrian uses have standard curbs to provide a degree of separation and safety. Concrete barriers may also be used where additional safety is warranted. Where walking traffic and vehicle traffic do cross, there are crosswalks, signals, and the legal mandate that pedestrians have the right of way.

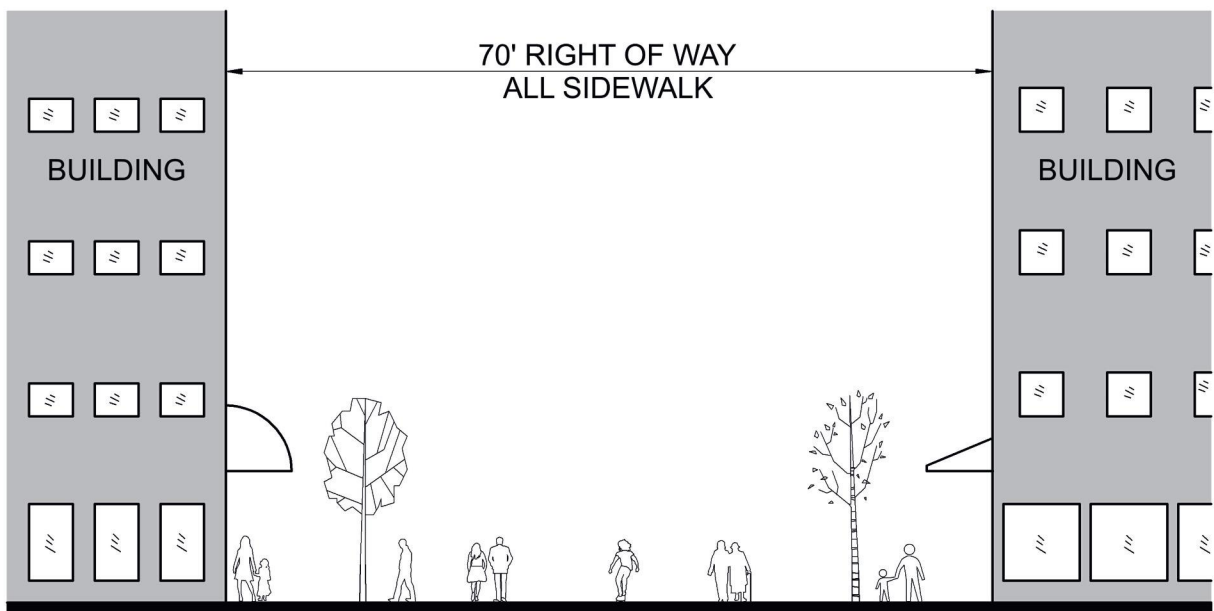
The separation of pedestrians and bicyclists is also a major concern. The two share some sidewalks and footpaths, which can create a hazard for both. Throughout Pedestria there are bike lanes that are separate and off limits to both vehicles and pedestrians. These are separated from the vehicular roadways and sidewalks by pavement striping and curbs. However, there are numerous walkways (sidewalks) and footpaths (paved and unpaved) that are shared by cyclists and walkers. Pavement striping, directional arrows, signing, and various partitions help to create a high degree of safety (see page 80 for examples of barriers between pedestrians, bicyclists, and vehicles). Equally important for pedestrian and cyclist safety is education of the general public on safety rules, and enforcement of those rules by the police force and





## RESIDENTIAL COMMUNITY (SECTION G-G)

Not to Scale



NO MAJOR UNDERGROUND UTILITIES

## CENTRAL CORE (SECTION I-I)

Not to Scale

## PEDESTRIAN DESIGN FEATURES



A pedestrian street with limited access (not a through street) and time limited parking for vehicles carrying goods and services.



A covered pedestrian street - an example of what is possible in many of Pedestria's central core right of ways and the residential community commercial districts.



A pedestrian only street lined with many shops, restaurants, and businesses.



A narrow right of way with stairs providing connectivity between streets and neighborhoods, a key component of urban pedestrian orientation.



A small one story street right of way with second floor and above building rights for adjacent properties. This is a great use of space while providing good connectivity.

neighborhood watches. This education should begin very early in the public schools.

Pedestrian safety from the elements is another important design consideration. Throughout much of the city, particularly in high density areas, there are varying degrees of pedestrian protection from the weather. All of the central core transit terminals and residential community terminals are covered at both the below ground (loading platform) and ground level (transit plaza).

Radiating out from all of the central core transit terminals are right of ways that provide full width protection from the elements. Most of the residential community commercial district right of ways are also fully covered. These covered streets provide open air shelter, meaning that the ends of the covered streets are not necessarily enclosed. Therefore, there is a natural flow of air throughout the network of covered streets that will allow a natural rise and fall of temperature and humidity according to the outside ambient conditions. The covered street network in Pedestria can be designed to be entirely enclosed. This can be done either permanently or temporarily during extremes of temperature and humidity. Heating and air conditioning are also a possibility during periods of enclosure. An example of how these covered streets might appear and function are the enclosed or open air shopping malls which are so prevalent today.

Throughout many of the remaining streets (non-covered streets), some shelter is provided. This shelter is in the form of canopies, awnings, building overhangs, and porticos (which are prevalent in Europe). Pedestria's building code requires all central core and zero setback buildings along non-covered streets to provide weather protection along their street frontage. The amount of protection varies, but can extend as far as 10 ft. out from the building. This weather protection helps create a pleasant walking environment.

Security from crime is another important consideration in pedestrian oriented cities. People who don't feel safe or comfortable walking in their city will be reluctant to do so. Many factors go into a person's feeling of security as they walk: age, sex, size, time of day or night, and security along the route all contribute to one's sense of well being or lack thereof. For a number of reasons Pedestria will have the potential to be a low crime city. Aspects of crime will be discussed in greater detail in Chapter 7. Here it shall suffice to say that the compact nature of the city will simplify policing and neighborhood watches. Also, the abundance of pedestrians throughout the city will provide security in numbers. The watchful eye of passersby will help thwart crime before it happens. There are, however, areas that should be avoided during periods of low usage or at night. These are paths and trails through parks and open space, and possibly some of the industrial area's less traveled streets.

**Short distances, protection from the elements, and a sense of security will revitalize a form of transport that has all but**

**succumbed to the advancement of the automobile. Walking will be more meaningful and convenient. It will be more pleasant, attractive, and secure. Walking will be a way of life in Pedestria.**



A pedestrian street with crowds of people.



Pedestrian striping - Very valuable, particularly in high traffic areas of directional conflict.

A pedestrian street lined with many shops.



A wide pedestrian street - lightly used

## PEDESTRIAN PATHWAYS AND INFRASTRUCTURE



A narrow pedestrian street filled with outside seating for adjacent restaurants.



An extremely narrow passageway/right of way between houses, connecting two streets.



A paved path between an apartment complex and open space.



A narrow footpath traversing the open space between communities.



A much used low cost gravel path.



A pedestrian foot bridge crossing over railroad tracks.



**Fencing used to keep people out of sensitive areas.**



**A inexpensive and portable barrier used to control the flow of pedestrian traffic.**

### MOVING SIDEWALKS, ESCALATORS, ELEVATORS, AND OTHERS

Pedestrian orientation also includes a number of mechanical enhancements. These are machines that increase the speed of the walker or allow them to go from one floor to another quickly and effortlessly. Moving sidewalks, escalators, and elevators are three types found in Pedestria. Many of these pedestrian enhancements are publicly owned and operated. They are provided by the city to increase efficiency and convenience.

Moving sidewalks are not common in existing automobile oriented cities, except in a few high pedestrian volume locations, such as airports. They are useful for moving people horizontally over substantial distances. Escalators are much more common than moving sidewalks, but are still not overly abundant. They are useful in moving people up or down one or more floors. Elevators are, of course, very common in numerous applications.

In Pedestria there are many high volume pedestrian locations. In addition to the airport, the central core and residential transit terminals are most noteworthy. Escalators and elevators are located at all the city's transit terminals. These mechanical devices allow large numbers of people to quickly and effortlessly gather or disperse

from the below grade loading platforms, improving overall transit efficiency. Stairs are also provided at these locations. Most people will be inclined to use the faster and easier escalators rather than the stairs. Elevators at these locations provide access for anyone preferring to use them, typically people with disabilities or people with packages, strollers, and such.

The escalators shown emerging from the transit terminal in Garden Village are 5 ft. wide (40 inches between handrails). Escalators in all central core transit terminals are 6 ft. wide (52 inches between handrails). Typically these travel at a rate of 1.66 ft. per second and have an approximate maximum practical capacity of 5,000 to 6,000 people per hour.

There is duplication of escalators and elevators at all of Pedestria's transit terminals. This allows closure of some facilities for maintenance or during low usage periods (late at night). Remaining facilities will still operate, and service will not be curtailed.

Public escalators and elevators may be found at other locations throughout Pedestria, wherever there are sufficient volumes of pedestrian traffic at significant grade or level changes. Communities located on Blue J Hill, with some steep slopes, are candidates for a series of escalators from the bottom of the community to its top.

Of course, private escalators and elevators will abound. All multi-story buildings (the vast majority of buildings) in Pedestria are required to have elevators.



**In Pedestria elevators will be available at all transit terminals and will be required in most other multi-story buildings.**

Escalators are not a requirement in the city, but will commonly be used in building designs.

Moving sidewalks in Pedestria are primarily a public infrastructure found in the central core. Here large numbers of people walk along covered streets radiating from transit terminals, making them the best locations for these mechanical time-savers. The high volume of people needing protection from the elements makes this a perfect environment for moving sidewalks. Pedestria's moving sidewalks are typically located in the center of the street right of way. They are usually in pairs, side by side, with one moving in each direction. They generally extend the length of the block, break at the cross streets, and then continue the length of the next block. This pattern continues for up to two blocks (approximately 600 ft.). Most moving sidewalks in Pedestria are 48 inches wide, travel at 2.0 ft. per second, and have a maximum practical carrying capacity of approximately 7,000 people per hour. Moving sidewalks increase average walking speeds by approximately 40%.

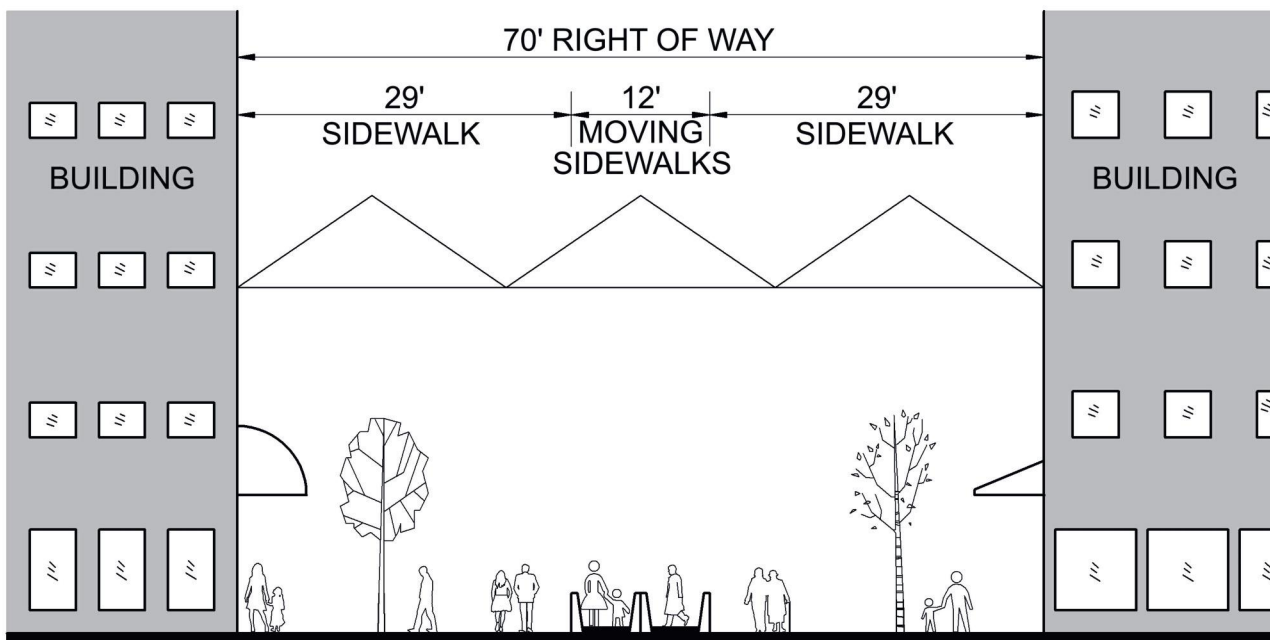
There are areas in the central core and in some high density residential communities where uni-directional flows of pedestrians are common. For example, at the transit terminals there is heavy morning traffic in one direction, and heavy evening traffic in the opposite direction. This is also true at large sports stadiums and entertainment facilities where large numbers of people gather and then later disperse, all at once. These locations are candidates for moving sidewalk(s) that can change

direction morning and evening or before and after events. This arrangement makes the best use of such facilities.

The convenience, service, and ease with which these mechanical aids expedite the task of foot travel are easily understood. There are, however, some down sides. Their cost and the cross street barrier they create are two negative aspects. The cost of purchase, installation, operation, and maintenance is substantial. There are at least 80 public moving sidewalks (1 block in length), 432 public escalators (1 level rise), and 452 public elevators (1 level lift) possible in this design scenario of Pedestria.



A moving sidewalk located in an airport terminal - very similar to the moving sidewalks in Pedestria's central core covered streets, which radiate out from each of the central core transit terminals.



NO MAJOR UNDERGROUND UTILITIES

## CENTRAL CORE (SECTION G-G)

Not to Scale



**Escalators are very common in Pedestria, especially at the central core and residential community transit terminals.**

These represent considerable infrastructure in addition to other transit facilities. Limited operation during low volume hours is a possible cost saver.

The cross street barrier problem is primarily related to moving sidewalks. Long sections of moving sidewalks through the middle of public right of ways obstruct cross street movement. However, they are located in areas that primarily serve as longitudinal corridors. Streets that contain moving sidewalks must be of sufficient width and design to handle all pedestrian traffic in the event moving sidewalks become inoperable. There needs to be unobstructed free space on either side of the moving sidewalk so pedestrians can travel in either direction.

Moving sidewalks are an important and productive addition to the transportation infrastructure of this city. They complement the main transit system by reducing overall travel times. They bring distant parts of the central core and communities within closer range of all citizens.

### BICYCLING AS AN IMPORTANT MEANS OF TRANSPORTATION

Bicycling is an important and common means of transportation in Pedestria. The city's compact nature and its network of good bicycle facilities put the vast majority of this city within range of the average cyclist. The distance the average cyclist is willing to pedal to reach important destinations, commute to work, or run errands is approximately 5 miles. The diameter of Pedestria is only 6 miles, thus from any starting point, a 5 mile range would put the majority of the city within cycling distance. For slightly more ambitious riders, the entire city is their cycling domain.

A typical rider travels an average speed of between 10 and 15 mph. At this speed the 5 mile journey will take approximately 24 minutes. The distance from an average residential community to the nearest central core transit terminal, which is midway across the central core, is 2.33 miles (this distance is not straight line distance, rather it is a calculated door to door distance, from actual point of departure to actual destination). The average bicycle rider

can traverse this distance in 9.5 to 14 minutes. By contrast, the average automobile commute in the U.S. is over 12 miles, requiring 23 to 25 minutes of driving time<sup>5</sup>.

In the United States, bicycling as a means of traveling to important destinations is limited to a very small number of people. Bicycling in this country has been primarily thought of as recreation or exercise, an activity that should be done during leisure time. In the past there has been little consideration by transportation planners to adopt bicycling as a serious form of every day urban travel. Only in recent years has it begun to receive some well deserved attention in a handful of cities.

This is, however, not true for many other parts of the world. Throughout many countries, most notably those in Asia and Europe, bicycling is an important means of travel. In some countries bicycles outnumber automobiles by a significant margin. For instance, in China there are over ½ billion bicycles<sup>6</sup> for a population of 1.34 billion. In comparison, there are just over 100 million cars<sup>7</sup> in China (albeit the number of cars is increasing rapidly). The bicycle is a vehicle for the masses. It is inexpensive to purchase, maintain, and operate. It is versatile; bicycles can go many places an automobile cannot. They are even used to haul quantities of freight, and they contribute greatly to cottage industries, all the while creating very little pollution and foreign debt. As successful as bicycling may be in these countries, it is often considered an underclass form of transportation. It is considered a vehicle for the commoner. In many of these foreign countries, as in the United States, the common attitude of transportation planners toward bicycle transportation is not serious. Throughout most of the world, the automobile dominates the designs, aspirations, and emphasis of most transportation planners.

In auto oriented cities that have few cycling facilities, there is a corresponding low number of bicyclists. For the few hardy souls who dare ride frequently in this automobile jungle, it is a gauntlet of danger, obstruction, and circuitry. Cyclists are up against an onslaught of heavily muscled machines. They are literally cycling for their lives. Traffic related cyclist accidents in the U.S. number 51,000 per year<sup>8</sup>.



**Bicycling - when safe and convenient, a wonderful way to get around.**

## BICYCLES AND INFRASTRUCTURE



Bicycle parking does take up space, but just imagine how much more space would be needed if each of these was a car.



A passing lane for bicyclists on an uphill grade.



It has been argued that “there aren’t enough bicyclists to warrant the expense of creating bike lanes”. Yet, imagine how few cars there would be on roads that just ended. There needs to be a well connected infrastructure of bike lanes before there can be mass use of bicycles



Some bike lanes in Pedestria will inevitably be shared with pedestrians and their pets. Common courtesy and slow speeds will be a necessity.



Covered bike parking - a nice amenity that is much appreciated by the cycling public.

Automobile advocates argue that if there are so few cyclists in our cities, why should large sums of money and resources be allocated toward such a disproportionate few? "Won't we be building bike lanes and bike facilities that will have little use?" This argument is often based on the fact that some existing bicycle paths and lanes are severely under used. However, on closer examination, many of these poorly utilized facilities do not connect centers of population or commerce, the exact places that would generate more ridership. Bike lanes that serve population centers and activity nodes would provide a host of meaningful destinations for the cycling populace.

An undivided network of bicycle facilities providing direct routes to viable destinations with a good degree of safety must be in place before a substantial bicycling population will exist. Given a friendly and comprehensive cycling environment, many more people



will be inclined to ride. **A bicycle path to nowhere generates as much traffic as a road to nowhere.**

In Pedestria an amicable and comprehensive network of bicycling facilities extends throughout the entire city, providing an alternative means of inexpensive, environmentally sound, and healthful transportation for all citizens so inclined. The most common bicycle facilities in Pedestria are bike lanes. They are one way lanes adjacent to truck and transit lanes, usually separated from these vehicle lanes by wide striping, but sometimes separated by curbs and concrete barriers. Most bike lanes are meant for single file riding, but some can accommodate two riders abreast. On the other side of the bike lane there are usually a curb and sidewalk, designated for pedestrians. For dimensions and details of all the various bike lane facilities, turn to the following central core and residential community cross sections: “Central Core (Section M-M)” and “Central Core (Section J-J)”, page 74; “Residential Community (Section F-F)”, page 75; and “Central Core (Section F-F)”, page 84. There are bicycle facilities adjacent to both vehicle and pedestrian facilities. Some paths are exclusively for bicycles, and some are shared with pedestrians.

Besides pavement striping, curbs, and concrete barriers, that separate cyclists from vehicles and pedestrians, there are also barriers that restrict cyclist access all together (stairs, turnstiles, and narrow walk-throughs, for example). These restrictive barriers either prevent bicycles entirely or force cyclists to walk or carry their bicycles. Areas of the city where large numbers of pedestrians are prevalent may be bicycle exclusion zones or dismount zones. Exclusion zones are areas where bikes are not allowed at all. Dismount zones are areas where bikes must be walked, not ridden. Transit terminals, transit plazas, and covered streets are the main places where one or both of these restrictions are enforced.

With literally thousands of bicycles in Pedestria, there is also a need for bicycle parking. Bike racks that provide good security and are sheltered from the rain are best. Racks should also be placed clear of pedestrian thoroughfares and out of harm’s way as much as possible. Both public and private bike racks are common in Pedestria. City building codes require that all public and private buildings provide bicycle parking facilities for employees, residents, and customers. The quantity of bicycle parking spaces is dependent upon the square footage of a building, its zoned use, and its actual use.

Since there are large numbers of pedestrians and cyclists sharing facilities or using adjacent facilities, it is paramount that the safety of each is given important consideration. Bicycle and pedestrian accidents could be a problem in Pedestria. This problem could be compounded or minimized by a number of factors: the amount and quality of cyclist and pedestrian training; the quality and inherent design of bicycle and pedestrian facilities; the city's laws that govern use of bicycles and define responsibilities of both cyclist and pedestrian; and the enforcement and adherence of these laws. These safety

factors can be evidenced in a variety of ways. Cyclist and pedestrian training can begin in preschool and be periodically taught as refresher courses. These classes may be mandatory for insurance premium discounts and for bicycle licensing and registration (if this is made a legal requirement of ownership). The inherent safety designed



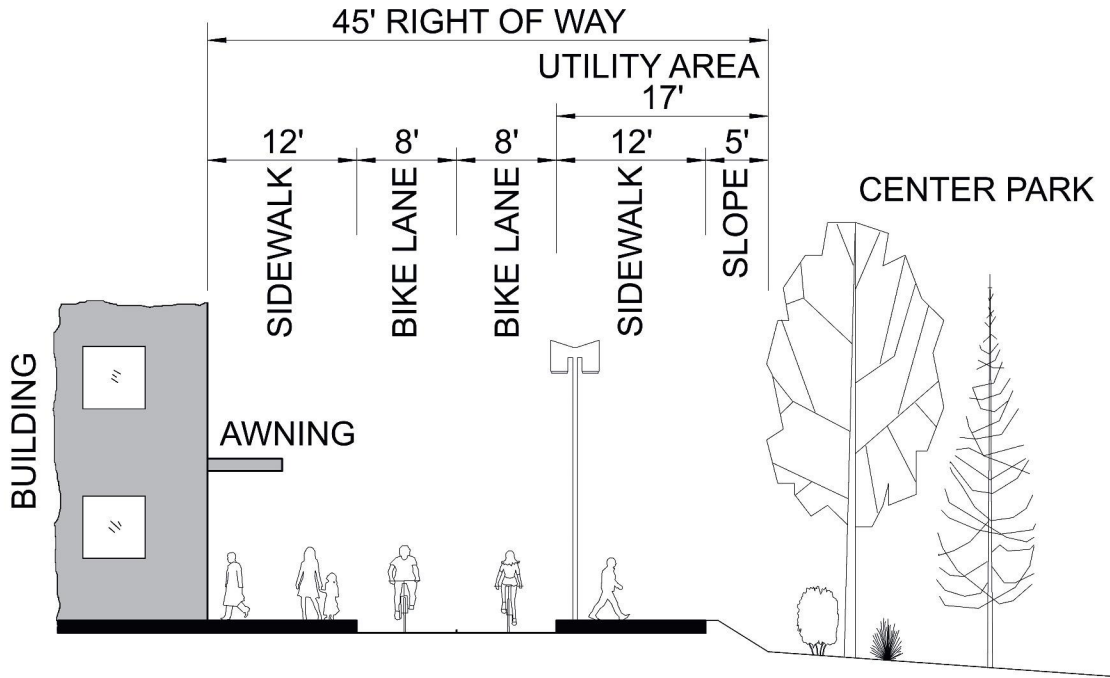
**In hilly areas it may be necessary for cyclist to dismount and carry their bikes.**



**There will be places in Pedestria where cycling and skateboarding are prohibited.**

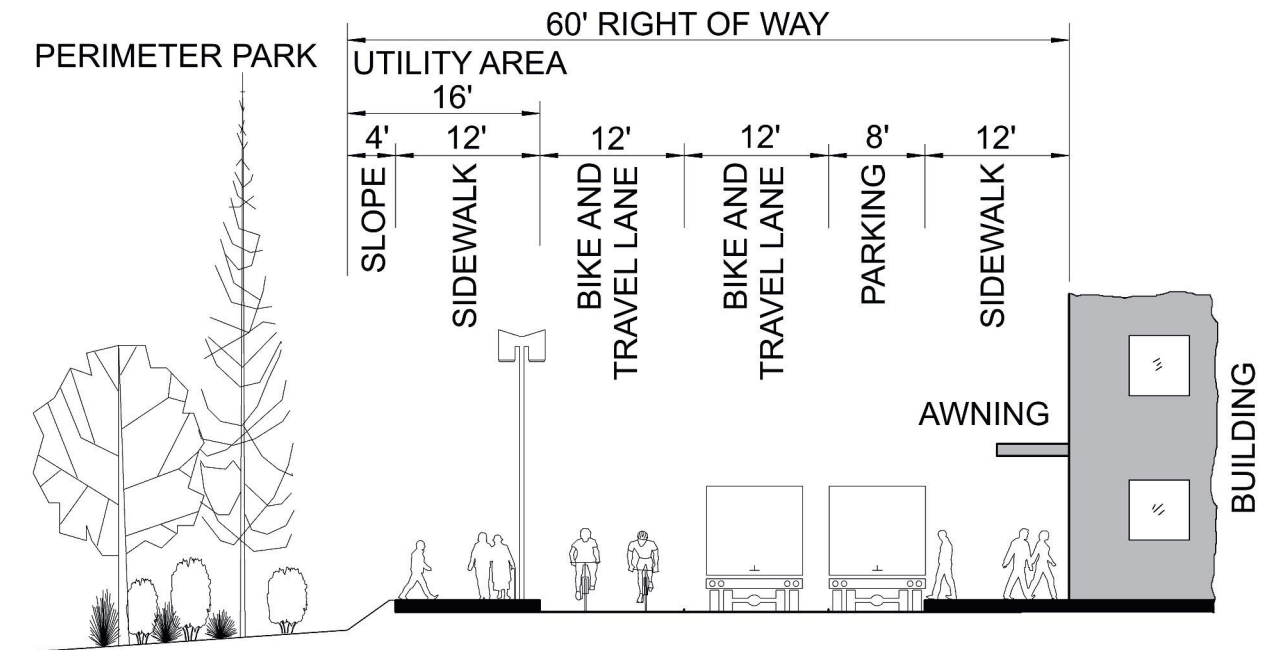


**There may also be places where physical barriers are necessary to slow bicycle traffic down.**



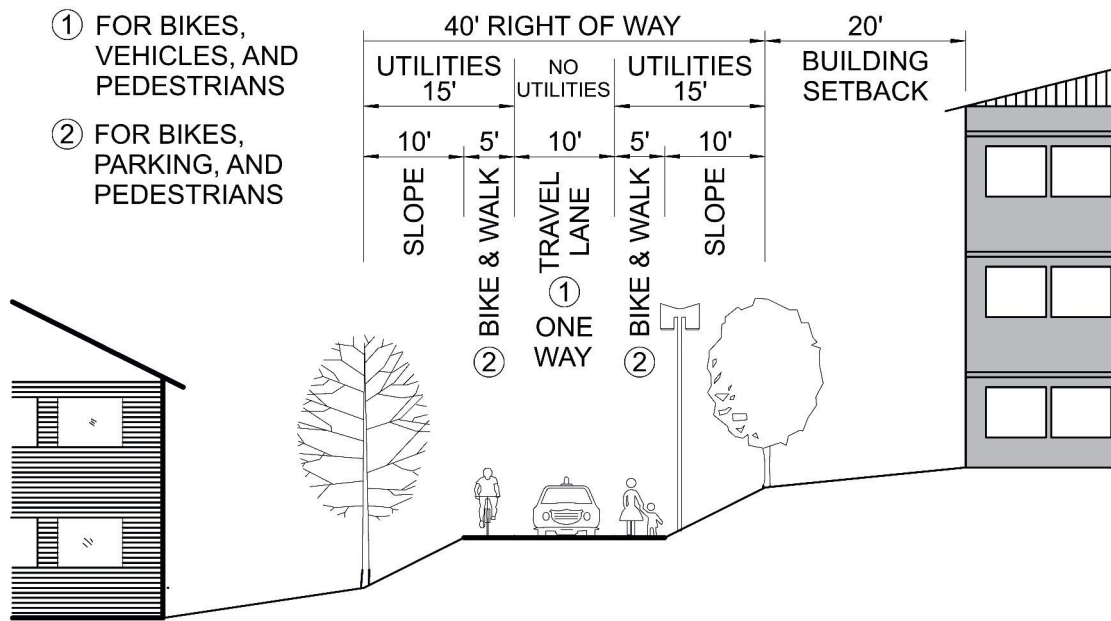
## CENTRAL CORE (SECTION M-M)

Not to Scale



## CENTRAL CORE (SECTION J-J)

Not to Scale



## RESIDENTIAL COMMUNITY (SECTION F-F)

Not to Scale

into bicycle and pedestrian facilities is evidenced by many technical design criteria. Adequate widths, sufficient striping, proper signing, and effective separation are some of the important parts of safety design. Also, laws that govern both cycling and walking are important in promoting safety. The goal of these laws is to require safe riding and walking practices. Pedestria's cycling and pedestrian laws are similar to those in existing auto oriented cities. Simple rules such as obeying signals, signs, and striping are basic to orderly and safe movement of people and bicycles. These laws are enforceable and can carry fines and penalties if violated, including citations and bicycle confiscation. Licensing and registration of bicycles may be a necessary element of public bicycle safety. In Pedestria, this will depend on its perceived need and its voter popularity.

### MOTORCYCLES, SCOOTERS, AND MOTORIZED BICYCLES

Obviously, non-motorized vehicles such as bicycles are permitted in Pedestria. All forms of motorized travel for private and personal transportation of people are strictly forbidden. Motorcycles, scooters, motorized bicycles, motorized skateboards, and most Segway-type vehicles are categorized with private automobiles. In order to maintain the autoless nature of this city, they are banned.

It could be argued that vehicles like motorcycles and scooters don't constitute a very large intrusion on Pedestria's landscape. It can also be similarly argued that bicycles are not much different in their space requirements, their infrastructure needs, and their hazards to the

pedestrian public. However, the allowance of personal motorized vehicles of any kind adds one more class of vehicles to the city's compact urban design. Pedestria's transit system is designed to be an abundant, timely system accessible to all, and to all parts of the city, for free. It would not be a wise decision to undermine that system with the introduction of another entire system of transportation based on private and personal motorized vehicles. Pedestria has eliminated the negative aspects of personal mechanized transportation, namely pollution, enormous infrastructure (private and public), and huge costs (both private and public). It would be contradictory



Motorcycles - Not allowed in Pedestria for the general public, but permissible for police and security.



**Motor scooter - Not allowed in Pedestria. This is motorized personal transport.**



**Mopeds and E-bikes are not allowed in Pedestria. They are motorized personal transport.**

to allow some of that negativity back into the city. The line of demarcation between allowed non-motorized personal vehicles (bicycles and such) and prohibited motorized personal vehicles (cars, motorcycles, scooters, e-bikes, motorized skateboards, and taxis) is clearly and permanently drawn in Pedestria.

#### MISCELLANEOUS ALTERNATE TRANSPORTATION

There are a variety of minor miscellaneous modes of transportation in Pedestria that fulfill special transportation niches for a variety of people. They are all permitted, and in some cases are given special attention with regard to the design of public and private infrastructure.

Wheelchairs are a common type of transportation for those who are permanently or temporarily unable to walk. Pedestria's contemporary design means that it will be built initially with handicap access throughout. Wheelchair access via elevators, curb ramps, special doorways, etc., will all be requirements of the city building code. All types of wheelchairs will be permitted in Pedestria, including push, self-propelled, and emission free motorized. Motorized wheelchairs and motorized Segway-type vehicles will be the only personal motorized vehicles

allowed throughout the city (for the disabled general public). These types of personal motorized vehicles will only be allowed with proper medical exemption licensing. A person will be required to prove a medical need to operate such a vehicle in Pedestria.

Skateboards and roller skates are another miscellaneous mode of transportation that will be popular in Pedestria. These activities are normally thought of only as recreation. In Pedestria, where distances within the city are reduced compared to auto oriented cities, and where there is a complete network of pathways and sidewalks throughout the entire city, skateboarding or roller skating/blading will become a viable and enjoyable means of transportation. In today's cities, children and young teenagers almost exclusively are the age group participating in these activities. In Pedestria, these activities will continue to be dominated by the younger generation, but will be enjoyed by both young and old. No special urban design considerations are given to skating, because most architectural design features for wheelchairs and pedestrians will also accommodate skaters. Like bicycling, skating will also be governed by certain rules and regulations that are designed to promote safety and enjoyment. Areas of high pedestrian traffic will have skating restrictions (skating exclusion zones) similar in nature to bicycle restrictions. Other areas will be off limits to skaters for safety reasons or to prevent property damage. Pedestria will have a number of skate parks (both large and small) for boarding enthusiasts.

Within Pedestria there will be a number of miscellaneous specialty businesses that provide a limited degree of alternative transportation. These will include boat and canoe rentals on Center Lake, bicycle or porter drawn rickshaws for hire, and horse drawn carriages for hire. These services will constitute more of an entertainment or tourist activity than transit, yet these activities can transport people to various places within the city. Although these activities may be marginal in terms of overall urban transportation, they do add to the culture and flavor of the city. No special urban design considerations are given to these additional miscellaneous activities. There will, however, be rules and regulations that are designed to promote health, safety, and enjoyment of these activities.

#### NON-TRANSIT VEHICULAR TRANSPORTATION

In order for Pedestria to have a balanced and total transportation system, there must exist the capability to move goods and services on a large scale. There also must be allowances for emergency vehicles and a variety of specialty vehicles, all of which are indispensable to the city. These all comprise non-transit vehicular transportation.

## PEOPLE ON THE MOVE



Wheel chairs are permitted in Pedestria, both push and mechanized. Because Pedestria is a brand new city, it will be built entirely accessible to the handicapped.



Because of universal ADA standards and wide sidewalks, baby strollers will be used with ease in Pedestria



For the elderly, Pedestria will be a safe accessible haven.



For teenagers, skateboards are a common and viable means of transportation. Their use will be allowed in Pedestria. However, restrictions and enforcement will be necessary to prevent damage to property and conflicts with pedestrians and cyclists. Local skateboard parks will be present in Pedestria's neighborhoods to help focus teenage energy and enthusiasm.



Horse drawn carriages and pull and pedal rickshaws will be allowed in Pedestria on a limited basis, primarily for tourism.



Segway - Not allowed in Pedestria by the general public, but will be permissible for special permitted uses, such as security and some medical conditions.

## THE MOVEMENT OF GOODS AND SERVICES

Movement of goods and services encompasses all activities that can be defined as the movement of things (distinct from people) and the movement of commissioned or non-commissioned services. The movement of goods and services is a large-scale activity, which is vital to the economy and functioning of the entire city.

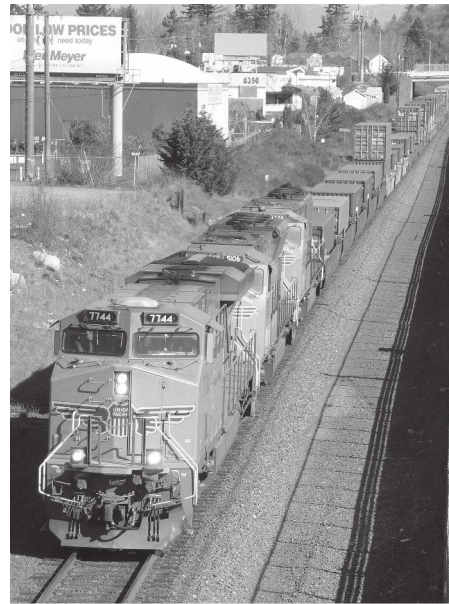
Movement of goods and services is generally thought of as the carrying of freight by trucks; it is also the movement of goods by rail or plane. Another example is the movement of services that require tools, equipment, and materials that must be transported by vehicle. Transporting of goods and services goes beyond minor freight moving capabilities provided by the transit system and alternative modes of transportation. Although transit and some forms of alternative transportation have accommodations for transporting small packages, rolling suit cases, and small amounts of goods, they are not adequate for supplying the commerce needs of a large city. Therefore, trucks and service vehicles will be allowed in Pedestria as they are in auto oriented cities. Businesses and companies that require vehicles in their normal operation can own a vehicle or even a fleet of vehicles, depending on the size and nature of the company.

In existing auto oriented cities, the composition of vehicle traffic consists of approximately 85 to 90% private automobiles and motorcycles, and 10 to 15% truck and service vehicles. Of course, some of the trucks and service vehicles are fulfilling automobile business. From these percentages and from detailed traffic counts, it can be construed that Pedestria will need roadway, parking, and service facilities for approximately 10% of the traffic volume that would be found in a comparably sized auto oriented city.

Pedestria will be a city with select types of vehicles. There will be all kinds of trucks and vans, both large and small, traversing the roadways of Pedestria. There will be everything from pickup trucks to eighteen wheelers, golf carts to large step vans. Basically any type of vehicle will be allowed to operate in Pedestria as long as its actual use is that of moving goods, services, and emergency assistance, and not the personal transport of people.



Service/maintenance vehicles will be allowed in Pedestria. Both private contractors and public agencies may have a need for such vehicles.



Freight train.

Movement of goods in Pedestria will be handled by a variety of public and private carriers. Public carriers, such as the U.S. Postal Service, will deliver mail and packages. There will also be a number of private carrier companies that will provide package and cargo hauling services. These businesses will vary in size from large parcel services with huge fleets of trucks, to individuals who own a single pickup truck or small electric cart and make a living hauling miscellaneous merchandise for a fee.

## FREIGHTWAYS AND STREETS

Throughout Pedestria there is a complete network of roadways designed specifically for trucks, service vehicles, and emergency vehicles (non-transit vehicles). These roads are called freightways. They are totally separated from the transit roadways in the central core and are combined with the transit roadways throughout most of the residential communities. For locations of Pedestria's freightways, see the "Pedestria Overall Map", the "Central Core Detail", and the "Residential Community Detail", on sides 1 and 2 of the supplementary map. For section details, see "Residential Community (Section C-C)" and "Central Core (Section E-E)", page 57; "Residential Community (Section H-H)", page 58; and "Central Core (Section L-L)", page 83.

Pedestria's freightways are basically identical to roadways in conventional auto oriented cities. The one difference is they are only traveled by trucks, service vehicles, emergency vehicles, and sometimes buses, but not by private automobiles.

The basic network of freightways in Pedestria consists of two loops circling within the central core donut, 16 roads connecting these 2 loops, and 7 community loops extending outward to the various communities (branching to all 15 community loops, plus the airport). The central core inner loop is approximately half way between the

## VARIOUS WAYS GOODS AND SERVICES ARE MOVED.



18 wheeler for big hauling jobs.



Smaller freight truck.



Step van for frequent deliveries.



Even bicycles can be commissioned to do hauling jobs.



Small vehicles such as this one will be available for hire in Pedestria, but will be restricted to hauling freight (freight taxis). These are not meant to be conventional passenger taxis, but passengers will be allowed to accompany their freight.



If Pedestria was a port city, it might have facilities like this.



*Photo Credit - Pictometry International Corp.*

Large container handling port facility.



Forklift - used for heavy items or pallets of smaller items.

## SOME CONSTRUCTION EQUIPMENT THAT WILL BE FOUND IN PEDESTRIA



**Dump truck.**



**Front end loader and compacter.**



**Concrete truck.**



**Garbage drop box truck.**

## POSSIBLE BARRIERS FOR SEPARATING PEDESTRIANS, BICYCLISTS, AND VEHICLES



**Portable fence - used to separate vehicles from pedestrians or bicycles.**



**Gate - opened only for emergency vehicles and for special permitted occasions.**



**Pop-up bollard used at a guard station.**



**Removable posts - pedestrians and bicycles can pass with ease, but not vehicles**



transit loop and Central Park. The outer central core loop is roughly half way between the transit loop and Perimeter Park. Both loops are 3 lane, one way roadways. The inner loop travel direction is clockwise; the outer is counterclockwise. The one way configuration is efficient, increases speeds, accommodates large volumes of traffic, is safer than two way traffic, and reduces the need for a fourth lane. The 16 connection roads between these inner and outer loops are 4 lane, two way roads. This configuration, although not as safe and efficient as one-way, reduces the travel distances for most vehicles. The residential freightway loops are 4 lane, two way roads from the central core to the second communities on both sides of each loop. The remainder of the freightway (from community #2 to community #5) is 2 lane, two way. The residential freightways nearest the central core have more lanes than those farthest from the central core. They carry more traffic because of their relative proximity to the busy central core. The freightways and transitways are exclusive to their respective types of vehicles throughout the central core. The residential transit/freightway loops are shared and traveled by transit vehicles as well as all non-transit vehicles.

These roads are the basic arterial network from which all goods and services pass. These major arterial freightways provide access to the central core, all residential communities, and the airport. They give access to other roads, such as minor collectors and neighborhood streets. All of these road types combined provide access to individual properties and buildings throughout the entire city.

There are 4 kinds of roadway classifications within Pedestria for non-transit motorized vehicles. Each type of roadway has degrees of access and certain restrictions.

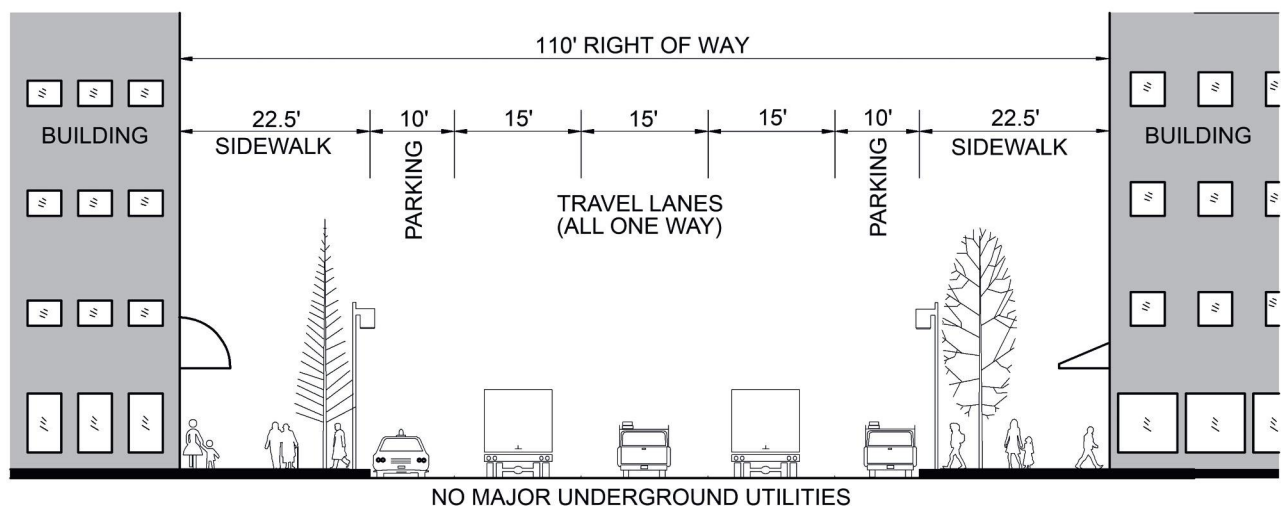
Major arterial freightways are the largest roadways with the highest volume of traffic, greatest weight limits,

and highest speeds. They vary from 2 to 4 lanes (lanes are usually 13-15 ft. in width). They are one or two way. They include freightway loops and connectors in the central core and the residential community loops. Size and weight limitations are comparable to U.S. interstate highway standards. Speed limits range from 25 mph to 45 mph in the residential loops, and 25 mph to 35 mph in the central core. These speeds are established for both safety and efficiency reasons, and are easily achieved and maintained by all manner of vehicles.

Within the central core there are traffic signals at major intersections and major pedestrian crosswalks. The central core signals can be synchronized for varying speeds, but for this design they are set for a comfortable 30 mph. Within the residential community groups there are few intersections and only a handful of major intersections requiring traffic signals.

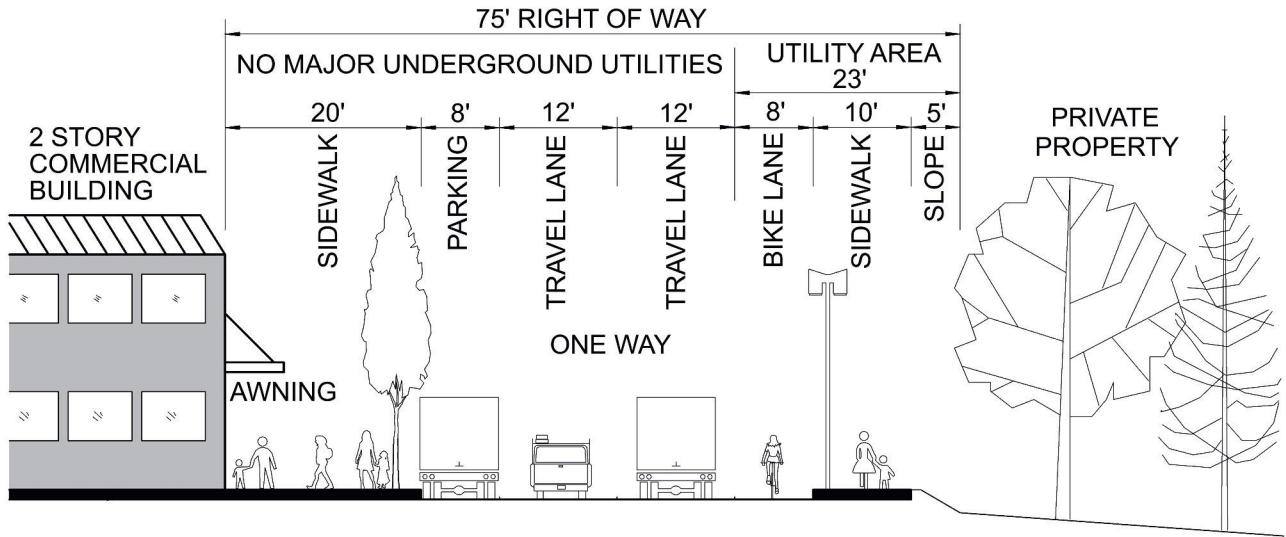
Next are minor collector roadways, which are prevalent in residential communities. These are standard roadways with curbs, sidewalks, and usually bike lanes. They vary from 1 to 2 lanes (each 12 ft. wide) and are one or two way. They include the perimeter roadway around the residential community commercial districts and many of the streets throughout the communities. There are a variety of size and weight limitations; commercial district perimeter roads have size and weight limits comparable to the freightway loops; the remaining minor collectors also have reduced size and weight limits. Speed limits for minor collectors range from 15 mph to 25 mph, and there are very few traffic signals. Within the central core there are very few minor collectors. Here there generally are just transitways, freightways, and shared pedestrian/vehicle streets.

Next are shared pedestrian and vehicle streets. Vehicles co-mingle with pedestrians on these streets. There are considerable numbers of these shared streets in the



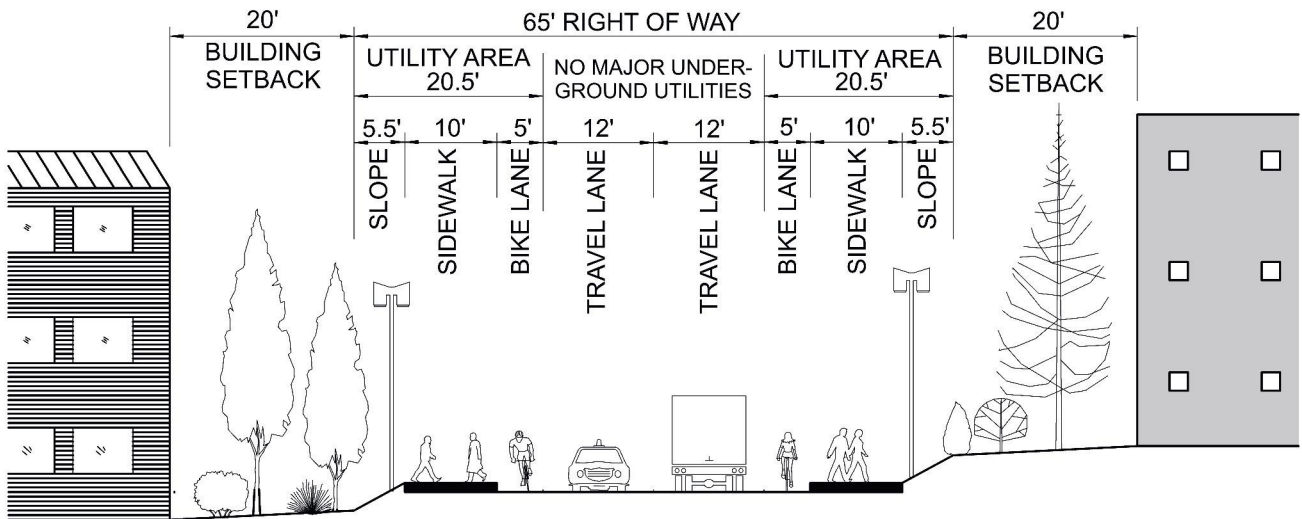
## CENTRAL CORE (SECTION H-H)

Not to Scale



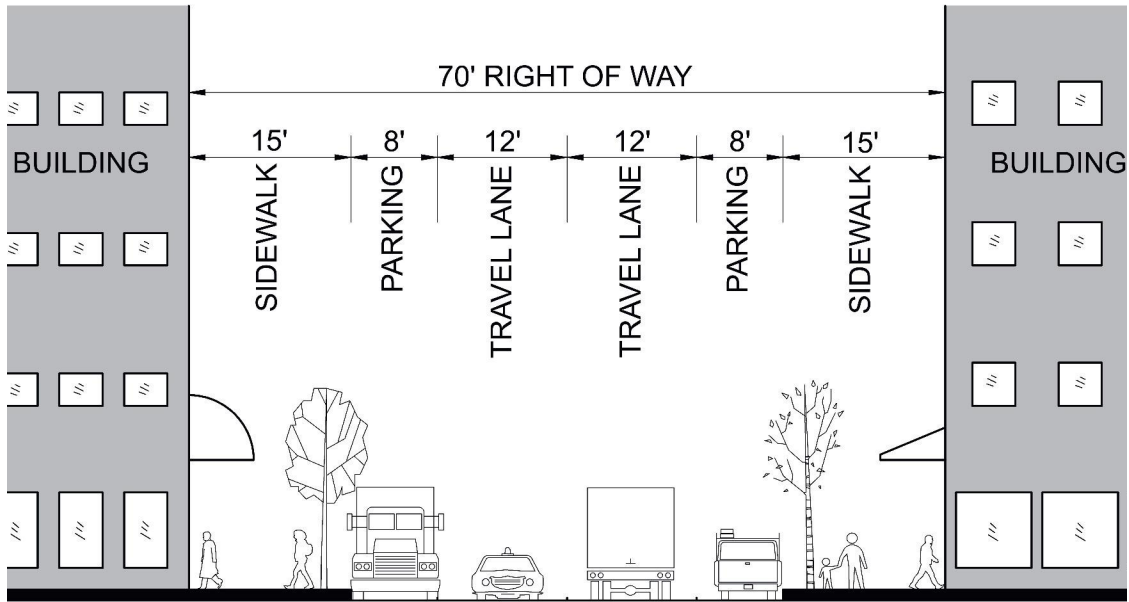
## RESIDENTIAL COMMUNITY (SECTION D-D)

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## RESIDENTIAL COMMUNITY (SECTION E-E)

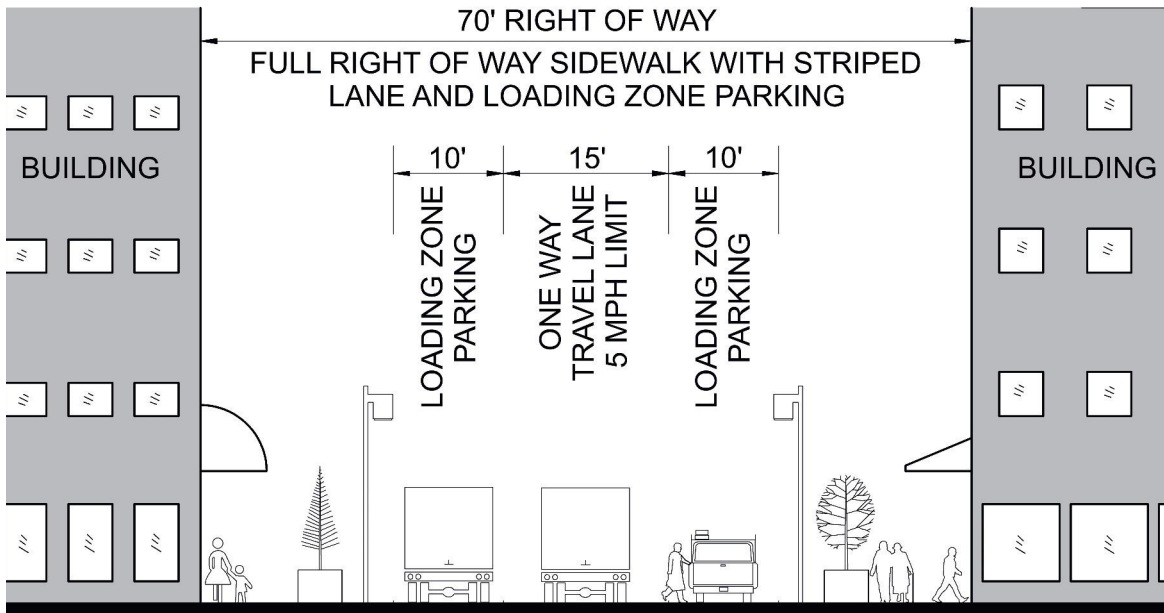
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NO MAJOR UNDERGROUND UTILITIES

## CENTRAL CORE (SECTION L-L)

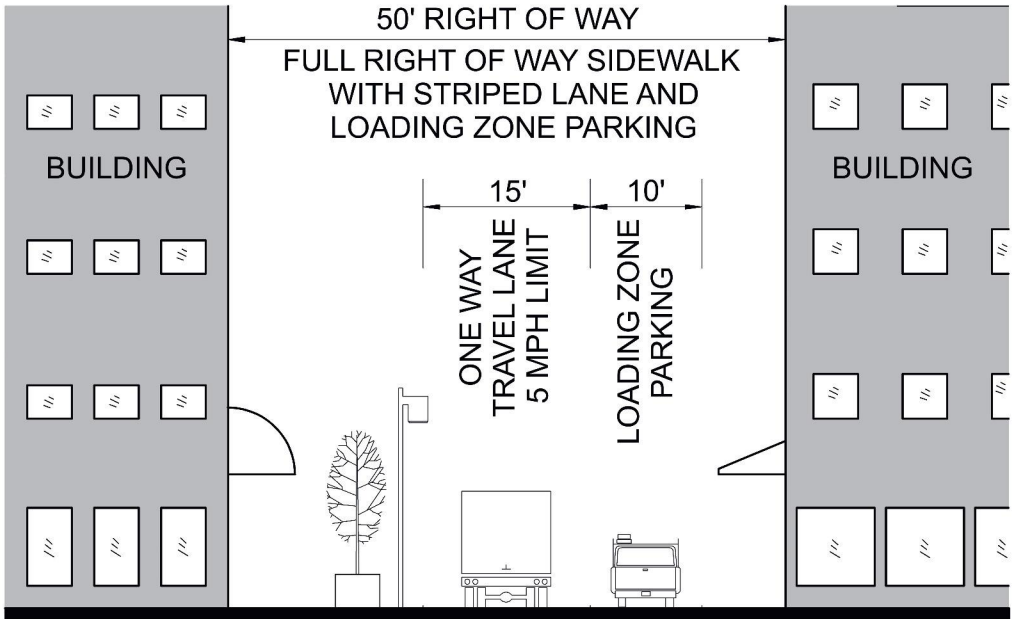
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MAJOR UNDERGROUND UTILITIES HERE

## CENTRAL CORE (SECTION N-N)

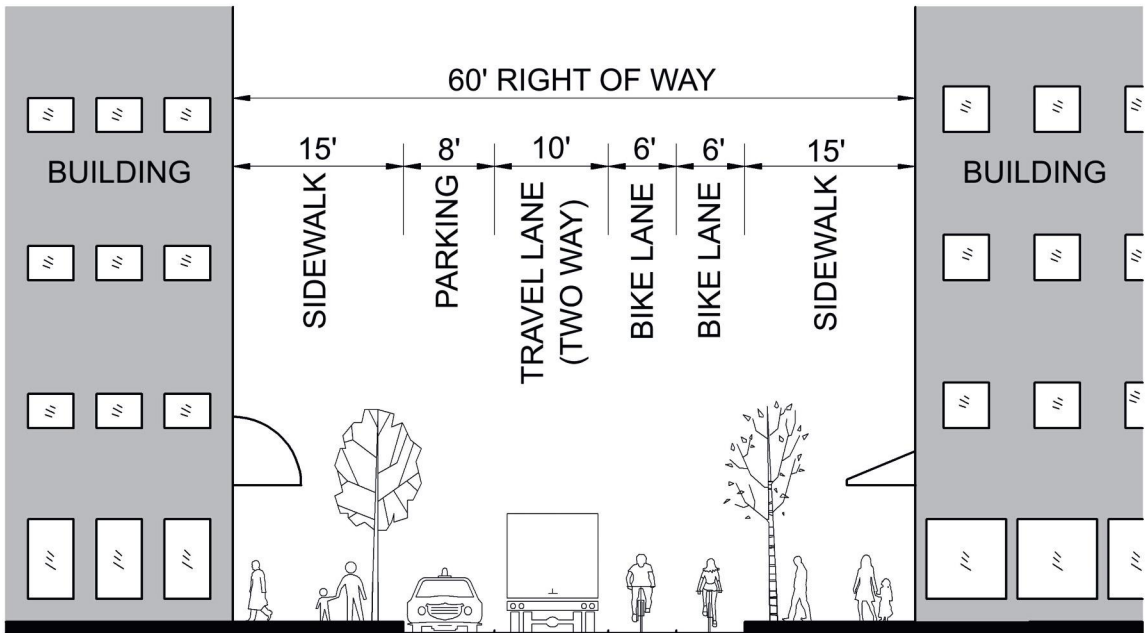
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MAJOR UNDERGROUND UTILITIES HERE

## CENTRAL CORE (SECTION O-O)

Not to Scale



NO MAJOR UNDERGROUND UTILITIES

## CENTRAL CORE (SECTION F-F)

Not to Scale

central core, and only a small number in the residential communities. The need for traffic on these streets is very limited; therefore there is only an occasional vehicle. Traffic usually amounts to deliveries, service calls, and an occasional police patrol. These are very simple streets, generally without curbs and sidewalks, and they usually have a single, one way, striped lane for vehicles. Vehicle lane widths are narrow, 10 ft. being common. Vehicle access on some of these streets is limited by time of day restrictions. During certain hours, deliveries and service calls are prohibited. Emergency vehicles are exempt from these time limitations. Speed limits are very slow (5 to 15 mph). Size and weight limitations are rather restrictive due to narrowness of lanes, thin pavement sections, and the presence of numerous pedestrians, cyclists, etc. There are no traffic signals on this type of street. See "Central Core" (Sections N-N and O-O), pages 83 &84 for details.

Finally, there are exclusive 'pedestrian only' streets. These are covered and uncovered streets in the central core and residential communities. Pedestrian only streets are right of ways that naturally have large numbers of people. In most cases they are the outward radiating streets immediately adjacent to transit terminals. Non-motorized vehicles (bikes, skateboards) may be allowed on some of these streets, but usually just in walk through areas. The exceptions to this vehicle exclusion are emergency vehicles, which are permitted on all types of streets. Also, special use permits allow non-emergency vehicles into these restricted areas on a temporary basis. Occasional maintenance work is a good example of when such vehicles are permitted. Special use permits can be obtained through the city government. Pedestrian only streets are similar in cross section to shared pedestrian/vehicle streets. For examples, see sections on pages 65 & 70.

#### MISCELLANEOUS

Loading zone parking spaces are provided within the various types of streets (except pedestrian only streets). These parking spaces are provided as a requirement of building codes and the building permit process. All private and public buildings are required to provide loading spaces. These may be located in the public right of ways or within the confines of the building. Thus, there is an assortment of loading zones and loading docks within the public right of ways and on private property. These spaces accommodate the parking needs of trucks, plus service, contractor, and emergency vehicles. They provide the necessary space for delivery and pickup of goods and services that must travel by vehicle. All buildings have use of these loading and parking facilities. Limitations may be put on these spaces, such as time of day restrictions, size and weight maximums, and limits on number of vehicles. The city's building code contains general parking/loading dock guidelines, but the actual details are handled on a case by case basis during the building permit and review process. Parking/loading dock stipulations are dependent

upon building configurations, usage, adjacent right of way configuration, and to some degree, surrounding buildings.

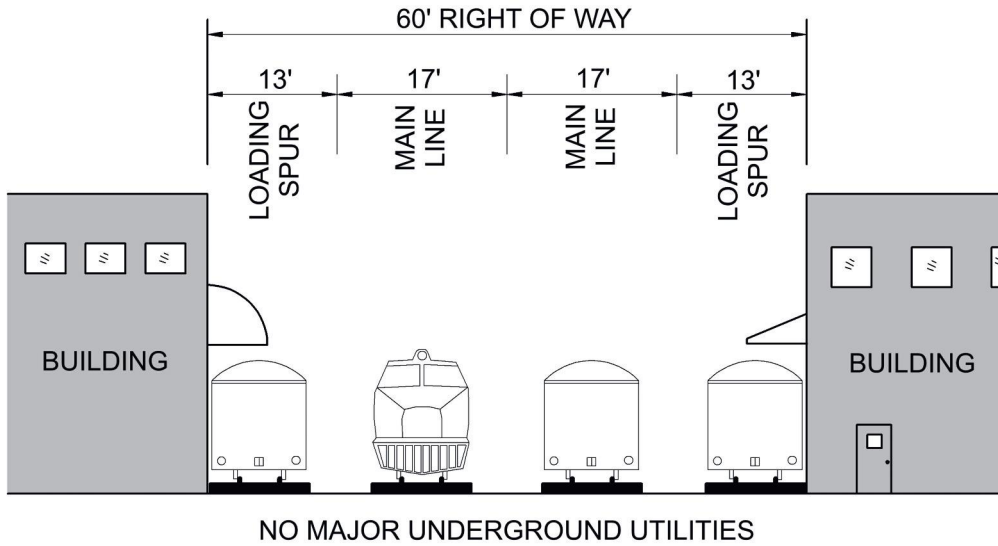
Some movement of goods throughout Pedestria's central core industrial district is accomplished via a network of railroad lines. It is essentially identical to the same service provided in existing cities. For railroad locations, see "Central Core Industrial District", side 1 of the supplementary map, and "Central Core (Section K-K)", page 86. Major rail lines come straight into the city from the north. There is a switching yard on the north edge of the city, from which there are a number of intermediate rail lines that access much of the central core's northern industrial area. Branching off the intermediate lines are spur tracks that veer off from the intermediate tracks and access adjacent private properties. The major rail lines, the switching yard, and the intermediate lines are all on public right of ways. These rail facilities are owned by railroad company(s), franchised to operate within the public right of ways, much like other private utility companies (gas, power, and phone). Spur tracks outside of the right of ways may be owned either by the rail company or by private property owners.



**60 ft. railroad right of way through an industrial district.**



**Railroad switching yard.**



## CENTRAL CORE (SECTION K-K)

Not to Scale

### LOADING DOCKS, BOTH RAIL AND TRUCK



Railroad spur track accessing a factory or warehouse.



*Photo Credit - Pictometry International Corp.*

Supermarket - freight loading dock (right hand side of building).



Office building - freight loading dock.



Curbside loading of freight (old style freight elevator popped up out of sidewalk)

## THE MOVEMENT OF GOODS AND SERVICES



Contractor's work vehicle



Maintenance vehicle.



A conventional store owned grocery cart (small version).



Folding shopping cart - a commonly owned and used item in Pedestria.



Hand truck - Used often to get freight in or out of a store.



Armored vehicle.

There is also rail passenger service in and out of Pedestria. This will be discussed in greater detail on page 92.

Air freight is another means of moving goods in and out of Pedestria. It is a popular means for overnight and special delivery of small packages. It is essentially identical to the same services provided in today's existing cities. Pedestria's main international airport is equipped to accommodate air freight services, as well as passenger service.

There are also different types of miscellaneous non-vehicular cargo/merchandise movers that are possible in Pedestria. Conveyor belts and pneumatic tubes are two of these types that are primarily used by specific industries or businesses. They are generally used to transport goods within the manufacturing process of a particular product by a single company. (It is rare that conveyor belts and pneumatic tubes are used between companies via an extensive network.) This type of transportation fills specific niches within the manufacturing sector.

There are also a number of miscellaneous cargo/merchandise movers that can be used by individual residents of Pedestria. There will be a need for individuals to have the ability to move furniture, groceries, and other bulky items without hiring a professional hauler. Shopping carts, wheeled dollies, and hand trucks are small inexpensive devices that can assist in this endeavor. In existing cities today, dollies and hand trucks are commonly found in offices and businesses. Shopping carts are used in grocery stores and various commercial stores. In Pedestria, without personal automobiles to haul groceries or merchandise home from the store, it will be important that people have a viable means of transporting these goods. Carrying items in one's arms is only feasible for small packages and short distances, so owning and using these small hauling devices will be common in Pedestria. These devices come in a variety of sizes, styles and designs, for various individual needs. It will be very common for citizens of Pedestria to bring groceries or packages home in their own small, collapsible, wheeled shopping carts. Of course, hiring this service from local freight haulers will also be widely available. See page 90 for more details.

## EMERGENCY AND SPECIAL VEHICLES

Besides public transit and the movement of goods and services, there is a need in Pedestria for emergency and special vehicles. Provisions for emergency services in a large city is an absolute necessity. Emergency services consist of police, fire, medical, and military. Each of these has its own requirements for number, size, and type of vehicles. Police and other law enforcement vehicles are primarily patrol cars, although there are officers on motorcycles, bicycles, horseback, and on foot as well. This is similar to what is found in auto oriented cities. The city fire bureau has a variety of vehicles, including pumper trucks, ladder trucks, and miscellaneous backup vehicles.

The city's emergency medical services primarily use ambulances and medical lifts. Military units within the city (national forces and/or reserve units) have a variety of vehicles, personnel transports, and light armored vehicles being some of the more common.

The use of these vehicles for emergency purposes is essential. Protection of people and property, maintaining order, and upholding the law are crucial for any city. Therefore, these vehicles are granted unrestricted access throughout the entire city. In emergency situations, these vehicles can disregard speed, weight, size, and access limitations imposed on other types of vehicles. However, for routine and non-emergency purposes, emergency vehicles must adhere to the standard limitations and



Police patrol car.



Police motorcycles.



Fire department - ladder truck.





**Ambulance**



**Military/national guard vehicles**

restrictions within the various public right of ways. Discretion must be used by emergency service personnel when exercising these extended privileges. Public infrastructure can sustain damage by oversized or over weight vehicles. The emergency service provider may be liable to repair such damages.

The selection of vehicles owned and operated by emergency services should, as much as possible, be in conformance with the design limitations incorporated into the city's right of way infrastructures. That is, narrow roadways, thin pavement sections, and tight corner radii may dictate the type of vehicles most useful in this city. Vehicles that are cumbersome, cannot navigate streets, or routinely do damage in carrying out their tasks should not be purchased by the city. On the other hand, Pedestria's initial infrastructure design should incorporate, as often as possible, design standards that permit usage of state of the art as well as stock emergency equipment. There must be a balance between initial infrastructure design and newly purchased equipment functionality. Initial anticipation of the special needs of emergency services can minimize damage to public facilities and help maximize response of emergency service providers.

There will also be a number of specialty vehicles that are afforded special privileges, these being vehicles used for construction or maintenance equipment and

limousine/town car service. Construction and maintenance activities may be of an emergency nature or a non-crisis nature. They may involve city crews or private contractors. It will occasionally be necessary to drive vehicles and equipment to locations that would normally be prohibited. Through the issuing of special use permits by the city government, those necessary activities can be allowed in certain locations on a temporary basis.

Limousine/town car service is a business requiring special vehicles. In Pedestria limousine service is permissible, but restricted to only a few special use categories. This service is not intended to be like a taxi cab (a form of public, personal transportation). Limousine service is allowed through the issuing of special use permits for dignitaries, celebrities, notable personalities, and funeral processions only. Comprehensive definitions



**Limousines and town cars - Not allowed in Pedestria by the general public, but permissible by special permit for diplomatic and celebrity service, and possibly for other special occasions.**

of these special use categories, and who is eligible for them, is necessary to adequately limit this service. All roadway restrictions pertain to this service unless stated otherwise on the special use permit. Special use permits are applied for and purchased online, and restrictions are enforced by local police.

#### LIMITATIONS AND RESTRICTIONS ON MECHANIZED VEHICLES

The elimination of private automobiles for personal transportation needs is a major emphasis of Pedestria's design. Other than private automobiles, taxis, and motorcycles, there are few restrictions on types of vehicles allowed in this city. However, if too many vehicles are allowed, then the city's autoless nature is jeopardized, and congestion and automobilia will multiply. Limitation and restriction of vehicle numbers must be sufficient to alleviate their associated problems, yet not be so restrictive as to prevent necessary uses of essential vehicles. Therefore, some regulations will be placed on vehicles in this city. As part of registering vehicles in Pedestria, verification of a vehicle's business usage must be provided by the owner. Legitimate usage must consist of transporting goods and services, and must not involve personal transit. Some uses of vehicles will not be allowed; for example, a business man needing only a briefcase, suitcase, or laptop computer to conduct business could not claim the need for a private vehicle as a part of

his work. Yet, a contractor who hauls building materials and lots of tools would be allowed such use.

In Pedestria there is a definite line drawn between allowed and prohibited vehicles. Prohibited vehicles are those motorized vehicles that serve as private and personal transportation for people. They include private automobiles, motorcycles, scooters, and mopeds, the only exceptions being motorized wheelchairs and segways for the physically disabled. Allowed vehicles are those motorized vehicles that serve as public and non-personal transportation for people, goods and services, and emergency services. All non-motorized personal vehicles, such as bicycles, are allowed.

Services like taxi cabs, Zip cars, and Uber are common in existing auto oriented cities, but they will not be allowed in Pedestria. There will be some privately owned vehicles for hire or rent that can be used for special personal transportation by the general public. The distinction here is between motorized and non-motorized vehicles. Non-motorized vehicles for hire, such as horse drawn carriages and bicycle or porter drawn rickshaws, will be allowed in Pedestria for personal transportation (of tourists). These will not constitute a prolific introduction of an undesirable form of transport. The introduction of motorized personal transportation, such as taxi cabs, motorcycles or mopeds, is undesired and will be banned in Pedestria. Once personal motorized vehicles are allowed into the city, there is an erosion of the basic foundation and principals by which an autoless city is established.

As mentioned earlier, limousines/town cars are allowed in Pedestria via special use permits. These vehicles are motorized and provide personal transportation, (which the city normally prohibits), but they do fill a niche that cannot be satisfied any other way. They are heavily restricted and should not constitute a large number of vehicles. Their exception is only a minor infraction of the basic transportation principles of Pedestria.

There is another distinction between allowed and prohibited uses of vehicles. Hired taxi cabs, used only for personal transportation, are prohibited. Freight taxis and delivery trucks, hired for personal transportation of cargo, are allowed in Pedestria. Freight taxis can vary from small electric carts to pickup trucks to even small semi trucks.



Taxi cab - Personal transportation for hire. Not allowed in Pedestria.

Freight taxis are available to haul items of any size. They provide a very common service for people needing bulky or difficult to carry items transported. They can transport anything from a couple of sacks of groceries to an appliance to even building materials. It is permissible for freight taxis to carry passengers along with their freight. An example of this might be when a person or a business wants to move a large item across town, and it is necessary that they send someone along to help make the delivery. They could call a freight taxi to come and haul them and their merchandise to the desired destination, for a fee. This is a perfectly legitimate enterprise in Pedestria. An abuse of this service would be people hiring freight taxis not to haul cargo, but as personal transportation, much like a taxi cab. This would be an undesirable misuse of this service. Adherence to this is enforced by a combination of honor system by freight haulers, self-policing of the industry, and by local law enforcement.

The allowance of many different types of vehicles in Pedestria is tempered by their small numbers and by their regulation. In the United States, regulatory agencies that govern and administer use of motorized vehicles are typically state agencies. In Pedestria the use of vehicles is sufficiently different than in any other city. Pedestria has a number of unique vehicle regulations that must be incorporated into or replace existing state regulations. Licensing, registration, and inspection of vehicles, and licensing and testing of drivers are normally a responsibility of the state department of motor vehicles. In Pedestria ownership of vehicles and allotted parking spaces are tied to city building permits and/or city business licenses. Private vehicles cannot be owned and operated on a regular basis in Pedestria by private individuals without the explicit allowance of a business license or a special permit. This combination of state and city regulations governing vehicle usage will likely be a joint administrative effort by city government and state departments of motor vehicles.

Emission control requirements for vehicles operating in Pedestria and for stationary point sources (industrial



Small utility carts - allowed in Pedestria for the purpose of "freight taxi". In Pedestria if you have something large to haul across town you might hire one of these or a pickup truck.

processes) are equal to, or in some cases, more stringent than U.S. federal requirements. Use of low emission vehicles (LEVs) is required for all types of vehicles registered within Pedestria. LEV status may be attained by use of alternative fuels or fuel mixtures, by engine design and modification, or possibly by various other means. Also, use of zero emission vehicles is encouraged in Pedestria by monetary incentives, such as registration and licensing discounts.

Stationary point sources of pollution must also meet federal emissions standards and are encouraged to exceed these standards with the use of state of the art equipment. Economic incentives can also be tied to these higher levels of excellence.

Air quality in Pedestria will be permanently exceptional. Vehicles within Pedestria will pollute, but only well within federal limits. The primary reason for Pedestria's excellent air quality is its greatly reduced number of vehicles. Pedestria will have about 10% of the vehicles of a comparably sized auto oriented city. Nearly all vehicles in Pedestria will be low emission vehicles. The only exceptions will be outside vehicles temporarily operating in Pedestria by special use permits. Natural gas, hydrogen, and electric vehicles will be common. This permanent high air quality is one of the ultimate goals of this city.

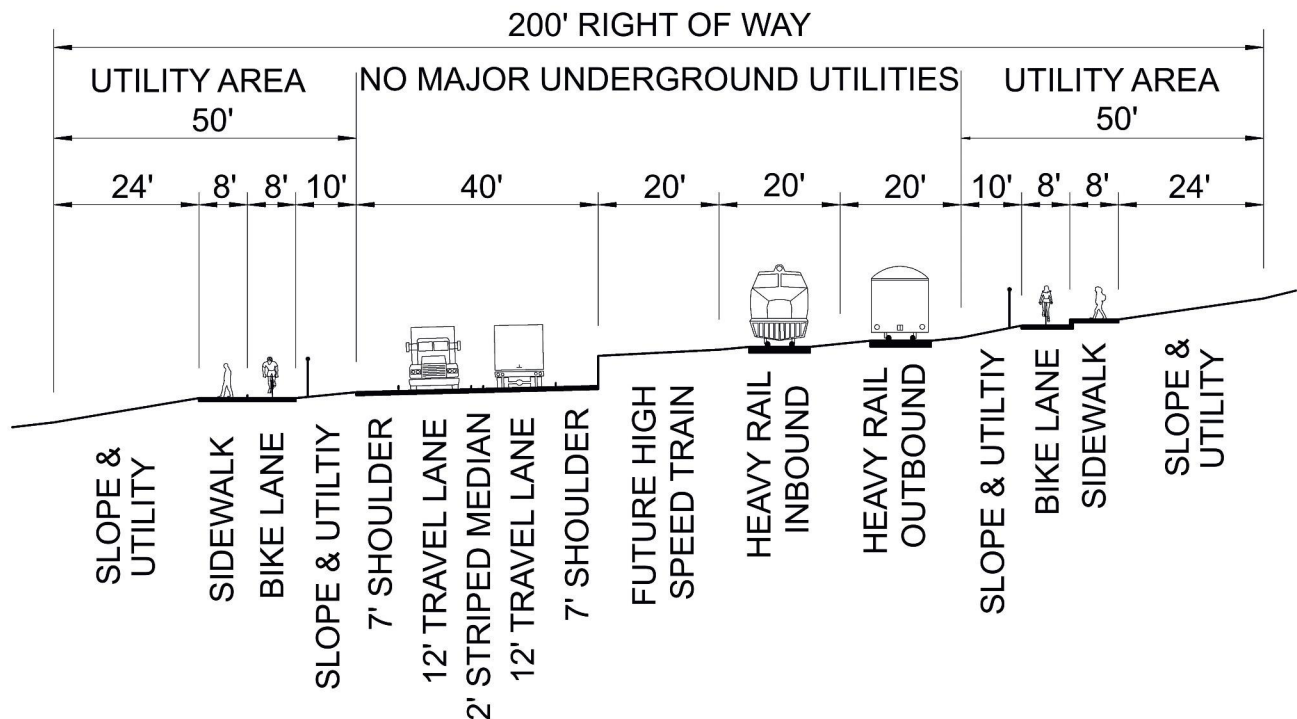
Permanent low noise levels are another important goal of Pedestria. Noise control requirements for vehicles and

stationary point sources are equal to or higher than current U.S. federal requirements. Pedestria's design necessitates close proximity of vehicles and people, which requires that noise levels be minimized. Because of far fewer vehicles overall, the nature of traffic in Pedestria will at times be very intermittent, resulting in a high contrast of noise levels. Minimization of excessive sounds/noises is yet another important goal. In a relatively quiet city like Pedestria, the occasional loud vehicle or blasting stereo will be a greater annoyance than in a generally noisy city. The huge reduction of vehicles, orientation of the airports, enforcement of noise ordinances, and noise reduction buses will help make Pedestria one of the quietest cities of its size in the world.

### TRANSPORTATION NETWORKS LINKING PEDESTRIA WITH OTHER CITIES

Pedestria is linked to neighboring and distant cities by standard forms of transportation. It is linked to the outside via highways, rail lines, air travel, and miscellaneous other means. Intercity travel is important both for passengers and for freight.

There are several locations within Pedestria where these links to the outside occur. On the north side of downtown there is a 200 ft. wide right of way called the "North Transportation Corridor" (see "Section A-A" below). This right of way comes straight into the city and



## NORTH TRANSPORTATION CORRIDOR (SECTION A-A)

Not to Scale

contains the intercity rail connection, main highway connection, and major utility lines such as gas, power, and communications. This transportation and utility corridor extends all the way into the central core where there are direct hookups with Pedestria's infrastructures. This corridor also has a link to the auto extended zone in residential community C5.

There are two additional highway connections into the city. From the south, a highway connects to the city at residential community L3. From the southeast, there is a highway connection to community I6.

The city's rail line linkages are via the north transportation corridor. The two sets of tracks are capable of carrying both heavy freight trains and high speed passenger trains. For sorting and deploying of freight cars, there is a switching yard on the north edge of the city. Heavy rail freight service then has access to most of Pedestria's industrial district. There also is a rail passenger terminal in the heart of Pedestria, adjacent to or beneath the central core transit terminal #2. This immediate proximity creates an extremely efficient and convenient connection between in-city bus service and the intercity passenger rail service. There is also space in the north transportation corridor for a future high speed magnetic



**Intercity rail passenger train at a train station.**

levitated train or other such future technological marvel.

The city's air link is through the international airport at the northeast edge of the city or via the smaller municipal airport at the northwest edge of the city. The international airport is directly connected to the city by the transit system. There is a designated airport bus route with specially designed articulated airporter buses and a bus terminal within the airport terminal. This provides extremely close access for people going to and from the airport facility.

The international airport in Pedestria is designed differently than airports in auto oriented cities. It is much more compact. There are no large parking facilities incorporated into the airport layout. With an underground transit link directly beneath check-in and adjacent to baggage claim, the main airport transit terminal has a small

circular configuration in comparison to the common, large traffic configurations of other airports. Airplane concourses radiate out of the airport terminal in all directions (360 degrees). See pages 93 & 94 for Pedestria's airport design. **Pedestria's international airport is like no other in the world. It is compact, efficient, fast, and convenient.**

Non-transit vehicles also have access to Pedestria's international airport via the transit road (a shared roadway). Freight, service, and emergency vehicles all need access to this busy and important transportation center.

The finite nature of Pedestria assures that the airport facility will not need significant expansion in the future. However, occasional modernization and/or remodeling may be necessary.

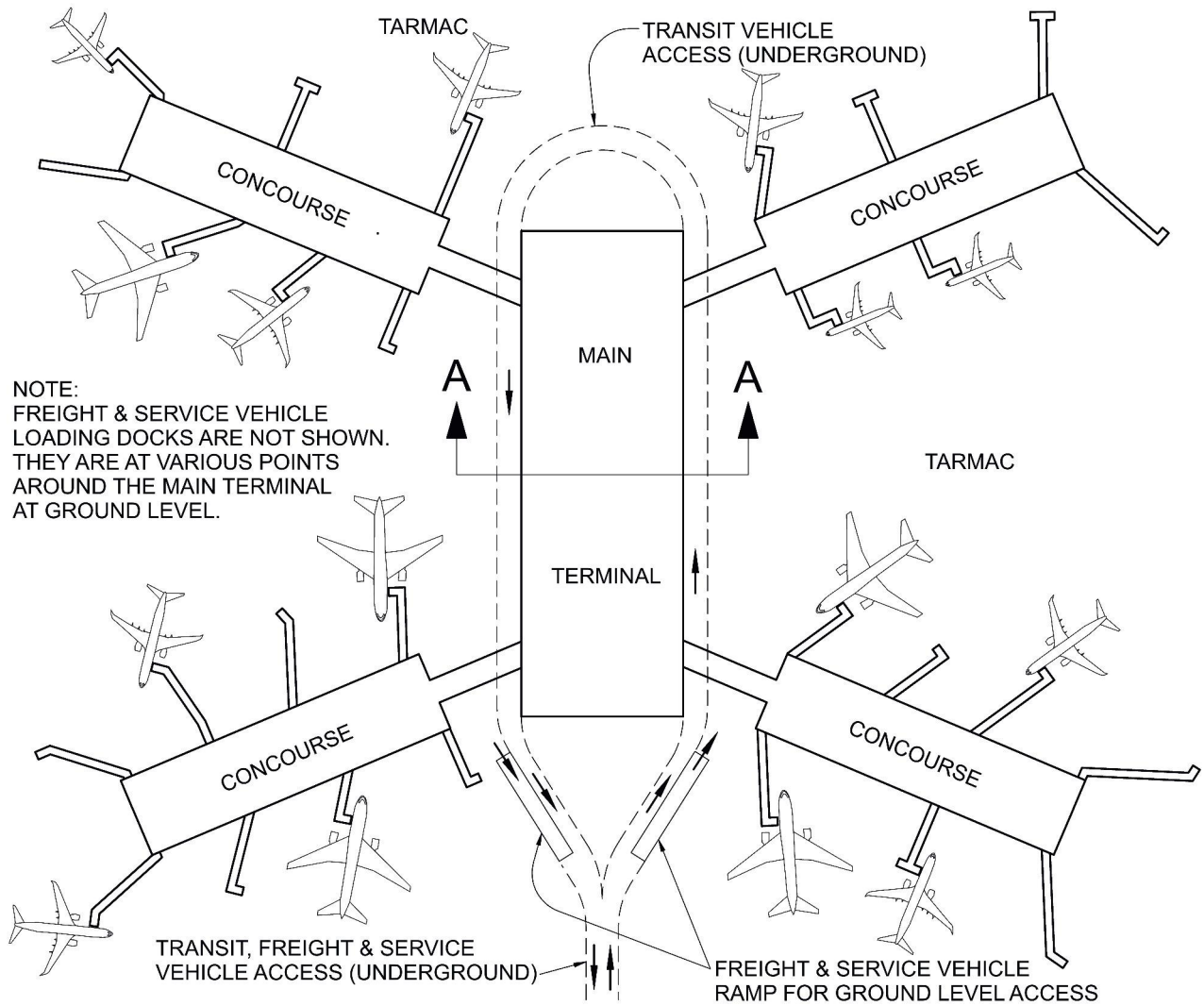
Pedestria also has a smaller local airport that primarily serves private aircraft. This airport does not have a direct link to the city's transit system due to the small volume of people using this facility. There is a roadway link from this airport to the transit terminal of the nearest residential community (A5). The local airport provides on demand shuttle service there as well. Hiring a professional hauler or freight taxi is also an option for people with large parcels needing to reach the local airport.

Within the city's central core area there are several helicopter ports. Some are privately owned and operated while others are city administered. All of these facilities are located on top of tall buildings. The city owned facilities are required to be within a two block radius of a central core transit terminal, but private heliports are not. These transportation facilities may provide intercity passenger service if there is sufficient market demand. At the very least, they provide quick air transportation for business and emergency concerns.

Both the international and local airports, plus the city owned heliports, are administered by a publicly controlled port authority. This authority has responsibility for overseeing and managing these facilities. It is also responsible for public works projects that relate to commerce and certain areas of economic development.



**Helicopter landing pad on top of a hospital complex**

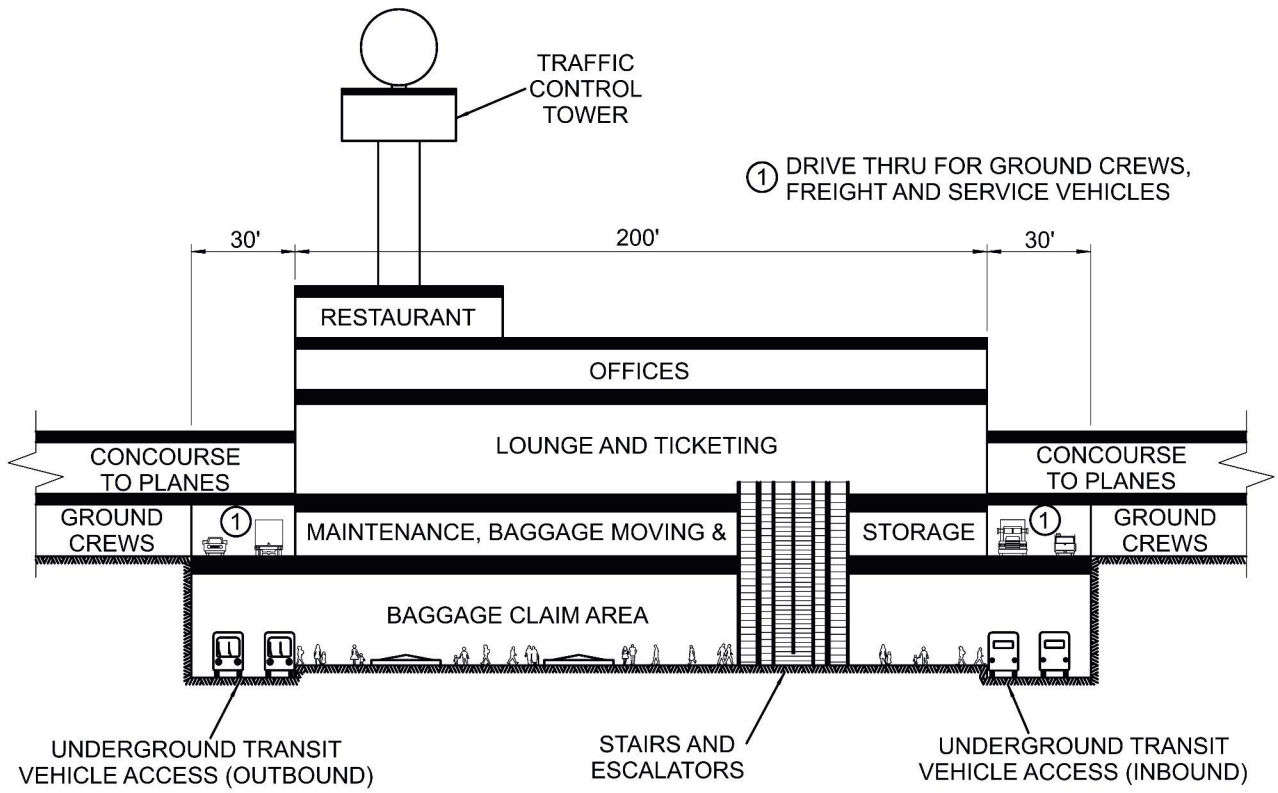


## AIRPORT DETAIL (PLAN VIEW)

Not to Scale



Jet aircraft.



## AIRPORT DETAIL (SECTION A-A)

Not to Scale



*Photo Credit - Pictometry International Corp.*

Large airport terminal - In Pedestria the numerous parking structures, parking lots, and elevated multi-lane roadways in the center and NE corner of this airport would be totally unnecessary.



**Helicopter**

Either the transit authority or the city government could have jurisdiction over the two airport facilities. There are also some miscellaneous links to neighboring towns and points of interest. There are several bicycle paths, hiking trails, and horseback riding trails that extend out from Pedestria. These facilities serve primarily a recreational need.

Pedestria is also linked to the outside world via the latest in electronic communications. Conventional phone lines, fiber-optic lines, and satellite links provide Pedestria with the communications infrastructure for modern telecommunications.

Pedestria's highway connections to neighboring cities and towns carry all manner of intercity traffic, from eighteen wheelers to an individual from an auto oriented city driving their own personal automobile to Pedestria. Upon arriving at Pedestria all designated freight and



**Communications array on top of a building.**

service vehicles are permitted within the city. They do not constitute an undesired form of transportation, so are allowed to enter the city and carry on their business. On the other hand, private automobiles are excluded from Pedestria. There are very definite restrictions for automobiles entering the city; they must end their journey at one of the three residential community highway connections (in C5, L3, or I6). A portion of each of these three residential communities serves as the stopping or starting point for all private and rental automobile traffic. These areas are designated as automobile extended zones, where it will be permissible for privately owned auto related businesses and services to operate. Within these zones a normal array of businesses catering to automobiles and other types of vehicles will exist, such as gas stations, repair shops, body shops, parts stores, parking and storage facilities, and vehicle rental businesses. These facilities will serve vehicles from within Pedestria, as well from outside the city. Due to the greatly reduced number of vehicles within Pedestria and the small number of private automobiles coming to and fro, the quantity of businesses in these auto extended zones will be extremely small compared to those found in a comparably sized auto oriented city.

Location of the auto extended zones within three residential communities rather than in the central core industrial section is intended to prevent access of private automobiles deep into the heart of the city. However, a central core location for these zones is not totally out of the question. There is some logic in locating these types of



*Photo Credit - Pictometry International Corp.*

**Vehicle storage facility - located in residential communities that serve as Pedestria's highway gateways (C5, I6, and L3), and possibly in an area of the central core industrial district at the terminus of the north end highway.**

activities/businesses in the central core industrial area; it would consolidate industrial uses and eliminate compatibility problems in the 3 residential communities. However, this would require either extending the intercity highways into the central core as totally separate roadways or allow auto traffic to share the community group transit/freightways. Neither of these options are very desirable, because they would essentially allow the unabated access of auto traffic into Pedestria's network of



**Tour bus and double decker tour bus.**



roads. Therefore, confining auto extended zones to select residential communities seems to be the best option for handling outside auto traffic.

A small transition or buffer zone is required between these industrial and residential land uses, thus minimizing compatibility conflicts between automotive land uses and adjacent residential land uses.

There is occasionally a need for citizens of Pedestria to use automobiles or rental vehicles for out of town use. Whether it is a small compact passenger car to be used on an out of town business trip or a large motorhome to haul the entire family on a vacation, these types of vehicles are only allowed and available to rent or own in Pedestria's three auto extended zones. Storage of these vehicles is also only permitted in these three zones. A temporary special use permit of very short duration (several hours to possibly a day) is required for these vehicles to travel any of Pedestria's streets. With this permit, people can drive the vehicle to a destination inside the city to load and unload passengers and possessions for their out of town trip.

#### OTHER AUTOLESS CITY TRANSPORTATION SCENARIOS

The following is a very brief, non-detailed discussion of other transportation scenarios for autoless cities.

There are transportation options other than those illustrated by this Pedestria example. Mass transit systems are not limited to bus systems. A new autoless city could be designed to operate with any number of transit types or combinations of systems. Some of these transportation options are; light rail, monorail, trolley, subway, and



*Photo Credit - Pictometry International Corp.*

**Rental cars - available in Pedestria in the three communities that have highway connections outside of the city.**



**Camper van - can be owned by citizens of Pedestria, but must be stored in a vehicle storage facility near the city's highway connections**



**Motorhome pulling an extra vehicle.**

magnetic levitated train. Each of these modes of transportation would require different design criteria and different system wide arrangements. Each would result in different costs and would possibly affect the urban configuration around them. For example, a subway system (subterranean) would require vehicles with no emissions because of confined space and reduced air circulation. It would also affect the location and arrangement of transit terminals, and the quantity and configuration of public right of ways necessary to accommodate it. All of these factors would influence the overall cost of the system.



Another autoless city transit option is a monorail system, which would be considerably different than a subway system. It would require more right of ways, higher aesthetic standards, lower noise levels, and above ground terminals.

For hypothetical purposes, it is conceivable that within Pedestria freight taxi and handicap transportation services could be provided by "special freight" buses. These buses would have to be customized to allow the safe boarding and unloading of the general public with large freight items. These buses would probably require an additional bus stop at each transit terminal, and their stopping times would be greater than regular passenger buses. This transportation option would allow people to transport large items without having to hire private freight taxis. However, this option is not used in Pedestria because of several downsides. It would increase the size of the transit terminals. There are also significant safety issues with people bringing all nature of items on public freight buses. Keeping to any kind of a schedule would be nearly impossible. This option would likely be more costly compared to a strictly private freight taxi service.

Other transportation options that could affect the arrangement and function of non-transit streets include freightway streets, pedestrian streets, and combinations of both. Exclusive separation of all freight, bicycle, and pedestrian functions could be a viable option. In parts of the city where freight deliveries are limited, an underground network of roads and loading docks is possible. In industrial areas where truck traffic is heaviest, there could be a complete grade separation of vehicle and pedestrian uses. A similar separation between pedestrians and bicycles is also conceivable.

A more extensive use of moving sidewalks is another autoless city possibility. This could effectively increase pedestrian walking distances to/from transit terminals, thus reducing the number of terminals necessary to access a given area of the city. For example, in Pedestria, instead of 9 central core transit terminals an extended pedestrian range might result in the need for only 8 terminals or even fewer. This would affect the average speed and scheduling of bus routes and reduce the overall number of buses needed to serve the city, but might necessitate an increase in each terminal's overall size.

Numerous restrictions on non-transit streets exist in Pedestria and are options for designers of future autoless cities. Speed, time, size, weight, and parking restrictions for trucks and service vehicles can be handled in various ways, each affecting the functionality of local central core and neighborhood streets.

The functionality of an autoless city's transit system can also be affected by staggering work hours. Peak demand for transit use is during the morning and evening journeys to work. These peaks can be reduced if rush hour is spread over a greater period of time. One way is by staggering business work hours, which can be accomplished by a mandatory change in company working hours or a voluntary flexible work hour option. Any

significant city wide change in business work hours can affect rush hour demand on the transit system. Ultimately, permanent decreases in rush hour demand can affect the transit system's daily operations. New vehicle purchases, bus interval scheduling, total size of fleet, and number of employees can all be affected. Also, crush capacities may be experienced less often.

In Pedestria, the transit system design and its capacity are not based on voluntary or mandatory work hour staggering. The assumption is that businesses will be free to choose their own optimum working schedules. This position reduces regulatory influences on local business. However, if for unforeseen reasons the city's peak hour demand greatly exceeds the system's design capacity, then it is possible that work hour staggering could be a solution.

#### THE EFFECTIVENESS OF PEDESTRIA'S TRANSPORTATION SYSTEMS

Pedestria's urban design and its various modes of transportation combine to create an extremely high degree of mobility. This magnitude of mobility is measured in a number of ways: patronage of the transit system; transit system service levels; numbers of transportation alternatives, and a comparison of traveling times between Pedestria and auto oriented cities.

Patronage of Pedestria's transit system is high. The transit system's close proximity to the entire population and to all destinations within the city make it accessible to all at no out of pocket charge (free). Its frequent schedule makes it convenient; the covered terminals and abundant amenities make it pleasant to use; and the short travel distances and times make it easy for users and efficient for the transit authority. All of these elements, plus the fact that there are no automobiles allowed in Pedestria, mean that support and use of the transit system is extremely high (essentially universal).

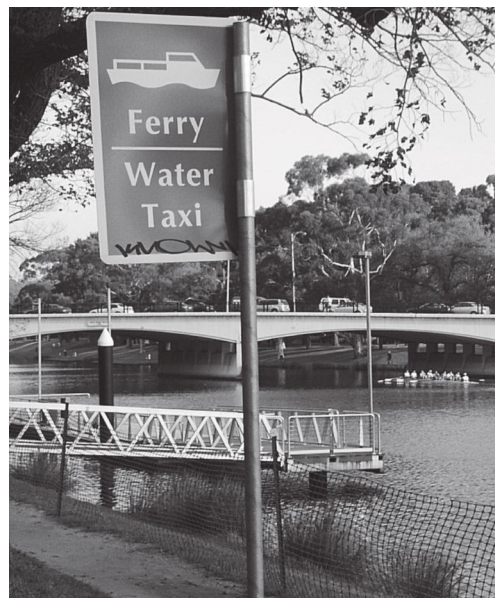
People's use of other modes of transportation are also high. Walking is as universal as the use of the transit system. Bicycling and other alternate modes of transportation are more seasonal, and confined to a younger and more athletic group. Yet, these forms of transportation are available to all. They are popular because of the compact nature of the city and the comprehensive infrastructure dedicated to their use.

The transit system's high service levels are a leading factor in its universal usage. Short runs and lack of traffic interference mean a relatively small number of buses can provide extremely frequent service within each bus route. Buses arrive so frequently throughout the day that at any given stop, there is virtually no need for a bus schedule. The "free" nature of this bus system only increases its desirability. **Access to all parts of the city, for all people, at all times, at no out of pocket cost, are virtues never before available in any other city in the world.**

## DIFFERENT TYPES OF PUBLIC TRANSIT WHICH COULD BE USED IN AN AUTOLESS CITY.



Light rail trolley vehicle.



Ferry and water taxi stop.



Elevated monorail.



Below ground subway and station.

Pedestria's repertoire of mobility options creates a comprehensive and balanced transportation system. Pedestrians, bicycles, buses, trucks, emergency vehicles, airplanes, trains, moving sidewalks, etc., are all part of this city's balanced mobility. These modes of travel fulfill the needs of society by meeting the requirements of their complex modern lifestyles.

This balanced transportation also provides adequate options in the event of unusual circumstances. If there is a city wide transit strike, there are alternatives; people can walk or bicycle the entire distance to work. As unpleasant and inconvenient as these may be for some people, they are acceptable ways of getting about and are even enjoyable to some. A transit strike during a period of foul weather would be far less pleasant. However, any type of civic upheaval in any city is a major burden on the people. Another example is if an individual in Pedestria sustains an injury and is temporarily unable to walk or function in their usual manner. They have alternatives, such as

using/renting a wheelchair or crutches. The entire city is architecturally designed with wheelchair access in mind. This includes wheelchair ramps throughout the city, access to all buildings and public areas, and provisions on the transit system.

A comparison of travel times between Pedestria and existing auto oriented cities is impressive. In Pedestria the average journey to work time is 17 to 20 minutes (see page 159 for a specific breakdown). This complete journey includes walking to the transit terminal, waiting for the bus, bus travel and stop time, and walking time to a final destination. In comparison, the average American has a comparable journey to work time of 25 minutes. In addition, the average American's driving journey to work has increased over 20% in the last 30 years<sup>9</sup> and is estimated to continue to increase in the future. By contrast, in a finite city such as Pedestria, travel times should stay relatively constant indefinitely.

Travel in Pedestria is balanced, practical, simple, and consisting of a lasting set of transportation options. Such qualities give this city much of its unique character. Pedestrian's have a city with exceptional mobility. They have a mass transit system that is "free" (no fare boxes) and runs so frequently that attention to bus schedules is unnecessary. They have easy access to the entire city on a time tested bus system. This system has accommodations for transporting small carry-on packages and merchandise, and also serving the handicapped. This transit system provides a reliable, non-polluting, and efficient means of travel. Many people are able to travel the entire length of their journey while protected from the elements and enjoying numerous amenities found in combination with the transit system. Pedestria's public bus system is very inexpensive compared to an automobile system. Auto oriented cities incur enormous transportation expenses in both public and private sectors. They also incur extra expense by attempting to provide a public transit system in addition to the automobile system. And finally, because of Pedestria's finite nature, its transit system will never be outgrown by the city it serves.

Citizens of Pedestria also enjoy advantages of a city that fully accommodates various aspects of commerce and economic trade. An entire network of transportation facilities is provided for movement of goods and services, and for emergency services. This creates an amiable climate

for business and industry . **With 85 to 90% of all traffic off the roads, this city is a truck driver's paradise.**

Pedestria provides public infrastructure for a number of alternative forms of transportation. Walking is imperative for living here. All transit trips and most neighborhood trips begin, end, or are entirely on foot. Short distances to many meaningful destinations, and pleasant amenities along the way, make walking a desirable choice. Bicycling is also accommodated very adequately; a network of safe and direct bicycle lanes access all of the city.

These numerous transportation alternatives are available to everyone in Pedestria. No one is transportation disadvantaged in this city. These transportation alternatives represent not just a replacement or substitute for the automobile, but an advancement over the automobile. A private automobile is unnecessary in Pedestria.

**The people of Pedestria do not live without cars begrudgingly. Rather, the absence of the car is a pleasure, an emancipation from burden. If an autoless city is built with these transportation provisions, in the proper design (as exemplified by Pedestria), then a new level of urban mobility will be achieved.**

# CHAPTER 4

## PEDESTRIA'S URBAN DESIGN AND DEVELOPMENT

### THE NATURE OF DEVELOPMENT IN PEDESTRIA

Pedestria's autoless nature requires a design very different from existing auto oriented cities. Its design is based primarily around its transportation systems, both transit and pedestrian. For these systems to work well, there must be accompanying high concentrations of diverse urban development. A number of design principles are employed to achieve an efficient mix of these diverse concentrations. They include transit orientation, pedestrian orientation, urban concentration, and mixed land use.

Transit orientation is Pedestria's primary design consideration, and mass transit is Pedestria's main transportation system. Urban development is built around and in close proximity to the transit system. Development is designed to take advantage of and



**Multiple use buildings - commercial and retail store fronts on the ground level and some second stories; offices and/or residences on upper floors.**

promote transit use. The residential communities and central core are oriented toward the transit system in several ways: by the centralized location of transit stops; by the configuration of streets and moving sidewalks which radiate out from the transit stops; and by minimum height requirements and multi-use zoning laws, which guarantee large numbers of people and activities are conveniently located near the transit system. Concentrated urban development, coupled with the transit system, provide Pedestria with a superior alternative to the automobile.

Pedestrian orientation is very similar to transit orientation. Here the emphasis is on the spatial

relationship between individual people and their surrounding city, which includes the transit system. Pedestria is oriented toward pedestrian needs in a variety of ways: by the layout of right of ways, by providing infrastructure (i.e., sidewalks and paths), by providing mechanical facilities (i.e., moving sidewalks and escalators), and by establishing legal statutes for pedestrian rights and responsibilities. Pedestrian orientation makes Pedestria a city that is sized and scaled for people. Its layout is designed on a human scale with distances and size based on human dimensions. Walking distances and pedestrian access are always important considerations since walking is such a prevalent means of transportation.



**Multi-use office building - commercial/retail uses on the ground floor, and office space and/or residential space on the upper floors, which is a zoning requirement in many parts of the central core and residential community commercial districts**



**Consideration for future upward expansion of buildings is an integral part of Pedestria's building code and minimum height requirements. Here another floor is being added to an existing 2 story building.**



**Central business district (downtown) - the highest concentration and density of urban entities within a city. In an auto oriented downtown (such as the one pictured), up to 50% of the land is used by the automobile, including freeways, roads, parking lots, parking structures, auto oriented businesses, and extraneous street property.**



**Multiple buildings per block - City blocks can contain a number of different buildings with different owners.**

**Various building heights - from vacant lot to high rise office building. Vacant lots in the downtown area are, of course, a complete under utilization of space. But even one and two story buildings can be considered under utilized, hence, the use of minimum height requirements in Pedestria.**



Urban skyline

Urban concentration is the next most important design characteristic creating Pedestria's unique and effective layout. It is the bringing together of urban entities and numerous activities within close proximity (high density), achieved by three main methods: compaction, consolidation, and clustering. All three fundamentals are instrumental in the design of Pedestria and critical elements in its layout. Compaction, consolidation, and clustering are the arrangement of selected urban elements into new and proposed configurations.

Compaction is horizontal concentration, the moving of urban entities closer together geographically. In auto oriented cities about 40% of an entire city's area is for automobile related purposes. By eliminating the majority of this unnecessary space Pedestria can be greatly reduced in size (compacted). Land that would normally be used by the automobile and its infrastructures can now be eliminated from the city, thus reducing the size of the city or allowing some of this land to be put to other more desirable and productive uses.

Compaction is also achieved by emphasizing public open space over private open space. In today's automobile oriented suburbs large individual private lots with single family homes consume vast quantities of urban land. In Pedestria, by requiring small individual lots and more multifamily living units, greater density is possible. Its reduction of private open space results in greater compaction of urban entities and more open space for the general public.

Consolidation is vertical concentration, the combining or stacking of urban entities into more densely utilized space. This is achieved by minimum height requirements that specify buildings have a minimum number of stories. These requirements vary from place to place, but are highest near the transit terminals to insure high density.

Minimum height requirements are opposite of maximum height restrictions, which are prevalent in today's cities. Our sprawled auto oriented cities under utilize buildings and spaces. One and two story buildings are poor utilization of valuable urban land. This is particularly true when proximity of urban elements is a



Urban water front - In the downtown area it can be a wonderful setting for a vibrant city life.



Single building, single block, single use fortress architecture - a sterile interface between pavement and building. Pedestria's multi-use zoning requirements guarantee a variety of uses, commercial entities at street level, and a much more dynamic urban scene.

necessity for a pedestrian oriented autoless city. Land that would normally be used by numerous one and two story buildings is reduced or put to better or more productive use.

The basic arrangement of urban growth in Pedestria is that of cluster development surrounding transit terminals. This is true for both the residential communities and the central core. Cluster development is a concentrated conglomeration of urban elements occurring in close proximity. These urban elements are arranged (through zoning and height requirements) with increasing density toward the center of each cluster. The greatest densities, the tallest buildings, and the most activity is nearest the centrally located transit terminals. Conversely, moving out from the transit terminals there is decreasing density, height, and activity.

The clusters in Pedestria are the residential communities and the central core. The residential communities are usually separate clusters, but some are touching or adjoining. Each is centered around a single transit terminal. Because of their size, geographic separation, and focus around a central node, they are very much like a small village. The central core is a single large donut shaped cluster with multiple high density

centers (the 9 transit terminals), each surrounded by a concentration of development.

Mixed land use or land use diversification is another of the major design considerations for Pedestria's urban development. The multi-use zoning laws require many properties to contain a variety of different uses. These laws ensure a concentration of diverse activities and the location of numerous urban necessities within convenient reach of many people.

Automobile oriented cities are notorious for their segregation of land uses, with huge tracts of land being used in singular fashion (much like the mono-culture crops in modern agriculture). Large expanses of residentially zoned land is segregated from large areas of separately zoned commercial, retail, and industrial properties. Wide spread patterns like these perpetuate the need for automobile ownership by nearly every suburbanite. In Pedestria diversification of land uses is a necessity for successful pedestrian oriented cluster development. The zoned mixture of land uses allows entrepreneurs the freedom to provide many types of services, commodities, and accommodations in close proximity to the residents of each community. The numerous shopping and employment opportunities within easy walking distance are a major element of pedestrian orientation. Each of the residential communities and most areas in the central core provide a wealth of diversity in housing options, commercial and retail business, and other miscellaneous activity. Much of the credit for this diversity can be given to Pedestria's pattern of land use zoning. A detailed and intricate approach to zoning creates a mosaic of land use variety.

**The combination of transit orientation, pedestrian orientation, urban concentration, and mixed land use are the basis for Pedestria's design and are paramount to a well functioning autoless city.**

#### DIAMOND BAR EXAMPLE

In order to better illustrate the design concepts just mentioned, an actual neighborhood shopping district in an existing auto oriented city will be examined. The essential elements of the shopping district will then be reorganized into a pedestrian and transit oriented autoless city format that will be compared to the original. In short, an auto oriented commercial district will be hypothetically redesigned into an autoless commercial district.

The survey of an existing auto oriented commercial district was conducted on 4-6-2012 using the shopping area Diamond Bar, located in Diamond Bar, California (Los Angeles County), U.S.A. It is centered at the intersection of 2 major arterial streets (Grand Ave. and South Diamond Bar Blvd.) and consists of commercial and business property only, with no residential properties within the study area. The boundary is a combination of commercial property lines and, in some cases, the

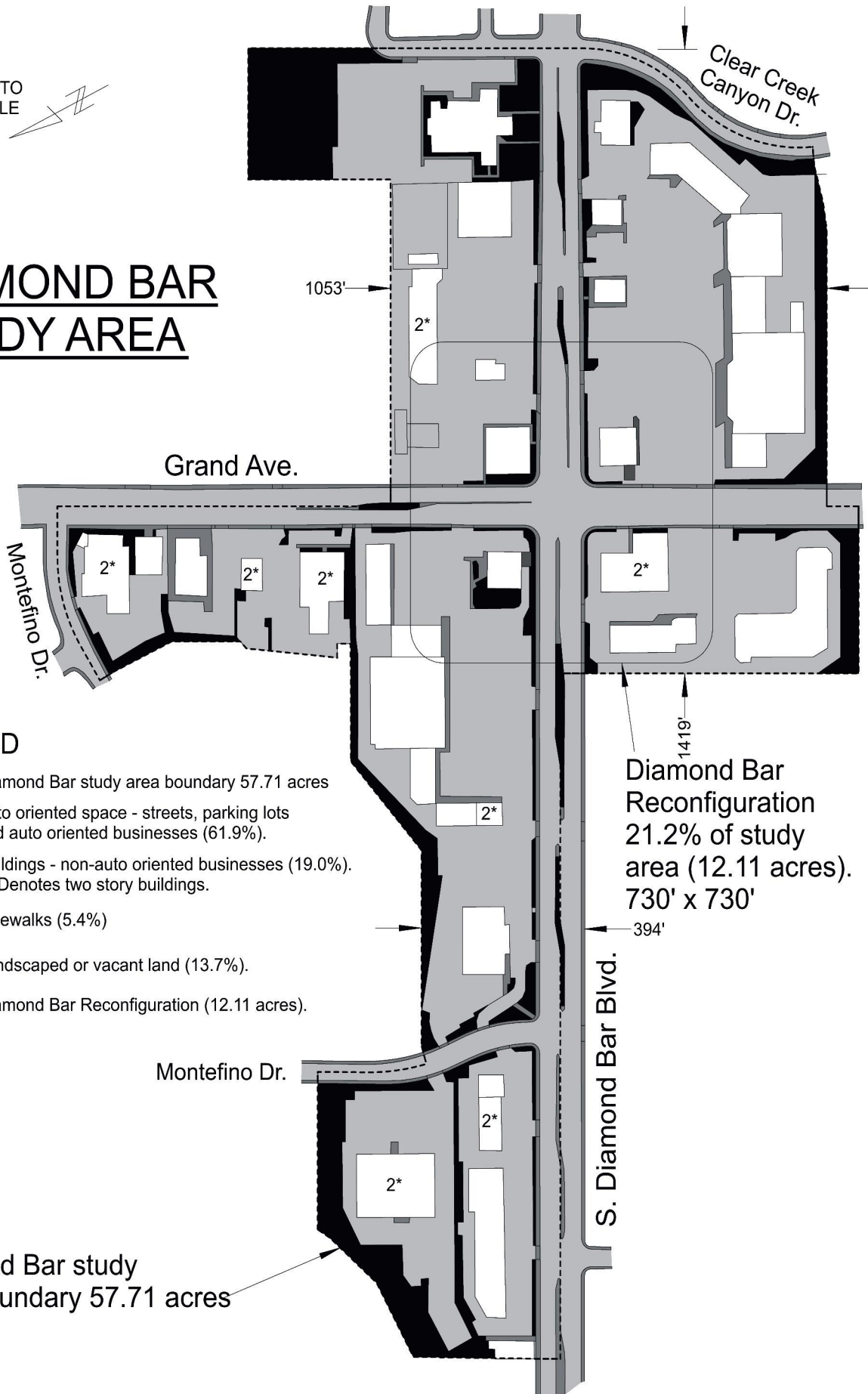
centerline of street right of ways. The total area is 57.71 acres (2,513,637 sq. ft.) and is broken down as follows: 19.0% actual buildings, 14.7% roadways, 5.4% sidewalks, 47.2% parking lots, and 13.7% vacant or landscaped. At the time of the survey there were 165 different shops or businesses in the Diamond Bar study area.

The following is a complete list of those enterprises:

- 24 eating establishments (restaurants and fast food)
- 3 coffee shops
- 5 bakeries/donut shops
- 1 candy store
- 1 library (public)
- 1 US Post Office
- 1 fire station
- 1 church
- 5 schools/academies
- 2 mailing/shipping outlets
- 10 banks
- 6 barber shops/hair salons
- 8 doctor offices
- 14 dentist offices
- 3 chiropractor offices
- 7 other medical clinics
- 1 veterinarian office
- 1 pharmacy
- 4 cleaners
- 2 grocery stores
- 4 small markets
- 4 insurance offices
- 2 tax/accounting offices
- 1 jewelry store
- 2 tobacco/liquor stores
- 7 spas/nail salons
- 5 misc. offices/businesses
- 1 shoe repair shop
- 2 travel agencies
- 3 martial arts studios
- 2 diet/exercise studios
- 8 real estate/escrow offices
- 1 music store
- 1 pet/grooming store
- 1 tire store
- 1 car rental store
- 3 small retail stores
- 1 large retail store
- 6 small industries
- 15 vacant shops/buildings
- 165 TOTAL

NOT TO SCALE

# DIAMOND BAR STUDY AREA



## LEGEND

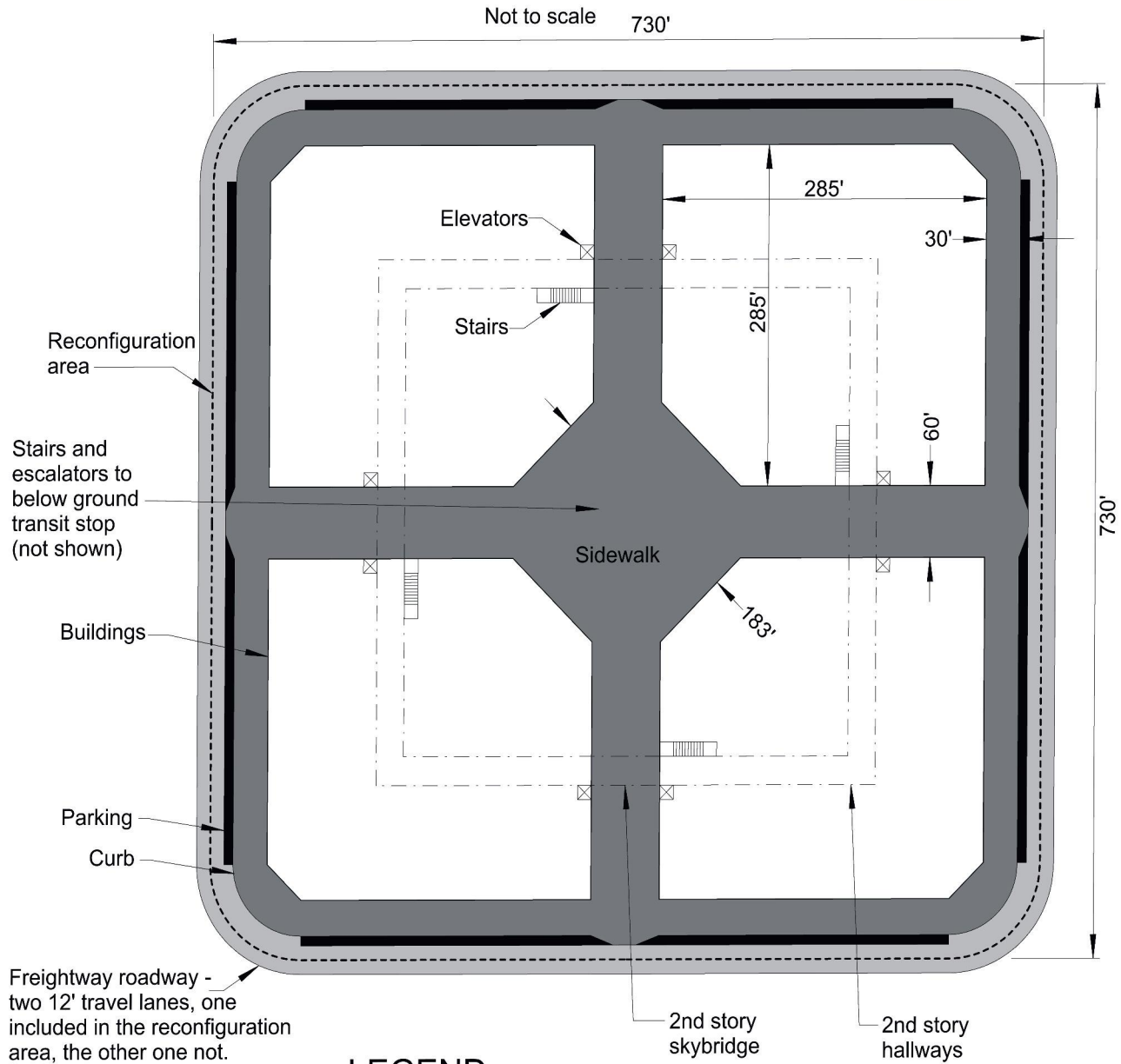
- Diamond Bar study area boundary 57.71 acres
- Auto oriented space - streets, parking lots and auto oriented businesses (61.9%).
- Buildings - non-auto oriented businesses (19.0%).  
2\* Denotes two story buildings.
- Sidewalks (5.4%)
- Landscaped or vacant land (13.7%).
- Diamond Bar Reconfiguration (12.11 acres).

Diamond Bar Reconfiguration  
21.2% of study area (12.11 acres).  
730' x 730'

Diamond Bar study area boundary 57.71 acres



# DIAMOND BAR RECONFIGURATION



## LEGEND

- Reconfiguration area: 100% (527,396 sq. ft.); (12.11 acres)
- Auto oriented space (roadway/pavement): 6.9% (36,152 sq. ft.)
- Auto oriented space (on street parking): 3.2% (16,960 sq. ft.)
- Sidewalks: 30.5% (160,984 sq. ft.)
- Buildings: 59.4% (4) all two story containing a variety of offices plus various commercial and retail businesses. Each building has 77,437 sq. ft. (first floor). 68,917 sq. ft. (second floor). 146,354 sq. ft. total; multiplied by 4 equals 585,416 sq. ft. of usable square footage. Excludes stairs, elevators, and upstairs hallways. Each building footprint is 78,325 sq. ft. x4 = 313,300 sq. ft.



Aerial view of Diamond Bar Study Area, 2010, Diamond Bar, California.

Photo Credit - Pictometry International Corp.

**DIAMOND BAR - TABLE 1**  
**BREAKDOWN OF EXISTING LAND USES**

- Auto oriented business (building area only): 0.1% (2,944 sq. ft.); 2 businesses (1 tire store, 1 car rental.)
- Parking lots: 47.2% (1,185,815 sq. ft.)
- Streets: 14.7% (370,505 sq. ft.)
- Non-auto oriented businesses (building area only): 19.0% (477,045 sq. ft.); 163 businesses; floor space of businesses is 585,425 sq. ft. due to some two story buildings.
- Sidewalks: 5.4% (135,731 sq. ft.)
- Landscaped, open, and vacant space: 13.7% (344,541 sq. ft.)
- Total auto and truck oriented area (transportation): 61.9%; auto oriented businesses, parking lots, and streets.
- Total Diamond Bar study area: 57.51 acres (2,513,637 sq. Ft.)

**RECONFIGURATION OF DIAMOND BAR'S  
 ELEMENTS INTO AN AUTOLESS CITY FORMAT**

This hypothetical reconfiguration of Diamond Bar into a small commercial district is modeled on Pedestria's Garden Village commercial district.

The first step in this exercise is to eliminate all the auto oriented space and replace it with an autoless city transit system and freightway roads. This occupies much less space and is the essence of horizontal compaction.

The second step is to stack the existing non-auto oriented businesses to a predetermined minimum height requirement (in this case, two stories). This results in the occupation of even less space and is the essence of vertical consolidation.

The third step is to create a transit oriented cluster development from the compacted and consolidated elements. This is a development that surrounds a central transit terminal and has comparatively high density.

The last step of laying out and reconfiguring Diamond Bar is to provide ample pedestrian access and orientation. This means providing wide sidewalks, large transit boarding areas, crosswalks, stairs, and elevators.

The final result is a reconfiguration with the same amount of square footage for non-auto oriented building space as in the study area (585,425 sq. ft.).

The diversity of businesses in this reconfiguration is designed to be the same as in the Diamond Bar study area. The actual location of individual businesses within the reconfigured design is not determined, but rather is shown as unspecified building space. The number and composition of businesses in the study area would probably differ somewhat from those found in an actual Pedestria residential community commercial district, but



Building top view of Diamond Bar study area - looking east.

**DIAMOND BAR - TABLE 2 BREAKDOWN OF RECONFIGURATION**

- Total Diamond Bar Reconfiguration Area: 12.11 acres (527,396 sq. ft.)
- On street parking: 3.2% (16,960 sq. ft.)
- Streets: 6.9% (36,152 sq. ft.)
- Total transportation related space: 10.1% (53,112 sq. ft.)
- Sidewalks: 30.5% (160,984 sq. ft.); does not include 2nd floor hallways and sky bridges.
- Building footprints: 59.4% (313,300 sq. ft.); 4 two story buildings, each with a footprint of 78,325 sq. ft. and a total usable square footage of 585,416 sq. ft. (All 4 buildings x 2 stories, excluding space for second story hallways, stairs, and elevators). This is a hypothetical stacking of floors (compaction), in this case from mostly one story to two stories.

**DIAMOND BAR - TABLE 3 COMPARISON OF DIAMOND BAR AND ITS RECONFIGURATION**

**DIAMOND BAR**

- Total area  
2,513,637 sq. ft. (57.71 acres)
- Detailed breakdown
- Transportation (streets, parking lots, & auto oriented businesses):  
1,556,320 sq. ft.
- Sidewalks:  
135,731 sq. ft.
- Building footprints (non-auto) commercial, retail, & office space:  
477,045 sq. ft.
- Total building square footage:  
585,425 sq. ft.
- Landscaped & vacant land:  
344,541 sq. ft.

**RECONFIGURATION**

- Total area:  
527,396 sq. ft. (12.11 acres)  
79% reduction
- Detailed breakdown
- Transportation (streets & parking);  
53,112 sq. ft. - 96.6% reduction
- Sidewalks:  
160,984 sq. ft. - 18.6% increase
- Building footprints (non-auto):  
313,300 sq. ft. - 34.3% reduction
- Total building square footage:  
585,416 sq. ft. - No reduction
- Landscaped & vacant land:  
0 sq. ft. - 100% reduction

this reconfiguration exercise is a helpful tool in visualizing the processes used in creating Pedestria's overall design.

The finished reconfiguration of Diamond Bar consists of 4 large 2 story buildings. (If this was actually a residential community commercial district in Pedestria there would be a below ground transit stop similar to the one shown in Garden Village.) A simple grid of wide sidewalks surrounds the buildings for easy access. A one way, 2 lane road (freightway) surrounds the perimeter of the reconfiguration. Along the straight stretches, there is parking and loading zone space.

Each of the 4 buildings contains 1 stairway and 2 elevators. The buildings are interconnected with second story sky bridges. The second story of each building contains an internal hallway, from which all the second story commercial spaces are accessed. There are no internal hallways on the first floor, so access to first floor commercial space is from the outside of the buildings. The square footage calculations exclude the stairways and elevators for both first and second floors, as well as the second floor hallways.

The edge of the reconfiguration area (the boundary used for area calculations) is the line between the two freightway lanes (dashed line). One lane is included in the calculation, but the other is not. This is because these lanes have the dual purpose of accessing both the commercial district and surrounding residential areas (see the "Garden Village" map for a comparable example). This is in keeping with the area calculations for Diamond Bar (where, if commercial areas adjoined streets on only one side, the centerline was used as the boundary).

## **PEDESTRIA'S RESIDENTIAL COMMUNITY DESIGN**

Pedestria has 90 different residential communities that vary in size, external shape, location, topographic features, population density, building density, internal street and property line configuration, cultural and socioeconomic diversity, as well as other variables. The intention of showing such variety is to convey the potential that is possible in designing autoless residential communities.

The residential communities are arranged in groups of six communities, called community groups. There are 15 groups, labeled A through O. Most community groups have three sizes of communities: 3 small (1/3 mile square, 71.1 acres), 2 medium (5/12 mile square, 102.4 acres), and 1 large (1/2 mile square, 160.0 acres). These repeated sizes are utilized ONLY to expedite different mathematical calculations. In an actual autoless city, the communities may all vary in size. The relatively small size of these communities is a necessity for pedestrian orientation; their modest size helps minimize walking distances.

In Pedestria the communities in each group are usually arranged in a loop pattern and connected by a common transitway/freightway. Two of the groups (I and J) are arranged in a linear pattern. Other community group patterns are geometric, symmetrical, asymmetrical, and irregular.

The individual communities vary in shape. There are square, pentagonal, hexagonal, octagonal, round, and irregular shaped communities. These different shapes are not a necessity for creating a good autoless city. They are varied in order to illustrate diversity of design. Most communities are separated from one another by open space; however, some are adjoining. Most groups are arranged with the smaller sized communities toward the center and the larger communities toward the perimeter of the city (there is more room for the larger communities toward the perimeter).

The land uses within the communities are also varied. They all have one transit terminal at their center and are surrounded by a mixed-use commercial district. This commercial district is more than just stores, shops and businesses; it also contains a small public plaza and public amenities such as a library, post office, meeting rooms, public restrooms, and possibly a small police station. Residential units above the two commercial floors are required by zoning and land use regulations. Pedestria's commercial districts are made up of public right of ways intermixed with private property. There is 24 hour access through the district's public passageways and streets. The commercial district is surrounded by a freightway which gives vehicles access to it. The freightway also connects to secondary roads which access the remainder of the community.

The neighborhood surrounding the commercial district consists of residentially zoned property of varying densities, including multi-family units and single family residences. There are also occasional miscellaneous properties such as schools and churches. Beyond the residential area is open space.

Most residential communities have their own elementary school, and each community group has its own high school. Practically all public schools in Pedestria are situated near the perimeter of the community in which they are located. This allows the schools to be near open space and the recreation facilities they need. Elementary schools draw students from their respective communities. Walking and bicycling distances are very short for these children. The high schools draw students from within the entire community group; these schools are centrally located within the community group to minimize distances traveled by the student body.

To best illustrate the complexities of a typical residential community we will focus attention on a single one. This community is intended to be representative of any in Pedestria. The one that will be discussed is the first community in group 'C'. It is a small square community, 1/3 mile per side, 71.11 acres, with an



**A street without cars (pedestrian only) - between houses and 2 story apartments.**

overall population density of 50 people per acre. Its total estimated targeted population is 3,556 people. It is called Garden Village (GV). GV's topography is mostly flat with few distinguishing natural features. See side 1 of the supplementary map for GV's location, and side 2 for a detailed plan of the community.

At the heart of Garden Village is a centrally located transit terminal. This terminal is an underground (below grade) facility and is the only mass transit stop for all of Garden Village. The terminal has a central platform with two travel lanes on each side and is directly beneath the center of the commercial district (small public plaza). It is accessed via 2 sets of stairs, 2 escalators, and 2 elevators.

The commercial district, which is above the transit terminal and occupies the center of the community, is like a small enclosed shopping mall. There are 6 blocks of private property intermingled with public right of ways. The right of ways are streets exclusively for pedestrians. The entire commercial district has a minimum height requirement of 2 stories. The different blocks are made up of one or more buildings. The division of this private property and configuration of buildings depends on the nature and sequence of development that takes place here. The types of businesses that exist and survive here depend on the desires of entrepreneurs and the market forces that are particular to this community. Some of the buildings have additional residential floors above the 2 commercial floors. These high density residential units in the center of the community are required by zoning. Access to the first floor commercial space is directly from the pedestrian walkways. Access to the second floor spaces is via internal hallways or possibly from external balconies. Access to the residential spaces on the third floor and above is via first floor lobbies and elevators, and emergency stairways. See "Residential Community (Section B-B)" on side 2 of the supplementary map for a visual perspective.

The public right of ways in the commercial district contain both public and private utilities and are available for public ingress and egress at all times, but do not allow

vehicles. In the case of Garden Village's commercial district they are enclosed.

The enclosure of the commercial district with a weather protecting roof is by no means a requirement of an autoless city commercial district. However, the compact nature of this district and the high volume of pedestrian traffic make this type of development a prime candidate for enclosure. Enclosure refers to the construction of roofs between the buildings at a height of approximately two stories. This type of enclosure may or may not be open at the ends of each block.

Pedestria's location in a temperate climate and the use of passive temperature modifying components in the structure's design eliminate the need for an artificially controlled environment (air conditioning). This means that there are temperature and humidity fluctuations within the enclosed area. On occasion these fluctuations may be uncomfortably excessive, but the rarity of extreme weather and the moderating effects of passive controls will negate the need or the economic justification for air-conditioning. Around the exterior of the commercial district is a 6 ft. wide overhang. This exterior weather protection is a building requirement and



**An urban scene similar to a residential community commercial district with surrounding road.**

is handled in a number of ways, depending on the style and architecture of the buildings.

The expense and maintenance of an enclosing structure can be accomplished in numerous ways. Ownership and maintenance of the enclosing structures can be by the city, adjacent property owners, the business association, or by some combination of these. In Pedestria the structure is financed in part by a city acquired grant and in part by financing arranged by the district's business association. The ownership and maintenance of the enclosing structure is solely the responsibility of the business association.

Like many business districts and shopping malls, Garden Village's commercial district has a business association comprised of businesses in the district. It is an alliance of commercial interests that is responsible for dealing with collective concerns.

There are miscellaneous amenities throughout the mall that make it a very delightful place, such as a variety of public seating, public restrooms, drinking fountains, trash receptacles, visible street signs, kiosks, public phones, public meeting rooms, architectural designs, artwork, fountains, trees, and flowers. There is also 24 hour security. These amenities add greatly to the enjoyment and use of the commercial district. In Pedestria, many of these amenities are provided for by the initial developers or by the city government, but are usually maintained by the district's business association.

Vehicular access to the commercial district is via a one way, 2 lane road that surrounds the perimeter of the district. This road is considered a minor collector in the city's road classifications. Vehicles needing access to the commercial district or the remainder of the community use this roadway. For vehicles wishing to pass through Garden Village to other destinations without stopping, the 4 lane freightway/transitway passes directly beneath the commercial district and the transit terminal via the right hand lane.

There is parallel parking around the entire commercial district. This parking is for short term loading and unloading only. Exceptions for long term parking are allowed with special use permits only. There are 2 internal loading dock facilities that provide more convenient unloading for the district's most voluminous merchants (a grocery store and a post office). No vehicles are allowed in the enclosed mall except under very strict circumstances and with the use of a special permit (for maintenance and special events). For these vehicles there are only two access doorways into the mall. Vehicle weight and turning radii restrictions in the mall are also strictly enforced.

Pedestrians and bicycles access the commercial district through the many sidewalks, paths, and bike lanes that radiate from the perimeter road. Non-signalized crosswalks with curb extensions to minimize crossing distances are amply provided around the district. A bicycle lane surrounds the perimeter road, and there are many bike racks on the district's perimeter sidewalk, including some under the cover of the exterior building overhang.

The types of businesses and enterprises within Garden Village's commercial district are numerous. It is full of private merchants, businesses, apartments, churches, an elder center, and it can even accommodate a few light manufacturing or cottage industries. There are also public entities, such as a small meeting hall and a community center. A library, post office, and police station are also possibilities. The buying power, lifestyle, and consumptive habits of Garden Village's populace will have a market influence on the types and success of businesses in this community. Although people outside the community are able to patronize enterprises and activities in Garden Village, it is the locals who are the primary customers for most residential community businesses. Because of this, it is difficult initially to

predict what types of enterprise will locate and/or survive in any given community.

There are businesses in every residential community in Pedestria that are essential to the community and will probably exist in all of them: a grocery store, pharmacy, bank, laundromat, medical and dental offices, an eating establishment, a day care center, and religious establishments. The size of the communities, even that of the smallest ones, is sufficient to support these enterprises. Businesses less essential to human urban survival will also flourish here, such as a coffee shop, dry cleaner, hair and beauty salon, shoe repair, barber shop, hardware store, clothing store, gift shop, video store, tavern/pub, bakery, and more restaurants. Even some non-essential and frivolous businesses may succeed here. For example there could be dessert parlors, a tanning and manicure salon, jeweler, liquor store, florist shop, and curio shop. Offices of varying types may be here, too, such as insurance agencies, various medical/dental offices, tax consultants, real estate offices, law offices, and travel agencies. Businesses may also be of a light industrial or manufacturing nature, as long as they conform to the district's stringent requirements and qualifications for such activities.

There are also some businesses and miscellaneous activities that are permitted outside of the residential community commercial district that are not of a residential nature. Examples are churches, private schools, and possibly day care centers. Private businesses that require use of or leasing of open space, such as cemeteries, golf courses, and race tracks, will exist on the community perimeter adjacent to their required open space.

The specific location of individual businesses in the commercial district will be both a matter of chance and regulation. Initial entrepreneurs will generally have the pick of locations to choose from. Businesses that come later won't always have a choice, and may settle for what space remains. Businesses that locate, but then close or fail, will be replaced by other enterprises. Timing, financing, and the desires of both seller and buyer (or lessor and lessee) will all come into play in these real estate transactions. The best use of a particular location is a matter of opinion, but there is usually a definable criteria for what is an acceptable land use in a given location. A business locating and moving into a perfect location may not be that prevalent, but hopefully even rarer will be businesses having to settle for what they consider the worst possible location. It will be to everyone's advantage (business owners and the general public) if companies are able to locate and prosper in advantageous and compatible locations.

City zoning ordinances and local business association recommendations can help establish guidelines for the location of certain business activities. There are certain types of businesses whose locations should be regulated by zoning laws, such as those needing a high degree of visibility, and those needing

convenient pedestrian/freight access. Visibility and access are extremely important to the survivability of certain businesses. Some businesses thrive on passers by, such as dessert parlors. Others, such as shoe repair shops or dentist's offices, are more accustomed to business on a premeditated or appointment basis. All the first floor commercial space in the residential commercial district has reasonably good visibility and access. For the second story space this is not as true. Upstairs commercial space access is from either second level balconies or internal hallways, and these areas are open to the public on a 24 hour basis. Here visibility from the main commercial district streets is less than optimum. It is in the business association's best interest to help optimize the strategic location of businesses. In other words, it would be unwise for the most visible and accessible locations to be occupied by businesses that are predominately appointment only, or to have businesses needing excellent access and visibility occupying upstairs out of the way locations. Through the city's and the business association's efforts, the location of businesses in advantageous locations can be better realized.

Large big box stores and national chains, versus small local mom and pop stores, will be another important consideration in the development of the residential commercial district. The primary developer, and eventually the city planning department and neighborhood association, will all be participants in this process. It may be possible to have a single corporation build an entire residential commercial district. If they create a one-stop shopping center that meets most residents' local shopping needs, then the public is well served. On the other hand, a more competitive arrangement with more variety and local flavor may be desired. The actual commercial makeup of each community will have many players and many possible scenarios and may have varying degrees of success and failure. Hopefully, as the city grows these issues will play out favorably for the people of Pedestria.

The remainder of Garden Village (that portion outside of the perimeter roadway) is not exclusively residential, but that is by far the predominate land use. The configuration of public right of ways throughout this residential section is as follows. The south half of Garden Village has a nearly symmetrical street layout, with each quarter being almost a mirror image of the other. The north half has a more varied configuration. All streets in the residential section are one way. There are 3 different sizes of right of ways in the residential section (60 ft., 40 ft., and 20 ft.). See side 2 of the supplementary map for locations.

The larger 60 ft. right of ways have 2 lanes of traffic (one-way), 2 bike lanes (one in each direction), curbs, sidewalks, and the remainder for slopes and landscaping. Vehicle travel speeds range from 15 to 25 mph. Very short term parking is permitted in the right-hand bike lane without a permit. Longer term parking is also permitted, but requires a special use permit. This on-street (on bike

lane) parking fulfills several special parking needs. Single family dwellings are not allowed to have off street parking on their property; therefore, any vehicle (such as a service vehicle or moving van) needs a temporary place to park. The infrequency of these occasions assures that parking in the bike lanes will not be a chronic problem. The low volume of traffic, with only the occasional parked vehicle, presents a minimal hazard to cyclists.

The 40 ft. wide right of ways are neighborhood streets shared by both pedestrians and vehicles. They contain a 20 ft. curbless street where travel speeds are limited to a range of 5 to 15 mph. For bicycles and pedestrians they are open sidewalks with a courtesy rule of "stay to the right, pass on the left". Vehicle parking is allowed but restricted to the right hand side of the street. It occurs infrequently enough not to pose a congestion problem.

The final type of right of ways in the residential section of Garden Village is for pedestrians and bicycles only. These are 20 ft. right of ways with 8 or 10 ft. wide sidewalks. These bike and pedestrian paths serve as short cuts through the community or access to the open space surrounding the community. Emergency vehicles are permitted to use these sidewalks if necessary.

Garden Village is targeted to average 50 people per acre and have a total population of 3,556. This number is an approximation; in reality, the population will fluctuate. This total population figure is based on residential building square footage. The figure used in Pedestria for estimating population totals is 500 sq. ft. per person. This means that there must be enough residential building square footage to house 3,556 people at 500 square feet per person. This calculation is based on the entire building floor space, including the common areas such as hallways, lobbies, elevator shafts, etc. Each building's total square footage per floor is multiplied by the number of stories, then divided by 500 to arrive at the estimated population for that residential building. This quantity of living space per person is comparable to living standards in many modern industrial countries.

Land use zoning and minimum density requirements assure that enough residential square footage is built in each community and the central core to attain this population goal. They are also meant to encourage a diversity of housing types and varying degrees of housing density. The community's zoning is arranged with lowest densities (single family detached homes) at the perimeter, and a transition to increasing densities as one progresses toward the center of the community. Detached homes give rise to duplexes, row houses, then low rise apartments, and eventually small high rise apartments above the commercial district. There are a variety of residential building types possible in Garden Village, including low and high rise apartments, townhouses, condominiums, plexes, rowhouses, detached homes, mobile homes, and communal housing buildings. There is also the possibility of retirement homes, nursing homes, and co-housing arrangements. A variety of

## DIFFERENT TYPES OF RESIDENTIAL UNITS



3 story apartment complex



2 story apartment buildings

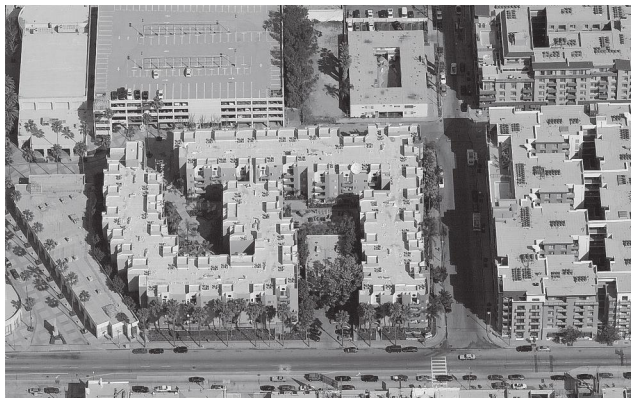


Photo Credit - Pictometry Intelligent Images

Aerial view of several apartment complexes - In Pedestria there would be no adjacent parking structures.



Condominium/apartments - an acceptable housing option in Pedestria.



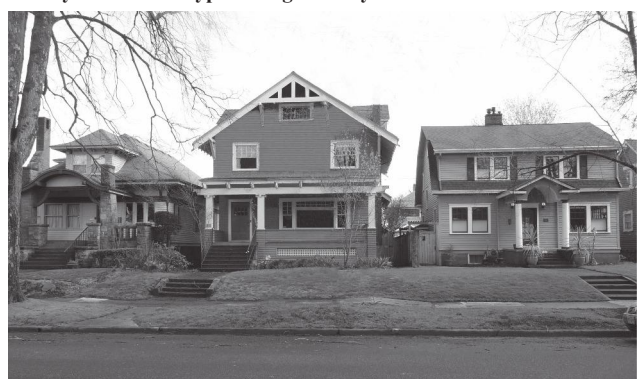
Row houses



1950's ranch style home with double garage and large front and back yard. Not the type of single family home available in Pedestria.



Single family houses. - types that might be available in Pedestria. Note: no driveways or garages.

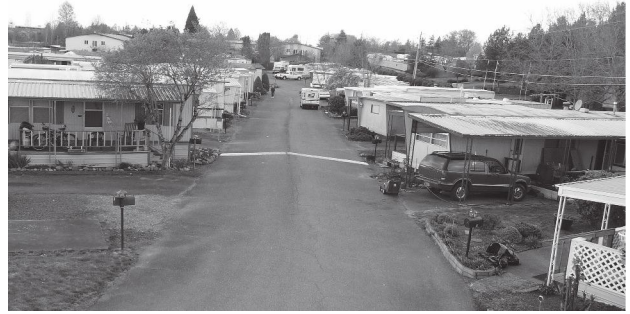




## MORE RESIDENTIAL UNITS



An aerial view of a variety of housing options - detached single family homes, duplexes, and row houses.



Mobile home trailer park



Senior retirement center



Duplex in an auto oriented city - Driveways, garages, and cars are the main focus of this building. Architecture will be quite different in an autoless city.



*Photo Credit - Pictometry International Corp.*

Aerial view of mobile home trailer park.



Low rise apartment complex - with its own private open space for use by tenants and guests.

housing options and price ranges are encouraged throughout the city, from low income to luxury (including subsidies for low income housing).

Lot sizes for houses and row houses vary and are rather small compared to most of today's suburban lots. Common single family lot sizes are 40 or 50 ft. x 80 or 100 ft. Common lot sizes for row houses are 25 or 30 ft. x 75 or 80 ft. All houses and row houses are two stories tall, as dictated by the height and minimum density requirements. Building set-backs for detached and attached houses are generally small in comparison to today's automobile oriented suburbs. They range from 0 to 20 ft. for front set-backs, and 0 to 10 ft. for side set-backs. The individual lot owners are allowed this small piece of private open space to fulfill their own personal land needs. In Pedestria private residential lots are only an option for a small percentage of housing units. Approximately 23% of Garden Village's population live in single family dwellings on private lots; this includes row houses. The remaining 77% live in multi-unit apartments or condominiums.

Lot sizes for apartment buildings vary considerably. They range from small lots for a single apartment building to giant lots for apartment complexes. Minimum density requirements specify 2 and 3 story apartment buildings. Apartment buildings built within the confines of the commercial district have a minimum height requirement of 4 stories above the 2 business floors. Variations of architectural style and arrangement are allowed in Pedestria as long as zoning and building code requirements are met. Architectural themes are encouraged within groups of buildings, and even throughout neighborhoods and whole communities.

The configuration and arrangement of residential buildings within their own lots will vary. Pedestria's zoning regulations and building code requirements are designed to assure quality, safety, and compatible development. Private developers and private home builders will make individual decisions on the best utilization of their property. They will determine the best layout of buildings, landscaping, and extra amenities. These private property decisions are equivalent to those made in today's auto oriented cities.

The residential section of Garden Village is not entirely residential; there are some non-residential land uses allowed. These are generally uses that require proximity to open space or where use of the property is greatly enhanced by separation from the commercial district. The two best examples are public schools and houses of worship (churches, temples, etc.). Most schools in Pedestria, and many of the churches, are located near the perimeter of their community. This is significant to schools because of their need for large areas for recreation (playing fields, etc.). The Garden Village Elementary School is located at the SW corner of the community and draws its student body only from the Garden Village community. The majority of its recreation facilities are outside of the community's

boundaries in the city's open space area, which is a permissible use. The two houses of worship are also located on the perimeter of the community on individual lots. This allows these religious buildings free expression of architectural design. If they were situated in the central community district, they would have building constraints placed on them by the surrounding buildings. This location also affords them close access and use of public open space.

Alternatively, schools and churches can be located within the commercial district, as there is no zoning requirement prohibiting this. Their location in or near the center of the community would certainly afford them better access to the transit terminal, which could be important to schools and churches that draw participants from outside their respective communities.

In Garden Village and throughout Pedestria there are



*Photo Credit - Pictometry International Corp.*

**High school with sports fields**



**Church**

a number of special corridors and easements. Generally these are for private and public utilities, such as gas, water, sewer, and power. These utilities are normally situated below ground within the confines of the public right of ways. Occasionally it is necessary to cross private land with the use of an easement. Other types of easements in Pedestria may include permanent and temporary easements, restrictive easements, and slope

and special easements. In respect to types of easements, Pedestria is very similar to today's auto oriented cities.

In Garden Village and throughout Pedestria there are a number of restrictions on development. There is a broad range of zoning classifications, each with its own conditions. Generally these classifications are broken down into two main divisions: residential and commercial/business. Zoning restrictions include land use, occupancy, density, height, buildable area, setbacks, and other types of restrictions. In conjunction with zoning are building code restrictions which are meant to promote quality and economical construction, health and safety considerations, and energy efficiency. Private restrictions, such as subdivision stipulations and covenants, may also be enforced in some developments. These different kinds of developmental restrictions are not peculiar to Pedestria; they are a common occurrence in today's auto oriented cities as well.

Garden Village is designed with many amenities in mind, both in the commercial district and the residential section. Amenities increase people's physical and mental pleasure, enhance a community's livability, and increase people's standard of living. Garden Village contains all of the following amenities: public restrooms, numerous public garbage cans, drinking fountains, visible street signs, a centralized community directory display, public phones, public meeting areas, public seating, public artwork, kiosks for public and private displays, architecturally designed and decorated public spaces, weather protection (where feasible), a variety and mixture of compatible land uses, and plantings of trees, shrubs, and flowers. In Pedestria these amenities are provided by public, private, and sometimes combined efforts.

The inherent design of Pedestria's residential communities, as illustrated by Garden Village, helps foster a sense of community. Neighborliness, unity, concerns for one another, and camaraderie are some of the attributes of a community with a sense of itself. Small things can make a big difference in the way people associate with their neighbors. Front porches, little or no building set backs, small front yards, low front fences, and centrally located mailboxes all help enable dwellers to focus attention toward the street and passersby. They increase chance meetings and contacts between neighbors and boost people's sense of community. Other intrinsic entities within the community that strengthen neighborhood bonds are geographic separation from other parts of the city, schools that are specific to the community or community group, a community center, a central business district, and a central transit terminal. These all bring people in contact with one another on a regular basis. Face to face contact and relationships with neighbors will be a common occurrence in Pedestria. Each residential community has a geographic organization similar to small village communities around the world. For people seeking anonymity, Pedestria's residential communities may be too intimate and personal.

Garden Village's compact centralized business district creates a vital local business environment. It is the community's main supply of basic goods and services. The business district is easily accessed on foot from the whole community. People move in and out of the business district on a regular basis in order to access the transit system. Centralized location and convenient access for customers are universal concerns of all neighborhood business districts and are accommodated in all of Pedestria's residential communities.

Garden Village is a single example of a residential community in Pedestria. The other 89 communities shown on the overall map display different sizes and configurations. Variations are by no means limited to these shown. Arrangements are limitless as long as the principals of compaction, consolidation, and pedestrian and transit orientation are adhered to. Variations can be manifested in the form of different street and building configurations, different population and building densities, land use variations, land ownership variations, and even the zoning and enforcement of different architectural motifs to create communities with unique themes. Many possibilities exist.

Garden Village as illustrated on the supplementary map and described in this text does not represent the complete picture of this community, nor is it completely representative of the other 89 communities in Pedestria. It shows the arrangement of streets, buildings, miscellaneous amenities, and the surrounding open space. What the plan is unable to show are the people. It is they who give this community life, flavor, and culture. The majority of this community's and Pedestria's culture is created by the citizens. It is possible for neighborhoods in residential communities and the central core to exhibit a great deal of variety, derived culturally from the people, and physically through professionally planned architecture and urban designs. Location, topography, and natural features also contribute to this mélange. Different ethnic backgrounds and various lifestyles add contrast and help instill a cosmopolitan flavor. Styles of architecture and people's personal touches to their property also enliven Pedestria. Different housing price ranges give all people, regardless of varying economic situations, a place in this city. The initial design of Pedestria, its arrangement of communities and central core, its pattern of streets and right of ways, and its arrangement of transportation systems all add to the uniqueness of this city.

## **RECREATION AND OPEN SPACE**

Open space and recreation property are an integral part of Pedestria's design. One goal is to arrange the city so as to grant all individuals close proximity and easy access to a variety of open space and recreational opportunities. There is a fundamental difference between Pedestria's open space configuration and that of most

existing auto oriented cities. Pedestria's open space is much more intricately intertwined with the residential communities and the central core. There aren't necessarily more types of recreational opportunities in Pedestria than in other cities; they are just more evenly distributed in keeping with the fundamentals of pedestrian orientation. The compact, modest size of the residential communities and central core guarantees close proximity to the transit system, commercial districts, and surrounding open space. Auto oriented cities typically contain a scattering of solitary parks or, in rare cases, an encircling green belt. These may furnish a substantial quantity of open space and a variety of recreational opportunities, but they do not necessarily provide easy access or close proximity for the majority of urban dwellers. Therefore, today's commonly found open space arrangements severely limit recreational opportunities for large percentages of urban dwellers. Most urban dwellers are a car's drive away from their city's various recreational opportunities. **In Pedestria, everyone is within walking distance of a variety of outdoor opportunities.**

Pedestria's design maximizes public open space and minimizes private open space. This emphasis is not to eliminate private open space, but to reduce it to small amounts that don't jeopardize the city's compact nature. Pedestria's zoning restrictions reflect this by requiring small lot sizes, row housing, and multifamily housing (essentially requiring higher densities than typical suburban zoning). The allowance for some private open space gives people the option to choose this type of ownership. It can be more expensive than buildings/dwellings with no private open space, but is what some people want.

These types of private open space manifest as single family dwellings on small lots, row houses on even smaller lots, and apartment buildings or complexes with limited private open space, including compact areas of lawn, landscaping, and facilities, such as, pools, tennis courts, patios, etc. See the NE and SW quadrants of Garden Village for detailed examples.

Pedestria's reduction of private open space compared to that of auto oriented cities translates into a significant increase in public open space. This abundance gives all citizens of Pedestria the chance to enjoy many more recreational opportunities than typical suburban backyards can provide.

Pedestria's open space is made up of three distinct areas: Central Park, Perimeter Park, and community park spaces. Within these park areas there are a number of distinctive open space classifications: manicured park space, unmanicured or natural park space, playing fields, garden and orchard space, amusement/activity space, and miscellaneous space. There are also recreational and open spaces available within the boundaries of the residential communities and central core, primarily in the form of pedestrian streets and plazas.

Central Park, in the heart of the city, is completely surrounded by the donut shaped central core urban area. It is 4,500 ft. on each side, square in shape, with a protrusion of Center Lake extending out into the central core. The park, with the entire lake, covers a total area of 478 acres, 20% of which is water. Central Park has a wide variety of recreation options available. There are manicured and natural park spaces, and miscellaneous attractions such as a small zoo, amusement park, arboretum, and amphitheater. There are no playing fields or garden orchards in Central Park (these are in Perimeter Park). Central Park has facilities and space for large public gatherings. Its centralized location makes accessibility easy for such events.

Perimeter Park is a wide band of park space surrounding the central core, separating it from the residential communities. The approximate distance between the central core and the nearest communities is 2,000 ft. Perimeter Park contains the full spectrum of park and recreation options.



**Demarcation of public and private land.**



**Close-up of private property marker.**

Community park space is the open space between residential communities. It varies greatly in size and configuration. Generally, most communities are 500 ft. apart. Exceptions to the 500 ft. norm are all of the groups that have attached communities; there is little or no open space between them. However, they are compensated with more open space between them and their neighboring community groups. In general, the total open space for all communities is roughly the same. Each community group is surrounded and intertwined with community park space containing the full spectrum of park and recreation options.

By no means is 500 ft. of open space between residential communities a hard and fast rule for autoless cities. That distance can vary greatly. In autoless cities built for people or cultures having agrarian roots, garden and orchard space might be increased considerably.

Certain geographic land forms and vegetation types may not warrant the inclusion of large amounts of natural open space between communities. Hence, the amount of open space between communities may be reduced. An example would be very arid deserts with little vegetation or very sensitive vegetation and erosive soils. These fragile environs would gradually be trampled and degraded to such extent they would cease to provide natural open space. Thus, distances between communities may be less than 500 ft. Pedestria's fictitious geography does not include these extremely fragile environs.

Park and open space classifications (shown on sides 1 and 2 of the accompanying map) are defined as follows:

- **Manicured park space** - This is space that is tended to on a regular basis, generally by the city maintenance or park bureau. Citizen or neighborhood groups may participate in certain aspects of park care. The manicured park areas include picnic areas, some play ground areas, and most of the general park space. These are generally areas containing mowed lawns, planted and pruned trees, shrubs, and flowers, and miscellaneous structures. Manicured park spaces are located adjacent to all the residential communities and the central core.

- **Unmanicured space or natural open space** - This is open space not tended to or cared for on a regular basis. Generally these areas are left as natural as possible. They are meant to provide the urban dweller with small areas of natural beauty consisting of native flora and fauna. The extent of development in these areas is usually limited to trails and paths. There are some maintenance tasks that may occasionally need attention. There are also fire, crime, and vagrancy concerns, which must be addressed by the appropriate city bureaus. Unmanicured park spaces are located near all of the residential communities and the central core.

- **Playing fields** – These are a major component of open space recreation. Playing fields of different types are located adjacent to all the residential communities and

the central core. They vary from football fields to baseball diamonds, soccer fields to tennis courts, etc. In many cases the playing fields are adjacent to a community's elementary or high school. These sports facilities range from little more than a grassy field to small sports stadiums with considerable amenities. Most facilities are either city park bureau or school district owned and maintained. It is also possible for a city wide park and recreation district to exist in lieu of the city park bureau. It could be a public or quasi-public organization providing some or all recreation facilities, such as playing fields, parks, swimming pools, and community centers. It could be tax and user fee financed.

- **Garden and orchard space** – These exist within Pedestria near all residential communities and the central core. These urban agricultural spaces are an important part of the city's park system and are administered by the park bureau. Certain park bureau rules apply for the use of the garden plots and orchards. Numerous small plots and individual orchard trees are available for lease or by assignment to individuals wishing to engage in gardening activities. The city or the gardening community can provide tilling, spraying, and composting services, which are financed by garden plot fees or by volunteers. Garden plots are large enough that, if intensely developed, they can provide a significant amount of produce for sale or personal use.

- **Amusement and activity space** – These also exist throughout Pedestria's intertwining parks. Amusements and activities found in Pedestria's open space include amusement parks, a zoo, outdoor museums, an arboretum, golf courses, horse and dog racing tracks, etc. These activities are generally open to the public but require an admission fee.

- **Miscellaneous open spaces** - These include cemeteries and mausoleums. For the miscellaneous spaces there are various options for ownership and operations of the land they occupy (This also applies to amusement/activity space.) Completely privately owned and operated, private/public partnerships, or completely public endeavors are all possibilities in Pedestria. These choices need to be finalized and established during the creation of this city.

There is open space, as well as recreation, within the boundaries of the central core and residential communities. Buildings and streets do not use up all the space within these areas. Homes and rowhouses have small amounts of private open space. Apartment complexes have private grounds and recreation facilities for their inhabitants and guests. Public streets, paths, and plazas also constitute open space within developed areas. Many of these streets and plazas are amenity filled urban spaces. Although they may not fit the definition of green open space, they are public streetscapes that are people friendly.

All of the open space outside the central core and residential communities is publicly held land. It is

## DIFFERENT TYPES OF OPEN SPACE



Natural open space - between residential communities.



Aerial view of natural open space between subdivisions.



*Photo Credit - Pictometry International Corp.*

Aerial view of a city park - with playing fields, garden space, and wooded park space.



Heavily wooded natural open space.



A downtown park



Highly manicured urban open space - with beautiful plantings, water features, sculptures, and other amenities.



A lightly used urban park - with manicured grounds, flower beds, play ground, tennis courts, and benches.

**MORE TYPES OF OPEN SPACE  
PLUS OTHER RECREATION  
FACILITIES.**



**A crowd in a central core park.**



*Photo Credit - Pictometry International Corp.*

**Aerial view of cemetery - Although not recreation space, cemeteries are green space within our cities. More importantly, they are hallowed ground.**



**Close-up of cemetery grave stones.**



**5 baseball diamonds and 8 soccer fields.**

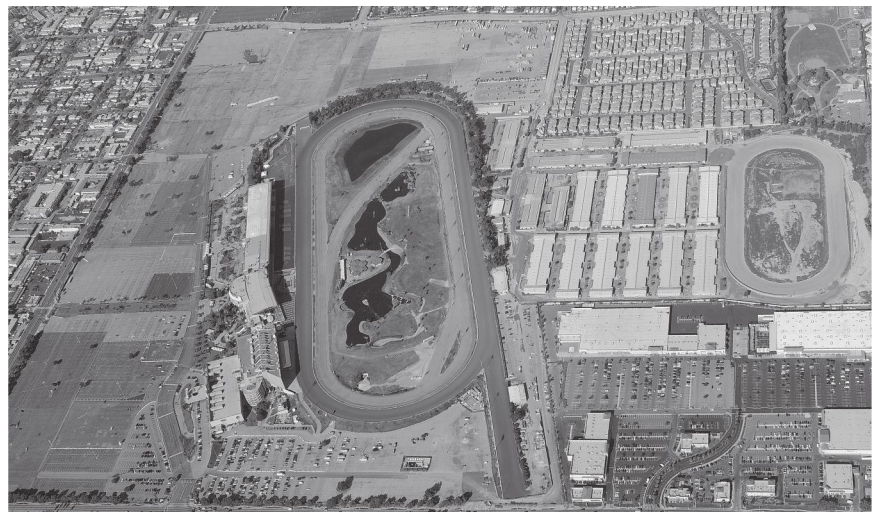


**Community recreation center and swimming pool.**



*Photo Credit - Pictometry International Corp.*

**Tennis courts, baseball and football fields.**



*Photo Credit - Pictometry International Corp.*

**Horse race track - with adjacent stables, practice track, and enormous parking lots. In Pedestria, all the parking lots would be eliminated.**



**Golf course**

*Photo Credit - Pictometry International Corp.*



**Public garden plots (winter time) - similar to those in Pedestria.**



**Rooftop patios and gardens - an oasis in our big cities.**

generally administered by either the city park bureau, school district, or maintenance bureau. However, some of Pedestria's open space is used for private enterprise, such as amusement parks, golf courses, racing tracks, private schools, and in some cases, cemeteries. Private companies are granted use of public real estate, either by leasing or special contract agreements. Properties can be leased for the expressed purpose of providing recreation or burial services. These special agreements are made during leasing of the properties, and stipulate rules, regulations, and responsibilities of both involved parties; they address future use and future transfer of the enterprises. The lessee and lessor (the city) agree upon financial and responsibility requirements for providing desired services. This may require the lessee and/or possibly the city to finance construction of certain facilities. Operation and maintenance of these facilities may also be a permanent requirement of the lease.

Leasing of public lands and contracting of services to private interests removes the city government from having to provide these services. It gives this task to the private sector and assures that these properties will be used for the activities stipulated in the contractual agreements. The actual ownership of these properties is with the city, and the city has ultimate control, but it is in the city's interest to have private enterprise provide these desired services and have them do so at a profit.

There is an alternative to the city owning and controlling all open space outside of the central core and residential communities. Some types of open space could be owned by private citizens or corporations, which by arrangement would be legally bound to operate as



designed. Types of open space that might be candidates for this arrangement are cemeteries, race tracks, amusement parks, some golf courses, and possibly even zoos. Whether a piece of open space is publicly owned or privately held will have to be worked out in the initial stages of the city. There are no hard rules pertaining to open space land ownership and/or concessions.

## **CENTRAL CORE DESIGN**

Pedestria's central core is the heart of its civic being, commonly referred to as "downtown". It has the greatest concentration of buildings, streets, activity, and people in the entire city. Pedestria's central core is a donut shaped downtown surrounding the geographic center of the city (Central Park). The donut has nine separate mass transit terminals, each surrounded by peaks of high building density. Downtown abounds with commercial, business, residential, industrial, medical, educational, and other endeavors.

One noticeable variation in the shape of the central core donut is the larger width of its northern portion. This area is dominated by industrial, warehousing, and big box retailers. Unlike most of the central core, it is served by rail transportation. This industrial section typically has very large city blocks to better accommodate industrial and warehousing uses. It also has other land uses within its confines that include commercial, business, and even some residential. These uses are generally located near transit terminals on smaller city blocks.

Because Pedestria is a compact and consolidated city (both horizontally and vertically), it is relatively small for a city of 1/2 million people. The donut shaped central core encompasses 3.48 sq. miles (2,225 acres), excluding the portion of Center Lake that extends into it. The diameter of the central core is 1.91 miles from east to west, and 2.29 miles from north to south. The width of the central core from Central Park edge to Perimeter Park edge is 2,800 ft. on three sides, and 4,800 ft. on the north side. The central core has an estimated population of 66,380. It has a roughly estimated total building square footage figure of 346 million sq. ft. This figure is based on the minimum height requirements for all blocks of the central core (width x length x # of stories for all central core blocks). This figure is instrumental in planning and establishing the overall size of the central core and ultimately, the size of the entire city. It is estimated that Pedestria's central core will employ roughly 3/4 of all employable people in the city. The other 1/4 will be employed in the residential communities and other places, such as the airport. (See Appendix Table 4 for a break down of this estimate.)

The mass transit system is the major contributing factor shaping the overall design of the central core. The urban development in the central core is strategically arranged around the downtown transit terminals. The

donut shaped central core enables the 9 terminals to be spread out, yet connected in a loop. The spreading of the terminals allows the central core to be of a sufficient size to accommodate the downtown urban entities for half a million people. The transit terminals are spaced 2,800 ft. and 3,500 ft. apart, and are equidistant from the inner and outer edges of the central core donut. This allows ample space for many city blocks and street right of ways, and optimizes the location of the transit system in relation to the urban development which it serves. The width of the public right of way at the transit terminals is 200 ft.; between the terminals it is 100 ft. (See "Central Core" [Sections B-B and D-D] on pages 59 and 55 for details.)

The central core freightway loops are important right of ways. They provide truck and vehicle access to the central core. The width of these is generally 100 ft. (See "Central Core" [Section E-E] on page 57 for details.) They also provide access to other minor truck routes and service streets. Together these different roadways access all of the buildings in the central core. Designated truck routes and service streets create a safer and more pleasant downtown, plus they make for a more efficient freight delivery system. There are a variety of time, speed, parking, and vehicle height and weight restrictions on all the different freightways, truck routes, and service streets.

The freightway loops are located 1/4 of the way between the inner and outer edges of the central core. They are away from the busiest areas of the city (the downtown transit terminals), which results in fewer pedestrians and trucks crossing paths. There are a variety of truck loading facilities in the central core. Most buildings are required by the city building code to provide loading dock facilities or, at minimum, a designated freight entrance. These are often off street facilities, and in taller buildings they are usually located internally. There is also on-street parking for truck loading on both the main freightways and on the minor streets accessible to trucks. These parking spaces serve businesses that do not have good access to off street facilities or at times when off street loading docks are full. In the industrial section of town, large truck docking facilities are common. These may be external to buildings and may resemble truck parking lots. Most loading docks at industrial facilities are on-grade, although they can be constructed underground if desired.

Besides the transit streets and the main freightway roads, there are also pedestrian exclusive streets and shared pedestrian /freightway streets. All of these types of streets and right of ways form varying street patterns with a variety of access within the central core. Most downtown areas have a strict symmetrical grid pattern, yet some areas exhibit an irregular pattern. The shared pedestrian/freightway streets are predominately used by pedestrians. Yet, these streets also function as minor truck routes and actually provide access to a large

number of buildings and small businesses in the central core.

The pedestrian exclusive streets are high volume right of ways. These streets usually radiate out from the transit terminal or are near the terminals in high density locations. In most cases they are covered, and many contain moving sidewalks. These streets serve as major pedestrian corridors and are lined with a mass of commercial activity. Vehicle access is strictly limited to emergency vehicles and special use permits only. These streets are bicycle walk zones (bicycles are allowed, but they must be walked), and skateboard use is prohibited; these measures are taken to maintain public safety.

There are also streets in the central core that serve as primary bicycle routes. These are the inner and outer bikeway loops and other connecting streets. Most bicycle routes tend to be away from the heavy pedestrian and truck traffic streets, thus reducing congestion and safety hazards. The central core exhibits a friendly atmosphere toward bicyclists, pedestrians, and truck traffic alike. As part of building code requirements, most buildings in the central core are required to have a designated number of bicycle racks. This number is based upon the square footage of the building and may increase if anticipated employee numbers are extremely high. For locations of different types of streets, see the "Central Core Detail" on side 1 of the supplementary map. For dimensional details, see "Central Core" (Sections A-A through O-O).

Different right of ways in the central core, including the main transit right of ways, are of sufficient width that they can accommodate all present uses, plus some future alterations. However, future changes or alterations that require additional right of ways will be extremely costly or impossible. The concentration of development in Pedestria's central core is very dense; buildings usually extend to the property lines and are zoned with minimum height requirements. There will be few vacant lots and no parking lots available as a source of developable land or as sources of "least cost" right of way expansion.

Right of ways nearest the transit terminals are generally wider than those farthest from the transit terminals. One reason for this is the increased pedestrian traffic near the transit terminals. Furthermore, concentration of commercial/retail business tends to exist in conjunction with this increased foot traffic. Exceptions to this pattern are the freightway loop right of ways and the promenades at the central core's inner and outer edges.

Pedestria's central core is abounding with all the activities which are typically found in large downtown areas. A full spectrum of land use opportunities exist throughout its various sections.

A mixture of land uses and activities is promoted throughout Pedestria. Multiple use regulations, tax incentives, and public promotions, as well as private economic entrepreneurship, all aid in producing a well blended mosaic in Pedestria's central core. Most of the

different parts of downtown are not dominated by any single land use; each contains a mix of activities. Many auto oriented cities, with restrictive and separation type zoning, have distinct districts of nearly uniform activity (i.e., retail shopping districts, business districts, and industrial zones). In Pedestria the notable exception to variability of land uses is the industrial area in the northern portion of the central core donut. This area has some mix of activity, but is dominated by industrial and warehousing uses. The rest of the central core contains more of an assortment of activities.

The central core contains businesses with a neighborhood or local focus that caters to needs and interests of the residents (approximately 66,000+ people). It also contains a full spectrum of both large and small businesses that have a city wide, national, or international focus.

Specific types of businesses and activities in Pedestria's central core are business and government offices, industry and manufacturing, warehousing, commercial retailing, freight and transportation services, schools and universities, hospital and medical facilities, entertainment and recreation facilities, sports facilities, residential units, and utility companies. These categories make up the greatest portion of Pedestria's commerce.

The following are brief descriptions and information about the different categories of businesses and activities in Pedestria's central core, and in some cases throughout the entire city. They are only generalizations and are not intended to be in-depth definitions. They are described as they pertain to Pedestria and its land use classifications. See the "Overall Map" and the "Central Core Detail" on side 1 of the supplementary map for proposed locations of some of these land uses.

- **Business offices** - There are numerous types of companies that are best described by this category. They generally consist of white collar workers and are usually service oriented. They employ the greatest number of workers in the city. Most of the business offices in the central core are located in the high density buildings near the transit terminals.

- **Government offices** - Pedestria has a city government with numerous bureaus and departments, all of which provide a large variety of public services. Pedestria is physically within a county and state, and is a separate government entity from its surrounding county. This eliminates duplication of bureaucracy. Because of this there are few, if any, county offices within the city. Some state agencies may have branch offices in Pedestria. There are also other public agencies located here. The majority of government offices are located in high density buildings near transit terminals. There are, however, many small offices and buildings scattered around the city in appropriate places. The city's maintenance bureau and park bureau are located in the industrial district.

- **Industry and manufacturing** - These activities are primarily confined to the northern section of the central core. Most heavy industry and manufacturing are relegated to this section of town due to objectionable side effects (noise, pollution, etc.). This portion of town is well accessed by freightways and rail. Most of the developable land within the industrial sector is divided up into large blocks (except land adjacent to transit terminals) to better accommodate the needs of large manufacturing. Some manufacturing, particularly clean industries that don't have objectionable manufacturing processes or large storage needs, are allowed in other parts of Pedestria.

- **Warehousing** - These activities are also primarily confined to the northern section of the central core. They usually require large buildings, yet employ relatively few people. Access by truck and rail transportation is paramount.

- **Commercial and retailing** - These types of businesses are located in all parts of the central core. They are predominately concentrated in corridors of heavy pedestrian traffic, usually near transit terminals where the greatest densities of buildings and activities are located. They include a vast assortment of stores and shops. Big box retailers are predominately located in the industrial sector due to their large building footprints.

- **Freight and transportation services** - These activities (trucking and warehousing) are based in the industrial section of town. Yet, much of their operation (hauling and delivering freight) is carried out citywide. Transportation services, such as intercity bus lines and tour lines, have similar conditions. Their home offices are in the industrial area, yet their services are carried out citywide or regionally. The city's bus transit system is the most important transportation service. Of course, it operates throughout the city, but has its main storage and service yards in the industrial sector. An exception to these industrial sector locations are the airports. Their services are confined to the municipal and international airports located on the city's perimeter. Automobile transportation services are located in the three highway gateway communities (auto extended zones).

- **Schools and universities** - There are all types of schools spread throughout the central core. Public schools (elementary and high school) are spread rather evenly throughout the area. They're usually centered within their respective student body areas, which divide up the downtown population. Private schools (ranging from preschool through 12th grade) are located with much less regard to geographic districts, as they draw students from the entire city. Universities are compact urban campuses rather than park like campuses commonly found in auto oriented cities. Most schools have a need for recreation and sports facilities, and their proximity to Central Park or Perimeter Park allows space for these activities. The issue of private schools using public open space for private recreation is potentially

controversial. It is in a similar vein as private enterprise operating recreation facilities in the city's open space. Certainly the city can accommodate most of the private school recreation needs with specially negotiated agreements. Agreements that grant special park privileges, yet don't compromise the city's ownership and ultimate control of park property, must be struck. There may also be fees and maintenance involved as part of these agreements.

- **Hospital and medical facilities** - These facilities are typically large buildings or groups of buildings. They may or may not be associated with universities. Emergency services, hospitals, and medical facilities do need good access to transit and freightway roads, and should be located accordingly. Helicopter landing facilities may also be incorporated into these medical buildings.

- **Entertainment and indoor recreation facilities** - These facilities are located throughout the central core, especially in corridors of heavy pedestrian traffic. Examples are cinema and theatrical houses, auditoriums, dance halls, arcades, fitness clubs, and small indoor sports facilities.

- **Large sports facilities** - Large sports stadiums are generators of large crowds, so they have a need for excellent access to the transit system. However, their use can be infrequent and their crowd generation sporadic. They also have fairly large real estate requirements. Therefore, their occupation of premium property adjacent to the transit terminals (the property with the best access and highest density) would be difficult to justify. Pedestria's solution is to locate large stadiums midway between two transit terminals (in lower density locations), and then provide special transportation accommodations to the transit terminals. These usually consist of pedestrian exclusive streets with moving sidewalks to quickly transport crowds between transit terminals and stadiums. Being between two terminals allows crowds to disperse in different directions. Moving sidewalks can be unidirectional to facilitate the timely gathering and later dispersal of crowds before and after events.

- **Residential units** - Residential units are spread throughout the central core. They are most prevalent in lower density locations away from transit terminals. These locations are quietest, farthest from crowds, closest to parks, and have the lowest land values in the central core. Residential units can, and do, exist in multi-use high rise buildings close to transit terminals. They can even exist in various locations in the industrial section of downtown.

- **Recycling and waste disposal** - Recycling and waste disposal are two necessary functions within Pedestria. Collecting recyclables, waste, and yard debris are citywide occurrences. Either city owned collection trucks or private contractor trucks pick up materials, much like they do in existing cities. Recycle processing

## DIFFERENT TYPES OF URBAN LAND USES



**Financial and business center of a city**



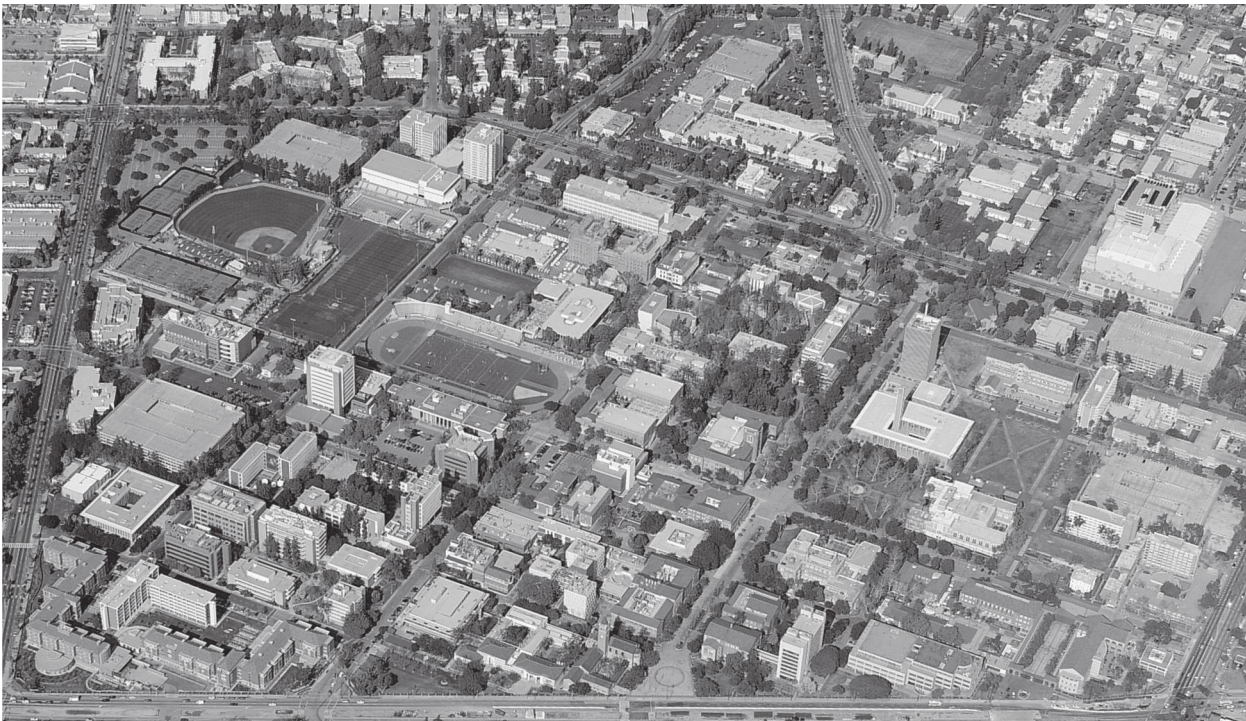
**Industrial and warehousing district**



**High rise residential complex**



**Medium rise residential buildings**



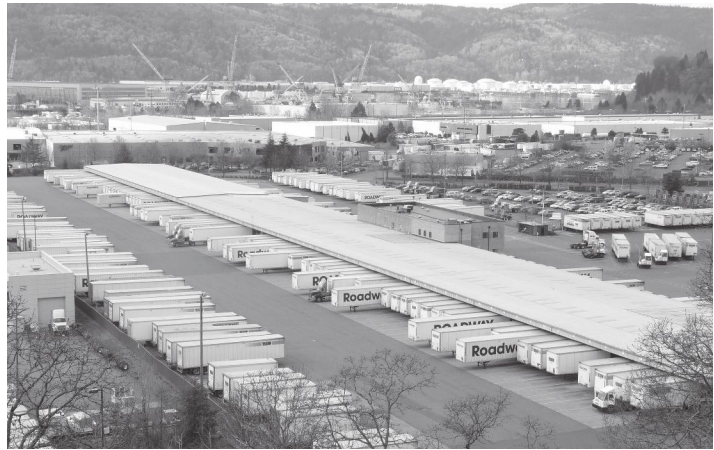
**Urban university campus**

*Photo Credit - Pictometry International Corp.*

## MORE TYPES OF URBAN LAND USES AND DESIGN



**Skybridge - a good way to join buildings for a safer way to cross busy streets and especially nice in cold or wet climates**

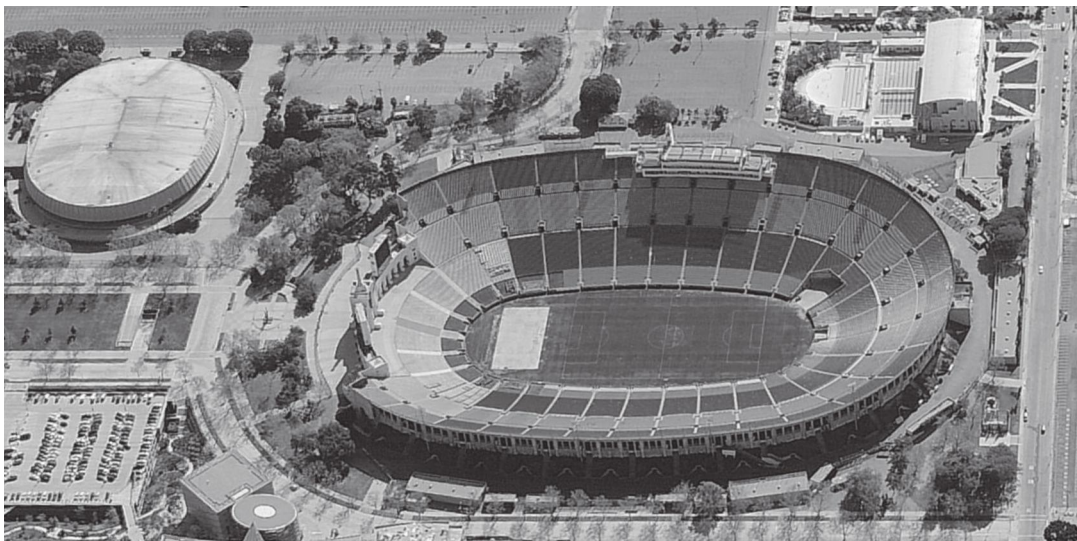


**Central core freight transfer terminal**



**Hospital complex**

*Photo Credit - Pictometry International Corp.*



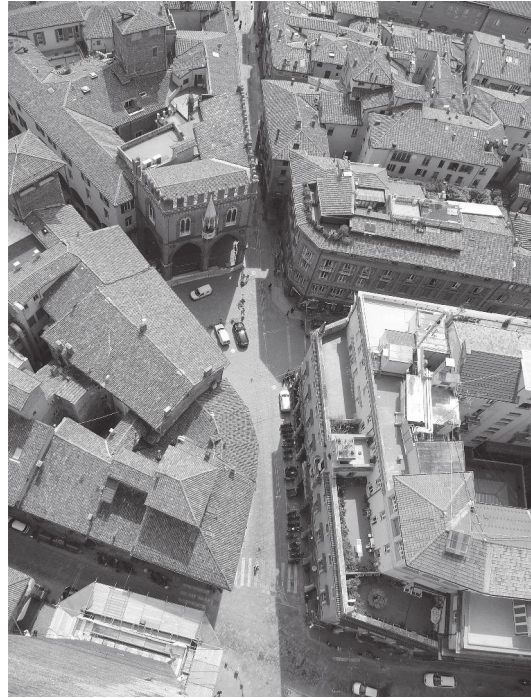
**Large indoor arena, large open air stadium, and a natatorium (swim center).**

*Photo Credit - Pictometry International Corp.*

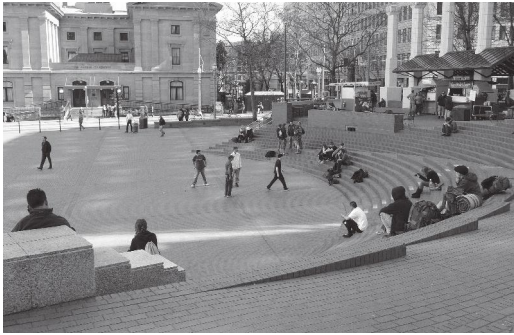
# DIFFERENT TYPES OF URBAN ENTITIES AND PATTERNS



Long, straight transportation right-of-way - a major influence on a city's architectural lines.



Pedestrian oriented streets - do not have to be so linear, thus lending themselves to more varied and interesting urban patterns.



Open air urban plaza



*Photo Credit - Pictometry International Corp.*

Civic center plaza - with many architectural features, sculptures, and plantings.



Small quiet plaza



*Photo Credit - Pictometry International Corp.*

Large parking lot - used for weekend farmers market, flea market, swap meet, or bazaar.



Downtown farmers market

and disposal of refuse are site specific (processing plant and landfill), and they are market price dependent as well. Pedestria's recycling center and landfill are located beyond and adjacent to the municipal airport. It would be a noble goal and potentially obtainable goal for Pedestria to recycle nearly 100% of its refuse and become as close to resource independent as possible. Pedestria's environmentally benign and sustainable nature would certainly be helpful in reaching this goal.

- **Utilities** - Although utilities are not considered a land use per se, they are a crucial ingredient in urban development and the functioning of a modern city. They are found throughout the city, in the central core as well as the residential communities.

Pedestria has the full spectrum of modern utilities, including water, sewer, gas, electric, phone, cable TV, internet, wifi, and other miscellaneous communications. Most are located underground throughout the entire city or, like wifi, are transmitted via airwaves. In order to reduce the high cost of underground facilities, multi-use conduits or shared conduits are installed as often as feasible. Another cost saving for Pedestria's utilities is the establishment of utilities prior to the development of surrounding property, thus eliminating the delays and conflicts caused by construction within high density urban areas. All utility facilities are intended to initially be properly sized for the ultimate buildout density of the city, thereby reducing future capacity upgrade expenses and reducing overall costs for providing these services. Although correct sizing may not always be possible, it certainly will work a large percentage of the time. Proper sizing should be finalized during Pedestria's planning stages or very early on in the city's construction phase. In existing cities utility companies are constantly enlarging or adding facilities to meet the demands of ever increasing densities and varying aged facilities.

In Pedestria there are designated right of ways within the central core and residential communities that are the primary utility corridors, containing the greatest number of and largest utility lines. In the central core they usually parallel the transitways and freightways, and are usually less traveled streets with few major appurtenances (such as moving sidewalks). See "Central Core" (Sections N-N and O-O) on pages 83 & 84 for details. Generally, all the transitways, transit plazas, freightways, and covered streets throughout the entire city are free of major utility lines. Although there certainly can be minor lines within these right of ways, such as some individual property services, electrical conduits for street lighting, signals, etc. Wherever utility lines are located, they are generally put in areas that will cause the least amount of disruption if repairs or upgrades need to be made. These areas are usually slope easements, sidewalks, and bike lanes. See "Residential Community (Section H-H)" on page 58 and "Central Core (Section M-M)" on page 74 for examples.

Pedestria's central core is designed with many amenities, that increase physical and mental pleasures and enhance the city's livability and standard of living for its residents, workers, and tourists. The central core is envisioned with all the same amenities that are in the residential communities (see page 115 for a complete list). Providing and maintaining these amenities can be a public or private endeavor, or it can be a combined effort.

Pedestria has a variety of sizes and configurations of city blocks in its central core. The "Central Core Detail" drawing on side 1 of the supplementary map shows some of these different types of blocks. Blocks adjacent to the central core transit terminals are generally 300 ft. square. Blocks more distant from the terminals either increase in size (area), as they do in the industrial portion of the central core, or they decrease in size, as they do in the non-industrial (business) portion of downtown. In the industrial part of town the comparatively smaller blocks near transit terminals help industrial and non-industrial activities to be within close proximity of each other. These varying block sizes facilitate diversification of land uses, which promotes heterogeneous urban activity in a predominately industrial district. In non-industrial parts of town the comparatively larger city blocks near transit terminals help increase densities in these locations, thus putting more activity closer to the transit terminals. The smaller blocks, away from the transit terminals and toward the edges of the central core, are smaller because of the shorter building height requirements. This also allows for more intricate and intimate neighborhoods, many of which are predominately residential.

Most city blocks are arranged in a grid pattern. This uniformity increases efficiencies of transportation and creates an orderly arrangement for the city. There are, however, areas in the central core with irregular and staggered patterns. These add variety and interest to an otherwise uniform grid.

In many older parts of existing cities there are often buildings side by side within the same block (as opposed to a single building covering an entire block). In Pedestria, for a variety of reasons, a developer or investment firm may not need or want to cover an entire city block with one building. Thus, multiple buildings within the same city block can and will exist in Pedestria's central core.

## **LAND USE ZONING**

The platted configuration of city blocks and right of ways is instrumental in creating the geographic make-up of Pedestria's downtown. Equally important in creating the fabric of downtown are zoning laws/restrictions that apply to the development and use of these properties. Pedestria has relatively few and simple zoning classifications. It also has development restrictions that are either linked directly to zoning laws or are separate legal entities.

## DIFFERENT TYPES OF URBAN AMENITIES



**Park bench - a welcome place for weary legs.**



**Built in chess board - Simple amenities can build a lasting sense of community.**



**Clustered postal boxes - efficient for the postal service, and a great place to meet your neighbors.**



**Wheelchair ramp - providing access to those who need it.**



**Covered sidewalks - much appreciated in wet, snowy or hot, sunny weather.**



**Multiple amenities - street name sign, trash receptacle, drinking fountain, flower pot, sculpture, newspaper stand, and information or advertising kiosk.**



**Multiple amenities - ornamental street lighting, newspaper stands, information kiosk, drinking fountain, ticket machine, and trash receptacle.**



**Public restroom - much appreciated.**



Zoning and land use restrictions discussed here are not intended to be absolute, exhaustive, or complete. They are general guidelines and recommendations for Pedestria's land use. It is not the intent of this book to list and explain every detail of each zoning classification. Broad categories with some detailed discussions are the emphasis. Details and specifics of zoning and land use restrictions would have to be clearly established during actual designing and planning of a real autoless city.

Pedestria has a number of broad zoning classifications: single-family residential, multi-family residential, commercial, industrial, parks, transportation, public works, miscellaneous, and special overlay zones. Within each of these classifications there may be sub-categories, mostly related to lot sizes. For example, the single family residential zone may have several different lot-sized distinctions, such as R3, R5, R7, etc. This is common practice in existing cities today.

Multiple use development is strongly encouraged or required throughout much of Pedestria. Many parcels of land in this city have several zones that apply simultaneously. To promote diversification large expanses of uniformly zoned property are discouraged in Pedestria. The preference is for a single zoned area to be rather small and adjacent to a variety of other zones. The main exception to this is the city's industrial section where there are significant areas of uniform industrial and warehouse zoning.

Special overlay zones are not unique to autoless cities. The following is a list with short explanations of some special overlay zones.

- **Street side commercial zone** - This zone requires buildings to provide street side retail and commercial shops. This zone is very prevalent in the residential community commercial districts and along many of the major thoroughfares and pedestrian streets in the central core.

- **Buffer zone** - This zone is transitional between non-compatible land uses. Typically it is located between noisy/polluting industries or sports arenas, and quiet and sensitive land uses, such as residential and medical.

- **Manufactured housing zone** - This zone permits manufactured and semi-mobile housing.

- **Sign board control zone** - This zone is an exterior advertising management zone.

- **Historical zone** - This zone is an architectural preservation zone. However, because of Pedestria's recent development there may initially be no need for preservation. Certainly this will change as the city ages.

- **Miscellaneous incentive zones** - These are zones in which builders/developers are encouraged to include special amenities or attributes for which they may be awarded bonuses. For example, bonuses might be given to builders who conform to an architectural style designated within a district or to builders who provide greater public amenities than are required. Bonuses may

include such things as deferred taxes or relaxed height restrictions.

There are also a variety of other restrictions and regulations pertaining to land use. The following is a list with short explanations of some of these directives.

- **Multi-use requirements** - These require multiple land uses within a number of specific zoning classifications. Multi-use requirements specify that more than one land use may apply to a given property. The most common locations for this requisite are in the high density areas of the central core and certain parcels in the residential commercial districts. The most common land uses utilized to fulfill this requirement are street side commercial, residential, and office. Anywhere from 2-4 different land uses may be a requirement. An example of property that fulfills this requirement is a high rise building with commercial and retail shops at ground level (and possibly on the second floor), office space above this for a number of stories, and residential floors and penthouses on the upper levels. Thus, one piece of property contains three distinct land uses and is multi-use. This is not an uncommon type of building arrangement in today's existing cities, but it is often done at building owners' discretion. In Pedestria this diversity is a requirement in many locations. The majority of central core property and much residential community commercial property are affected by this requirement. Most residential zones and industrial zones are exempt from the multi-use requirement.

Much of the emphasis on multiple land use is to help increase activities (i.e., business, leisure, and employment) and promote interactions between people. Multiple land use requirements create heterogeneous urban areas where a wide spectrum of consumer goods, services, and opportunities exist in close proximity. This creates an efficient, convenient, and economically robust place. In other words, the multi-use requirement creates dynamic places of action all day and throughout much of the night, the epitome of a vibrant city.

- **Minimum building height/square footage requirements** - These building requirements specify that every property be built up to a minimum number of stories with a minimum amount of square footage to assure that properties are not under utilized. It also assures that high density is located where it is most appropriate. For minimum numbers, see sides 1 and 2 of the supplementary map. The numbers within each building represent the minimum building height requirement for that block or for that building. For instance, a 300 ft. x 300 ft. city block with a minimum height requirement of 20 stories requires the building to be at least 20 stories high and each story at least 90,000 sq.ft. (300 ft. x 300 ft.). Minimum square footage for this block is 1,800,000 sq.ft. (20 stories x 90,000 sq.ft.) Note: Buildings come in many shapes and sizes. See the next two definitions for further details.

- **Maximum building height restrictions** - This building restriction specifies that a building shall not

exceed a maximum number of stories, to assure that properties do not over-shadow their neighbors by a gross amount. It also helps assure high density is not located where it is inappropriate, such as near parks. Together, the minimum and maximum building height requirements/restrictions create Pedestria's peaks and valleys of density. **The result is the majority of people and activity are situated nearest the transit system. As a rule, the most people have the least distance to travel.** Conversely, on the perimeter of the central core and on the perimeter of the residential communities, where densities are lowest, the least number of people have the most distance to travel. Maximum height numbers are not listed on any of the maps or drawings. Rather, they are a mathematical factor (1.5) of the minimum height requirement. Thus, if a particular building or city block has a minimum height requirement of 20 stories, the maximum building height is 30 stories (20 x 1.5). Note: Antennae, communications hardware, and other appurtenances can be permitted to exceed this restriction.

- **Minimum and maximum building height/square footage** - Because buildings have many different shapes, sizes, and architectural styles, these minimum and maximum numbers act as guidelines for shaping development. See "Central Core Cross Section (A-A)" on side 1 of the supplemental map for a graphic representation of this concept. The buildings on the right side of the cross section are drawn exactly to the minimum building height/square footage requirements. The buildings on the left side are drawn more realistically, with variation in shape and size, but they still meet the minimum and maximum requirements.

- **Building setback requirements** - These apply to residential zones in residential communities and to some specific miscellaneous zones throughout the city. In all other cases building setbacks are zero (directly at the property line). In many residential zones set backs are optional and subject to review. In the central core and residential community commercial districts, setbacks are almost always zero. There are exceptions in industrial zones, some miscellaneous zones, and for some architectural variances. This predominance of zero setbacks promotes complete utilization of urban land and heightens density and compaction of the city.

- **Site/design review** - A review process is required for every proposed development within the city. This includes a review of site utilization and relationship to adjacent properties. Also, there is a review of building design, both structurally and functionally, and a regulations compliance review done by all the appropriate government agencies. Included in these reviews may be negotiated development settlements or compromises, linkage between different government regulations, and even forms of agency intervention to assist regulation compliance.

- **Building codes** - All construction within the city boundary is subject to standardized building codes.

Adherence to these codes and specifications ensure safe, functional, efficient, long lasting, quality construction of all kinds.

- **Easements** - There are a variety of easements possible on private and public property. These may include utility easements (power, water, sewer, etc.), slope easements, and access easements. Free access easements may exist in public right of ways. These require a certain percentage of a right of way to be unobstructed for the free movement of pedestrians and are especially important in major pedestrian corridors. Sidewalk cafes and sidewalk appurtenances (poles, signs, news stands, kiosks, etc.) are subject to the free access easement rules.

- **Internal utility easements** - Some utility easements are internal to city blocks or buildings, such as store fronts or buildings that are adjacent to utility free right of ways. In these cases utility access must come through the building from the right of way on the other side of the block.

- **Utility free zones** - As discussed on page 127, these are right of ways where major underground utilities are prohibited. Some small local utility lines to points of usage are allowed. This restriction reduces future construction disruptions in high volume right of ways. Common locations for this designation are transit and freightway loops and major pedestrian thoroughfares.

- **Noise and noxious impact restrictions** - These restrictions regulate and sometimes prohibit land use activities that produce noise and noxious substances on a regular or semi-regular basis. These restrictions may limit activities to certain times and/or require certain abatements to be put into practice. Proper disposal or recycling of noxious substances may also be required.

- **Parking and loading dock/zone requirements** - Most land use zoning classifications require a small amount of parking and/or loading dock facilities. These usually consist of space for one to several vehicles, assuring adequate parking space for service or delivery vehicles which frequent building establishments. The amount of parking and loading dock space required is determined by the nature of the business; some will require more than others. Residential land uses, other than for apartment buildings, are actually not allowed to have parking. They include single family dwellings, duplexes, and rowhouses. In these cases service and delivery vehicles can park in the public right of way when doing business there.

- **Employment restrictions** - Employment restrictions may be enacted upon the entire city to help maintain a stable population. The city charter gives the government power to create and enforce these restrictions. As part of Pedestria's limited growth policy, these restrictions establish a ceiling for how many employees can work at a particular geographic location. Employment restrictions are a last resort for curbing population increases; they are a drastic means of maintaining population targets and could impose hardship on some businesses. It is hoped that other less

harsh means are sufficient in keeping a stable population range. See chapter 5 for more details.

- **Land development phasing restrictions** - The development of Pedestria is metered out in phases. The entire city is not built simultaneously, but rather sections of town are developed to near completion before other sections are allowed to begin development. Land development phasing also permits buildings to be initially constructed less than their final height, using early development minimum height allowances. This is permitted as long as structural provisions for additional future stories are incorporated into the initial construction; engineer approved plans for future additions are required as part of this regulation process. For example, property that has a final minimum height requirement of 25 stories may initially be built to only 10 stories as long as the structure is adequately built to accommodate another 15 stories in the future. This type of phasing reduces the initial cost of financing buildings and saves growth and expansion potential for a future time. This makes Pedestria more attractive to skeptical building developers who may want to minimize their initial investment exposure.

Early development substandard building codes are another means by which the city's development can be phased. In essence, the temporary relaxation of building codes allows individuals to live in substandard dwellings or temporary housing on their property while they construct their permanent building. This makes an owner built home or business more affordable. Time limits are enforced, and ultimately the permanent building must meet all city building code requirements.

Limiting initial development to certain areas (parts of downtown and specific residential communities only) also helps meter out expenditures and construction of public infrastructures by public agencies. This reduces the government's need to tax so heavily in the city's early developing years.

In addition to zoning classifications and regulations on land development, there are also some noteworthy special districts within the city. (These districts are also commonly found in auto oriented cities.) The following is a list with short explanations of some possible districts within Pedestria.

- **Geographic neighborhoods and associations** - Residential communities and specific neighborhoods within the central core have neighborhood associations that act as advocates for their respective neighborhood interests.

- **Special taxation districts** - These are separate areas within the city that are taxed differently because of voter approved tax funded programs (i.e., tax levies).

- **Political districts** - Some geographic areas may have independent bureaucratic representation.

- **Architectural and culture districts** - Some geographic areas may have special status because of their unique building and ethnic character.



**Historical mural painted on a building - architectural variation and beautification of city buildings and urban spaces.**

- **Other miscellaneous districts** - There are a variety of utility districts that are possible in Pedestria, including power, phone, water, street lighting, drainage, etc.

## **CENTRAL CORE AND RESIDENTIAL COMMUNITY VARIATIONS**

The complexity of urban design, exhibited by the drawings and maps of Pedestria, represents only a fraction of the variation that is possible. The initial design, arrangement, and construction of the city by planners, architects, engineers, and private builders will, by nature, create variation throughout the city. However, it is the citizens who will vastly increase the city's uniqueness and culture. It is the small individual personal touches that will collectively contribute to the unique character of Pedestria.

Variation will manifest itself in many forms. Topographic and natural features will have their effects. Ethnic and cultural flavor will be present. Street variations, architectural styles, and zoning differences will add to the *mélange*. Variations between standards of living and socioeconomic levels will also lend themselves to creating urban contrast.

Homogeneity can be its own uniqueness if applied to different communities or a central core district. Zoned architectural motifs could create whole neighborhoods that architecturally have a singular cultural look (i.e., Chinatown, Bavarian Village, Little Italy, etc.) Whether such civic engineering could create an authentic cultural base is questionable, but it does illustrate the types of possibilities that can be pondered.

There are other central core designs that are possible but are not illustrated by the Pedestria example. These variations can be very fundamental. For example, another autoless city could have a downtown designed in a linear pattern, a star shape, or even with complete enclosure between all buildings (covered streets).

Another possibility is a series of public right of ways at, say, the ten story level via skybridges, a network of "high streets" interconnecting the taller buildings around the central core transit terminals. They would be open to the public at all hours, accessed by public elevators, and could include internal building hallways. These streets could greatly increase the amount of high volume "walk by" commercial/retail space. They could be built and



Building over a public right-of-way - an efficient use of space.

maintained by building owners and/or the city. If successful they would be a great civic distinction. This high street example is typical of the innovation that is possible in a new autoless city.

There is even the possibility (or opportunity) in a residential community for a section of or even an entire community to be permanently designated for the homeless. This "camptown" could be designed into the comprehensive plan from the city's onset, thus avoiding confrontations with disgruntled neighbors if such a community were created at a later date. Such a place could be instrumental in eliminating vagrancy in other parts of the city. The camptown would have its own transit stop and commercial district. It would be a place for free camping, and would contain important amenities

and services for those living there, such as rentable storage units, large public restrooms with showers, covered public cooking areas, and covered areas or shelters with wood stoves for winter heat. Such a



Shanty town - an example of informal housing for the homeless.

community could assist with its own policing. Charitable organizations that provide help and services to the homeless could concentrate their efforts in such a location.

Creation of a brand new city built from scratch opens the door for incorporation of some new ideas (other than those shown in Pedestria). There will be a desire by the creators of a new autoless city to try unique urban design concepts and experiment with some legal governance variations. This will provide an opportunity to try new ideas that are difficult or impossible in existing cities.

Urban development in Pedestria is intended to be a high density compact clustering of many entities. This development is designed in concert with an efficient transit system. **It is hoped that Pedestria will be a quality city with vibrancy, efficiency, and opportunity. It is hoped it will provide lasting qualities of life for its citizens for generations to come.**

# CHAPTER 5

## A FINITE AND REPRODUCTIVE CITY

This chapter gives a brief discussion of limiting urban growth in an autoless city. It is not intended to examine the limiting of urban growth in its entirety. The mechanisms outlined attempt to illustrate the concept of a finite city as both desirable and possible. It is hoped that this chapter will promote thought in regard to this topic.

Finite growth is not essential to an autoless city, but its inclusion is important and highly recommended. Cities can and have grown indefinitely. The practice of limiting urban growth is relatively new and is certainly an idea and mechanism that has not fully matured or been widely embraced. Most attempts aim at slowing growth or managing it rather than fully limiting it. In a well planned autoless city unlimited growth would certainly result in future overtaxing of infrastructures. This would result in inefficiencies and waste, financial repercussions, and hardships for citizens. Finite growth would help maintain the economic stability and quality of life for citizens of autoless cities.

### WHAT IS A FINITE CITY?

A finite city is limited in definable ways - by preconceived determinable means that are conscientiously employed. It is, by design, intentionally limited in an orderly fashion. Pedestria is designed from its conception to be a finite city, limited in both its physical size (area) and total population. It is designed to grow and expand to predetermined limits in order to permanently maintain efficient levels of service, infrastructure, and overall quality.

Pedestria's finite nature is initiated by its city charter, which is granted by the state legislature. Among other things, it grants the city the ability and power to regulate its growth, finite nature, and reproduction. It gives Pedestria the legal right to mandate policies, procure financial resources, and elect or appoint officials to control its growth, finite nature, and reproductive destiny.

When discussing a city's growth and the limitation of that growth, it is important to define terminology. Throughout this book, the words "growth" and "limiting growth" refer to urban development and urban expansion. In this context, "growth" pertains to population (increasing numbers of people in the city) and buildable space (outward and upward expansion of the city). More specific examples of this type of growth are all types of buildings and infrastructure (homes, shopping centers, office buildings, factories, roads, parking lots, etc.). These are sometimes collectively referred to as "urban

sprawl" or, less negatively, as "urban growth" or "urban development".

Other types of growth that are not implied are personal growth (physical, intellectual, career, etc.), societal advancements (both technologically and socially), and some aspects of economic growth (profit, productivity, etc.). The limiting of Pedestria's growth refers to the limiting of its population and outward expansion, not the stopping of Pedestria's technological advancement, social progress, personal development of citizens, or the ability of businesses to increase productivity and profits.

A finite city is not a static, unchanging city. Social, political, economic, and technological advances will continue, but because of its limited population and physical size, the basic function and configuration of the city will remain fairly constant. Land use and infrastructures, such as the transportation system, will remain very stable and adequate over long periods of time, especially if they are designed and sized properly in the first place. Limiting growth will have adverse effects



**Distinctive boundaries between urban and rural land.**

on certain types of businesses. For example, those associated with real estate development and construction will face extremes of boom and bust, especially during the city's growth phase and subsequent growth limitations.

Control and abatement of urban growth have recently become topical subjects. Attempts are being made throughout the United States and around the world to regulate and/or contain growth. These attempts range from very specific restrictions on targeted forms of growth to general policies seeking to limit and slow the over all quantity of new development. Urban growth boundaries have been established in places such as the

Portland, Oregon and San Francisco, California metropolitan areas. They have been met with some success.

Existing cities have long histories of continual growth. The intensity of growth may fluctuate over time, but the continuum remains constant. Steering existing cities from growth orientation to a more limited or finite orientation is a formidable task, mainly because there are numerous special interests and agendas of individuals, businesses, and government agencies. These interests are well entrenched in the community, and many are geared to the perpetuation of growth.



Urban development to the horizon, with few breaks and a rather uniform density.

Strong and rapid growth create a powerful economic elixir that is self serving and builds upon itself. Attempts to corral growth are often deemed as anti-progress and are often met with resistance by such factions as developers, contractors, realtors, and other business interests. Growth itself is not bad; expected and accommodated growth is good. However, when it is unplanned, unanticipated, unaccommodated, and continuous, growth wreaks havoc upon the basic framework of our cities.

### **WHAT ARE THE CONSEQUENCES OF UNLIMITED URBAN GROWTH?**

One of the consequences of unlimited urban growth is urban sprawl. As discussed in Chapter 1, urban sprawl is the spread of automobilia and low density urban functions across the land, resulting in the destruction of vast amounts of rural land. It also contributes to increases in natural resource consumption and various types of pollution. Urban sprawl contributes to transportation inefficiencies, detrimental environmental consequences, and high costs for both private and public

sectors. It also encourages an evolutionary progression of urban land uses, often resulting in the premature replacement of existing land uses, which is inefficient and wasteful.

Urban sprawl is a result of many factors, including increased personal mobility, government loan policies, and home buyer attitude changes. It is also a result of the lack of any growth management strategies. A laissez-faire approach to ultimate land use goals leaves the door wide open for continued and unabated urban development.

Unanticipated and unplanned growth in an established city is like a cancer.

Infrastructures built and sized years ago will gradually become overloaded and overwhelmed by unabated growth and/or increased densities. This is analogous to the overloading of a bridge. A bridge has a capacity at which it functions properly (be it weight or volume of traffic) that is determined by the design of the structure. When that capacity is exceeded the bridge either fails structurally or is incapable of handling the traffic. It must then be modified to increase its load and traffic capacities. Repeatedly modifying or adding to it becomes detrimental or is no longer cost effective. Eventually, building a brand new bridge to supplement or replace the first one becomes increasingly warranted. Unlike bridges, most modern cities have no predetermined maximum capacity.

There are no human or natural laws of urbanization that explicitly determine the capacity and limits of cities. They can grow indefinitely as long as developable land is available, building heights can increase, and government continues to accommodate such growth with expanded infrastructure.



Ever increasing traffic exceeds the capacity of the old bridge, necessitating the construction of an additional bridge.

In auto-oriented cities the most common perception of overcrowding is frequent and frustrating traffic congestion. The second bellwether is usually jam-packed schools. Overcrowding of most urban infrastructures (roads, highways, utilities, etc.) is a direct result of continuous uncontrolled growth.

Citizens and city governments are customarily geared toward solving growth related problems by attempting to accommodate growth. This is in lieu of curtailing growth and beginning fresh with the creation of a new city. The emphasis is to continually develop and redevelop their way out of the problem. Building, adding capacity, expanding, infilling, and increasing density are some of the efforts made to accommodate or force new growth to fit into an existing urban framework. With each new development, from a single building to a large urban renewal project, there are growing pains and repercussions beyond the actual development itself, both geographically and into the future. So, as unreasonable as it is to infinitely add to a structure (like a bridge, to



**Major downtown boulevard - crowded with vehicles.**

increase its capacity), it is equally unreasonable to infinitely add to a city to accommodate more people, more jobs, and more expansion.

Although the concept of a finite city is not new<sup>1</sup>, the reality of one is currently unprecedented. In most (if not all) US cities, the concept of a final ultimate city size (an ultimate buildout) has rarely been contemplated or considered. Even in urban areas where growth boundaries and restrictions have been established, they are often full of exceptions and provisions for further expansion.

Pedestria's situation is different than existing cities in that a brand new city can incorporate a finite growth policy from its inception. Completion of its initial design, passage of its city charter, and activation of its growth policies establish the city's finite boundary and nature. It is a much easier pill to swallow for individuals, businesses, and government agencies when a limited growth policy is established and operational prior to the city's construction. Because it is a pre-existing

condition, it is not a surprise to anyone and isn't implemented without people's prior knowledge.

Pedestria's autoless design makes a limited growth policy all the more important. The city's transportation system is specifically designed to serve a predetermined population, derived from population density restrictions on developable lands around the transportation system. Any exorbitant amount of population growth beyond these numbers would guarantee the over burdening of the transit system. Likewise, any excessive amount of development beyond the external boundary of the city would have a similar effect. Other city services, including utilities, schools, and recreation facilities, etc., would also become overwhelmed.

In conventional infinite cities, the capacities of urban infrastructures of all kinds are constantly being over burdened by the influx of new growth. Roadways, utilities, structures, etc., are continually added on to or rebuilt to accommodate new development. This constant rebuilding causes disruptions and adds to the long term costs of providing these infrastructures. Without an ultimate size or an ultimate population density for a given urban area, there is no guarantee that the existing infrastructures will continue to be adequate in the future.

Even in situations where there is large scale planned development of a comprehensive nature, if there are no safeguards for limiting further growth, then continued growth and expansion can quickly produce major inadequacies. The resulting infrastructure overloading requires continuous expensive capacity upgrades. Without a functioning growth management policy, most planned unit developments, satellite new towns, and other



**Narrow street - packed with people.**

types of major large scale development are eventually subject to and sometimes overwhelmed by growth pressures. Separate and individually conceived developments result in haphazard and poorly organized urban patterns. Comprehensive and holistic planning prior to the development of a large scale project (like Pedestria), combined with a strong limited growth policy, will greatly reduce these problems.

With government and banking institutions' encouragement, property values and outward migration continue to advance beyond the perimeter of the city. Continuous and unrestrained growth on the fringes, where properties are often ripe for development, also results in local economic and social upheavals.

Historically in the US, over much of the last 50 years, the growth of suburbs contributed adversely to many inner cities. The migration of people and money into the suburbs left older established neighborhoods wanting for upwardly mobile people and financial investment. Neglect and crime often followed closely behind, and property values became depressed. These older parts of town then suffered further degradation from dissection caused by cross town transportation improvements (freeways) which were often placed in neighborhoods of least political resistance. The placement of freeways and the lack of freeway access in these older and lower socioeconomic neighborhoods caused even further decline. Unrestricted growth can therefore be a double edged sword. It can inflate property values through speculation and mass migration, and it can also depress property values through abandonment and dissection. These economic and physical upheavals of a city's basic fabric can have direct effects on the social well being of affected neighborhoods and their citizens.

### **PEDESTRIA'S GROWTH RELATED POLICIES**

Pedestria's finite nature is initiated by its city charter. This charter gives Pedestria the legal means of existence and establishes certain essential functions. Pedestria's charter includes the goal and objective of being finite and reproductive, and also grants the city the legal means to create mandates and policies that can fulfill these objectives. Pedestria has a comprehensive plan and three city policies that control its finite nature. (See diagram "Population of Pedestria" [hypothetical] on page 138 for additional details.) The policies are: the Active Growth Policy, the Limited Growth Policy, and the Reproductive Policy. These policies, along with the Comprehensive Plan, are legal strategies that fulfill the City Charter's growth, development, and finite requirements. They are city wide policies that are collectively carried out by all bureaus of city government. In concert, these three policies and the Comprehensive Plan allow Pedestria to grow, to stop growing, to reproduce, and in essence, to be finite.

The City Charter recognizes the city's initial Comprehensive Plan (or Master Plan) as the document that establishes the city's developmental foundation. It is created by the primary developer during the initial planning stage. The Comprehensive Plan (CP) is the blueprint for Pedestria that graphically and verbally explains the geographic layout of the city. It exhibits the overall design, ultimate land area, and population distribution. It is a detailed map depicting preplanned geographic information. The map is in the form of a computer based, survey accurate geographic information system (GIS). Included with the geographic details is written text explaining non-geographic information. The CP is the design goal that growth related policies strive for. By decree of the CP, Pedestria's finite size is 37.61 sq. miles, and its population is approximately 500,000 people.

During initial construction the prime developer tries to adhere to the CP. Once the city is administered by its own municipal government, it too will try to adhere to the design set forth. The CP is responsible for guiding the geographic layout of the city, but it is not completely rigid; layout adjustments can be made based on accrued knowledge as the city grows. The city government and citizens will have a mechanism available for giving input, and possibly even amending the CP, during the construction (active growth phase) of the city.

### **ACTIVE GROWTH POLICY**

Historically, a major problem facing new towns and cities has been weak early stage growth. Investment capital has usually been slow in coming to new, speculative, or unproven developments. Some new towns have even languished in the early developmental stages. In an attempt to prevent this problem, Pedestria's government takes an active role in bolstering development.

In Pedestria's infancy the emphasis is on relatively rapid growth. This growth effort (influenced by the Active Growth Policy) consists of advocating, promoting, and even subsidizing growth. It includes a strong emphasis on promoting the city's virtues to outside interests in order to attract development and spark the interest of people and enterprises to relocate there. The Active Growth Policy (AGP) has a primary function of starting and maintaining strong growth processes.

The AGP promotes and directs Pedestria's development with a variety of programs. These programs include promotional and advertising campaigns, plus land sale, land lease, and even land give away programs; they also include assistance programs for residences, small businesses, corporations, and institutions. In addition, the AGP manages Pedestria's growth by way of several directives, including the Growth Quantities Directive and the Growth Merit Directive. Both recognize the



Comprehensive Plan and attempt to steer the city toward adherence to its guidelines.

The Growth Quantities Directive (GQD) helps manage growth with specific numerical targets. These targets include overall population totals and densities for the entire city, individual residential communities, and districts within the central core. For example, the GQD targets Garden Village's population at 3,556. This is an average density of 50 people per acre. The GQD also has target densities for non-residential buildings (office, industrial, etc.), and employment densities for individual communities and the central core. These targets help guide the city's growth to meet the components of the Comprehensive Plan.

The Growth Merit Directive (GMD) helps select and manage growth with specific guidelines and goals. It attempts to create a non-polluting, balanced, and dependable economic base. For example, it attempts to screen potentially harmful and polluting industries, as well as businesses with erratic employment pools. Before a building permit or business license is issued, a review of a business's nature and activities is undertaken. As part of the GMD, the city's permitting office also gets input and recommendations from citizen groups. These groups, like the neighborhood associations, give input on how best to develop their communities and guide desired businesses into their most compatible locations. Citizen input is welcomed and advocated for enhancing the livability of communities.

The GQD and GMD allow considerable latitude and flexibility. They are subject to interpretation and are not absolute. These directives provide guidance for city bureaus that authorize the development of the city through a permit and licensing system (i.e., building permits, business licenses, etc.). The directives themselves don't contain the power to enforce their criteria and numeric targets; rather they rely on the enforcement powers inherent within the various city bureaus. City offices such as the planning bureau and the building permit department are obligated to adhere (as closely as possible) to these guidelines. These directives are integral contributors to the city's land use and zoning regulations. They help the city achieve the urban configuration set forth by the Comprehensive Plan.

#### LIMITED GROWTH POLICY

The Limited Growth Policy (LGP) is the city's primary legal and planning strategy for finite growth, the backbone of Pedestria's finite nature. The LGP actually initiates the phasing out of the AGP by discontinuing its incentives and subsidies. Some aspects of the LGP are, in effect, concurrent with the AGP. Other aspects, such as confining and controlling urban development and population increases, are phased in after the city's initial growth spurt. It is also instrumental in controlling ebbs

and flows of future growth after the city has reached its ultimate capacity.

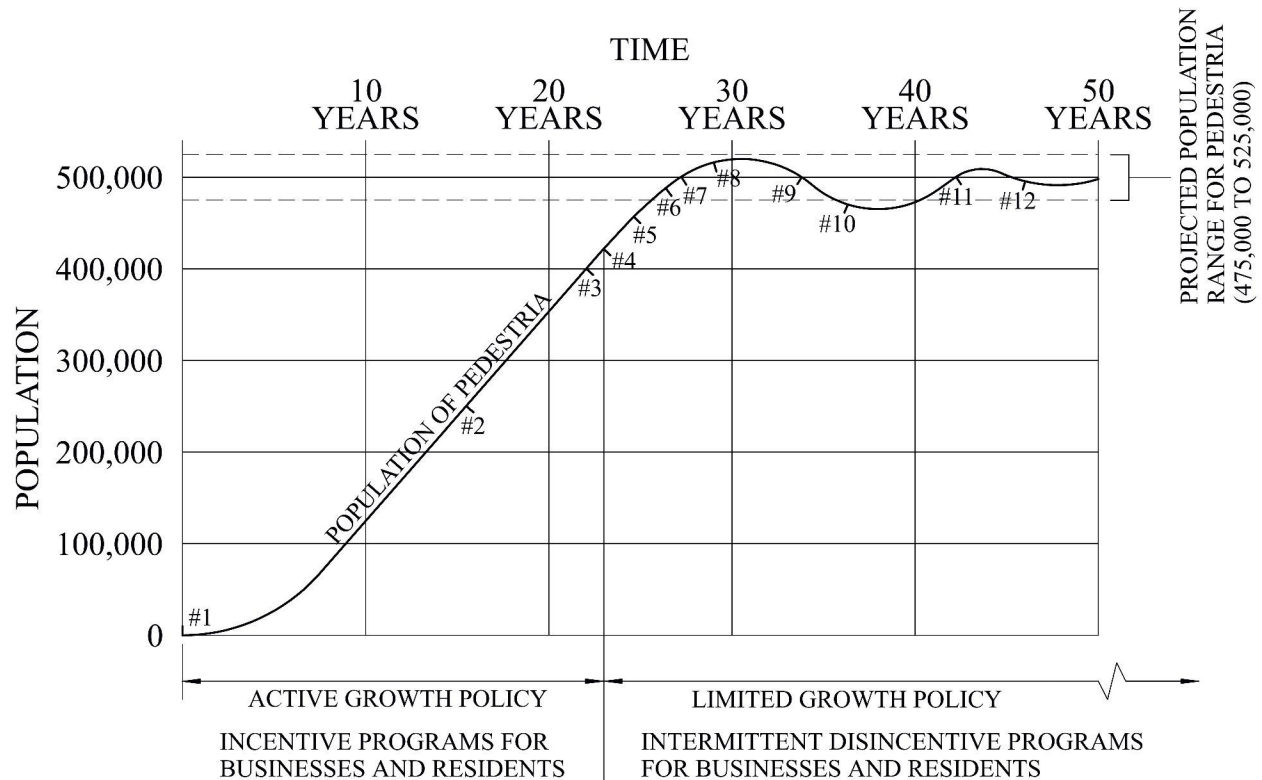
The LGP operates on two basic fundamentals: that Pedestria is a finite city in both its physical size (area) and in its total population. The LGP attempts to limit both by discouraging growth and development via a number of mechanisms or disincentives. These mechanisms can be activated as well as deactivated. Their utilization is done in a sequential manner or on an "as needed" basis. Activation of disincentives is meant to discourage growth, not encourage urban decline or economic hardship. Growth discouraging mechanisms curtail or drastically slow future growth, but don't do away with existing businesses. They actually help existing businesses by putting restrictions on incoming businesses. They discourage the establishment of new businesses or the expansion of businesses that will add additional growth pressures on an already full city. Utilization of these mechanisms corresponds with any continuing demands for development and with fluctuating population pressures. When growth pressures subside they are deactivated.

Possible mechanisms and disincentives of the LGP include stringent urban boundaries - both internally (the boundaries of the residential communities and the central core) and externally (the overall perimeter boundary of Pedestria). They also include the limitation of buildable land, restrictions on buildable land (i.e., zoning, min./max. height restrictions), restrictions on new construction, restrictions on new incoming businesses, and initiation of certain types of taxation. Some disincentive mechanisms for diminishing population growth are: strict job and employment control; office space square footage restrictions; residential unit density restrictions; infrastructure carrying capacity limitations; and possibly non-discriminatory restrictions on or taxation of incoming inhabitants. Infrastructure limitation mechanisms can be based upon sewage system capacities, transportation facility capacities, water works capacities, or by other quantitative means. Limitation mechanisms may also include non-discriminatory quotas on such things as building permits, business licenses, number of employees, number of resident and non-resident work permits, and the issuing of Pedestria resident permits.

The rising cost of doing business directly effects economic growth, which translates into diminished population and building growth. Through the manipulation of taxes, fees, and city influenced interest rates (such as some bond rates), the city can influence growth factors. Numerous mechanisms are available to the city, yet it may only be necessary to use a few to acquire the desired results.

The LGP mandates that the city's boundary (which is established during the initial planning stage via the Comprehensive Plan) is absolutely unalterable, except under the most stringent of circumstances, thus

# POPULATION OF PEDESTRIA (HYPOTHETICAL)



#1 Pedestria begins by incorporation. The Comprehensive Plan is created and is guiding development. The Active Growth Policy is initiated; this includes incentive programs for businesses and residents. Pedestria's population rises slowly at first, but gradually increases.

#2 The city's reproductive bureau (the New City Bureau) is created when the city reaches a preset population number (approx. 250,000). Efforts begin to create another autoless city.

#3 A "primary population growth evaluation" is conducted when the city reaches 400,000. Tracking of population growth is occasionally conducted prior to this study.

#4 The Limited Growth Policy is phased in as the Active Growth Policy is phased out. This includes disincentive programs for businesses and residents to curb population growth. Timing of disincentives is determined by results of the "primary population growth evaluation" and other forms of monitoring.

#5, #6 & #8 Various disincentives are activated by the city to curb population growth.

#7 Pedestria's New City Bureau is successful in starting a new autoless city at another location. People and businesses seeking to relocate to Pedestria are encouraged or directed to locate in this brand new city, rather than into Pedestria at its capacity. It is hoped that the creation of this new city is timed to coincide with Limited Growth Policy disincentives.

#9 & #10 Disincentives may be deactivated due to their success and/or due to the newly created city's ability to absorb Pedestria's excess growth.

#11 & #12 Long term activation and deactivation of incentives and disincentives are periodically used to maintain population within the desired range.

establishing the finite physical boundary of the city. It is an actual surveyable line that defines Pedestria's primary jurisdiction, and is the outward limit of its development. The LGP maintains the city's external boundary along with other internal boundary lines. These internal boundary lines are primarily dividing lines between different zoned land uses, and between private and public land. Internal boundary lines worth noting are Perimeter and Central Park boundaries, right of way lines, and boundaries surrounding residential communities. Like the city boundary, these lines have very stringent requirements by which they may be altered, such as during emergency declarations or if there is overwhelming growth pressure that cannot be satisfied in any other way.

The best assurance for reaching targeted population and employment numbers for the entire city and individual communities is by monitoring the city's growth. Responsiveness to the results is important, as is flexibility in correcting deviations from the Comprehensive Plan. The city's actual population and employment can be fine tuned as the city grows. Numbers can be more aggressively adjusted near the end of the active growth phase. Last minute changes to zoning densities for some, or all, remaining undeveloped properties can bring population and employment targets within reach.

Besides limiting the amount of buildable land, the LGP sets a limit on the total population of the city. This population limit is a population range rather than a specific number. Thus, the population is allowed to fluctuate within this set range, but around a target population. Pedestria's overall target population is 500,000 people, with a fluctuation range between 475,000 and 525,000. This is a variation of +/- 25,000 people, or a total fluctuation range of 50,000 people (approximately 10%). Having a range in which the population can fluctuate is more realistic than having an exact number to try to adhere to.

Limiting Pedestria's population is a more formidable task than limiting its physical size. Setting a city boundary and not allowing development beyond that line is relatively simple compared to limiting the number of people living in a city.

The Limited Growth Policy does not impose restrictions on human reproduction or limit numbers of children in any way. However, the awareness of population numbers and the finite nature of the city may have an affect on how many children people actually want or have.

The LGP mandates that different mechanisms or disincentives be activated at various periods in the city's development. The primary growth limiting mechanism for both the city's size and its overall population is the strict limitation on buildable land, accomplished by a rigid city boundary and controls on building densities and land use. Thus, when the planning stage is complete and the construction phase begins, the amount and location of

developable land are quite restricted. The responsibility for staying within the city boundary and complying with the active and limited growth policies are carried out initially by the primary developer's planning staff and later by permanent city staff. However, limiting the amount of buildable land and limiting the number and size of buildings (building density) does not guarantee that the population will stabilize. People and businesses can crowd ever tighter into the city's limited area. Therefore, there are other legal means by which Pedestria must be able to limit or discourage an infinite population rise.

Disincentive programs and mechanisms for slowing and curtailing population growth can be grouped into several broad categories. These include: slowing or stopping the migration of people into the city; slowing or stopping the creation of additional jobs in the city; and using taxation as a disincentive. Within each of these means there can be specific strategies employed that are effective in slowing the city's population growth. If it is deemed necessary, any or all of these strategies can be used to maintain Pedestria's finite nature. These growth limiting mechanisms are only activated by the LGP near the end of Pedestria's active growth stage, and then only as needed. They only pertain to population numbers and commercial endeavors, rather than the actual limitation of the city's physical size.

When the city reaches a predetermined population size of 400,000 a study is undertaken by mandate of the LGP, called the "primary population growth evaluation". It determines how quickly the city is growing and how soon it will be within the desired target population range. It monitors city growth by sensing and studying various capacity indicators. Census data and tax records are primary sources of information. Evaluation of this information is critical to both the Limited Growth Policy and the Reproductive Policy. From the results, a determination is made about which growth limiting mechanisms will be used to attain the goals of the policy, in what sequence they will be activated, and how quickly they will need to be employed. Activation of disincentive programs and certain levels of activation of the Reproductive Policy are dependent upon the results of this study.

Disincentive mechanisms are activated either singularly or in groups. Their number and duration are totally dependent upon their success in slowing and stopping Pedestria's growth. The severity of disincentives will be graduated, with more mild ones applied first. Additional disincentives will be activated as the population climbs toward 525,000 and deactivated as the population drops back toward 475,000. Growth incentives may be reinstated if population and the job base decline too dramatically. This exercising of disincentives and incentives enables Pedestria to control and maintain its population/growth within its targeted range. This is essential for a finite city. Yet, the city government must be cognizant not to cause violent

oscillations in the economy and population. Moderation in using incentives and disincentives should always be the rule.

The economic well being of the city is a prime consideration in implementing the mechanisms of the LGP. These mechanisms try not to penalize existing residences or businesses. However, some adverse effects can result from the LGP's disincentives, such as property speculation, higher inflation rates, excessive government interference, and some limitations of personal and business freedoms.

The LGP mandates that on-going monitoring of growth related aspects and various disincentive programs be carried out by the city government. Judgments on the nature of Pedestria's growth and the effectiveness of the disincentive programs will necessitate frequent and accurate information. Besides the "primary population growth evaluation", which is a major one time endeavor, the city does on-going monitoring of various capacity and growth indicators. This includes data obtained by a variety of sources including U.S. census, city sponsored census, studies of business and employment records, and surveys of pertinent federal, state, and city records.

Pedestria's growth limitation strategies extend beyond its city boundary, because unanticipated development on land adjacent to the city would have adverse effects on the city itself. This type of growth would have the same adverse effects as uncontrolled and continuous growth within the city. Therefore, it is in the city's best interest to prevent urban development outside of its perimeter. The city boundary acts as a barrier to Pedestria's growth, but does not directly prevent independent development on adjacent properties.

There are a number of techniques that can be employed to prevent urbanization of surrounding properties. These techniques are best employed during the property acquisition stage and the initial planning stages of the city. Limiting growth outside of Pedestria may include the use of the following techniques: agricultural buffer zones; land banks; land trusts; and stream/creek, wetlands, and woodlands protection zones. Also the transferring, donating, or selling of land development rights, and creating conservation easements may be employed. All of these techniques and strategies either prevent development all together or limit it to non-urban uses.

## REPRODUCTIVE POLICY

The final major element of Pedestria's finite nature is its Reproductive Policy (RP). Like the Active Growth Policy and Limited Growth Policy, the Reproductive Policy is authorized by the City Charter. The RP is a major break from traditional urban growth policies and planning practices, but it is a necessary element of a finite city.

The RP contains Pedestria's guidelines and directives for creating another autoless city. The RP mandates that if public demand for added growth is still

substantial when Pedestria approaches its finite limits, then the city will be responsible for providing for these developmental demands by planning and establishing a brand new city. In other words, if growth in Pedestria is strong enough to warrant the implementation of LGP disincentives, then implementation of the RP is also warranted.

In addition, the RP mandates that Pedestria's reproductive responsibilities be carried out via a newly established bureau called the "New City Bureau", whose responsibility and mission are to undertake all necessary steps in planning, financing, and initially establishing a brand new city.

The RP also mandates that this new city be modeled after Pedestria. Knowledge gained by Pedestria's successes and failures can be used to the new city's advantage. Excess growth from Pedestria and other sources will be directed into the new city rather than being accommodated in Pedestria itself (this is the ultimate growth outlet). The new city will provide an alternate place for people and businesses to locate or reside. This policy and new city will also help negate legal challenges (constitutionality issues) to Pedestria's limited growth policy. The RP assures that Pedestria directly provides for growth, in a unique way, even after it reaches its finite limits.

The New City Bureau (NCB) is formed by mandate of the RP when Pedestria's population approaches 250,000 people. When the city's population level reaches 400,000 people, the "primary population growth evaluation" is undertaken. This study, conducted by the NCB, assesses the existing growth pressures and the speed of growth in the city. The results determine timeframe and scheduling of the bureau's subsequent procedures.

The City Charter grants the NCB access to the city's general fund for staff and operating expenses. Expenses necessary for large capital expenditures (purchasing land and building initial infrastructures) need to come from sources other than the general fund. Thus, the NCB is allowed revenue procuring rights. These include voter approved taxes and bond sales; grant monies from state and federal sources can also be sought. Arrangements can be made with the new city to pay back Pedestria's expenditures/investments. Private investment sources and donations can also be arranged for a variety of development expenses and land procurement.

In addition to assessing potential growth beyond Pedestria's limits and securing funding sources, the NCB must accomplish many milestones to succeed in its mission. These milestones are: to acquire or secure a site for the new city; to secure government backing at all levels; to create the new city's charter and comprehensive plan; to design the new city; to begin construction of the new city; to promote and direct new businesses and residents into the city; and finally, to sever parental ties with the new city and allow it self determination and self rule.

The Reproductive Policy and New City Bureau do not require relocation of any citizens of Pedestria. However, citizens of Pedestria can invest or relocate in the new city if they wish.

The idea of a city reaching a certain (limited) size is not entirely new. What is new is the idea of empowering Pedestria, via the City Charter and the RP, with the legal, financial, and personnel resources to limit its growth and to direct excess growth into a new city development. This helps give the city the ability to maintain its finite nature.

Creation of a finite city that is reproductive would be a great ground breaking experiment. The premeditated limitation of a large municipality, and its self replication, would be a pioneering endeavor that is long overdue and well worth the effort.

## CHAPTER 6

# COMPLEX ISSUES AND PROBLEMS OF AN AUTOLESS CITY

Pedestria, and autoless cities in general, will not be utopias. They will be cities built and designed by people for people. This will inherently make them imperfect. Pedestria, like all cities, will have its share of problems. It will have problems that every city has, regardless of its transportation system and physical configuration. It also will have problems that are characteristic of its autoless nature.

This chapter presents and explains problems that an autoless city such as Pedestria might have. In some cases, potential solutions are offered.

### PROBLEMS WITH A BRAND NEW CITY

Pedestria is a brand new city built from scratch, a virgin piece of land on which an entire city is rapidly constructed. Obviously, when Pedestria is first started, there will be no preexisting stocks of buildings. The fact that the city is built within a relatively short period of time (maybe several decades), means buildings and infrastructures will be of a rather uniform age. It won't be until decades later that it has what are commonly deemed as older buildings. This can result in some associated problems.

In today's cities new buildings are, as a rule, more costly in comparison to existing stocks of homes or offices. New construction is more expensive for a number of reasons. Prices for land, engineering, materials, labor, etc. (all the components necessary for new construction) are at current prices, which are usually higher than prices in the past. Although there are occasional inflationary downturns, there are few exceptions to the long range rise in prices.

Financing is another reason newly constructed buildings are so costly. Most new construction is heavily financed with a variety of lending instruments and commands a higher price than older buildings. It is more common for older buildings to have smaller loan balances and a higher percentage of equity. Often this means older buildings have a stronger potential for economic solvency than newer buildings. A percentage of older buildings that have been in the same hands for many years are owned free and clear. Owners of these buildings have more flexibility in establishing modest rents than owners of heavily indebted properties. They can offer this simply because their debt is significantly smaller.

Older homes and buildings serve important functions. They harbor lower income families and lower income businesses. In most urban settings, brand new construction

is associated with more well-to-do people and businesses. In a brand new city the lack of varying aged buildings will translate into a lack of varying price ranges and rents for both homes and businesses. This will have the effect of limiting Pedestria to middle and upper income groups. The lack of low cost housing options and inexpensive business rental space will limit the opportunities for poor people.

Varied real estate and rent prices allow a city greater opportunity for economic and social diversity. Without this kind of variety some essential businesses, services, and living options could initially be absent. This is unfortunate, because it could limit economic and cultural diversity.

Building age uniformity within Pedestria, and the corresponding problem of high prices, can be reduced by the use of subsidies. In Pedestria and all autoless cities, it



**New downtown construction.**



**New subdivision of homes - Roads, utilities, and other infrastructures built prior to the construction of the homes.**



**Construction of high rise residential buildings.**



**Construction of a new commercial development - Its generation of traffic creates the need for new traffic signals (in this particular case, the need for three new signalized intersections).**

is important that city government take an active role in helping create low priced housing and low priced commercial space. Pedestria will encourage low cost housing through regulation (for example, rent control) and with subsidies. It will make an effort to provide housing and business rental space for those with lower economic means.

There are a variety of subsidies available for lower economic groups. These subsidies are accessible to potential home buyers, renters, and business owners. They include local (city), state, and federal programs. Private lending institutions have some helpful programs as well. Local and national charitable organizations also have assistance programs. The city government can be active in helping secure sources of subsidization from both public and private entities. Eventually the need for subsidizes will diminish as the city's building stock, housing and commercial space age. Over time a more varied array of building costs and building options will exist.

Another way of reducing the high cost of new construction is by promoting cost savings via construction standardization and mass production. City building codes that are not too oppressive or restrictive can help encourage these cost savings. Zoning and other land use regulations can also be a factor. They can allow lower cost housing, such as manufactured homes and mobile homes.

Possibly, under certain circumstances, they can allow owner constructed temporary shelters where owners can reside while their permanent home or business is being built.

There needs to be a balance between building codes that are too lenient and too restrictive. It is important to have safe quality construction. Energy efficiency and the durability of buildings are important considerations building codes must address. Yet, these codes must not be so restrictive that they disallow a large segment of the population from being able to afford descent housing or most businesses from affording acceptable commercial space.

The relatively uniform age of all construction in Pedestria will also create an aesthetic void for the city. It is estimated that Pedestria will be completely built and will have reached its maximum capacity in roughly 30-40 years. In comparison to most cities of the world, this is a very short period of time. Much of the style, art, and architecture of the city will be of a specific period. This will have an effect upon the city's architectural diversity. The subjective nature of aesthetics depends on the eye of the beholder. Some might feel that uniformity of style will create a more cohesive city. Others will disagree and want a wider spectrum.

It is quite possible for Pedestria to have the best of both worlds: uniformity of style and diversity of style. Rather than have a laissez-faire approach to architecture and letting each building adopt whatever style its owner prefers, the city could be a facilitator. Various central core districts and residential communities could require specific styles of architecture. This would indeed create very distinct communities and neighborhoods. Architectural styles could be designated for specific areas of the city, by either an architectural committee, a public panel, or other means. An architectural review committee could be in charge of overseeing compliance of architectural standards. Some communities or districts could have distinctive styles, such as Bavarian, Japanese, Elizabethan, modern, etc. It is common for modern suburban subdivisions to have covenants and restrictions requiring specific architectural styles or use of specific materials to insure a desired aesthetic appeal and to maintain high property



**Buildings of varying ages.**

values. Expanding this concept to wider portions of an urban area is an appropriate and viable option.

Another problem faced by Pedestria in its early years will be the difficulty of shifting from a construction based economy to a long term, stable, non-construction economy. From Pedestria's initial ground breaking to reaching its finite limits there will be a tremendous amount of building taking place. During this time there will be a high percentage of construction companies and construction type services. Their workers will be supporting families who will in turn support a whole array of other businesses. The construction boom times will abruptly come to an end as the city finishes its construction phase. The city should anticipate and react to this transition by promoting, as much as possible, the early development of a diverse economy with stable companies and industries with a long term future. Progress toward this goal should support a smoother economic conversion.

Another problem associated with Pedestria's relatively uniform age is the fact that its public infrastructures will be aging at roughly the same time. This will be wonderful for the first few decades when maintenance expenses are practically nonexistent. However, eventually a great deal of infrastructure will have to be repaired, upgraded, or replaced. The simultaneous deterioration of different types of urban entities could eventually be a costly liability for the city. This is a long range problem that will increase in the future. The city that was once brand new and leading all others in its modernity will one day become old and outdated. Eventually the private and public sectors will have to come to grips with this problem. Maintenance, rehabilitation, upgrading, and even urban renewal may be necessary to bring infrastructures up to modern standards. The city will be faced with making significant improvements to entities such as transportation systems and facilities (roads, bridges, signals, buses, terminals, airports, etc.), storm and sanitary sewer systems, water systems, park facilities, and public buildings. The private sector will also be faced with making improvements and replacements. The primary motivations for them will be increasing efficiency, cutting costs, satisfying customers and employees, and staying competitive. They will have to face the deterioration of buildings, old manufacturing processes, and outdated technologies. This problem is not unique to Pedestria. All cities and businesses face this. Pedestria's infrastructure rehabilitation, when it does happen, will occur over a relatively short period of time compared to most existing cities, which have evolved over a longer period of time and therefore have a more varied aging of their infrastructure.

Facing aging infrastructures will be an economic challenge for both the city and the private sector. This hardship can be reduced by several methods. The anticipation of large economic expenditures, well in advance, can soften the impact. The accumulation of funds or savings can be dedicated toward this end. This monetary stockpiling can amass funds for many kinds of upgrades. Also, the staggering of improvements over a period of time can help reduce any short term financial pinch. Good preventative maintenance can also be cost

effective. Private businesses may find it extremely difficult to make large capital improvements, especially if they are operating on a thin profit margin or are faced with a general slowing of the economy. In these cases, subsidies or grants from various sources could be in order.

Another problem facing new cities such as Pedestria is weak economic return on initial investments. As mentioned earlier, a major problem facing new towns and cities has been weak early stage growth and lack of adequate financial return. Pedestria will encounter this problem as well. In order for Pedestria to attract investors, particularly in its infancy, it will have to market itself skillfully. It will be important for investment and growth in Pedestria to proceed steadily, to avoid a reversal in momentum. It will be equally important, if profit motives are a part of the overall objective, that gains are in fact made. Otherwise, this could cause Pedestria to languish in its formative years.

## **PROBLEMS WITH A LIMITED GROWTH POLICY**

The city government of Pedestria will have a challenge carrying out and accomplishing the various goals of the Limited Growth Policy (LGP). This policy is an important endeavor. To succeed, it will require a concerted effort by skilled staff and dedicated workers. The city's strong advocacy toward growth in its formative years will give way to an opposite advocacy as it approaches its predetermined capacities. Although this shift in approach will not come as a surprise, it will cause some discontent among various factions, particularly in the political realm. The implementation of disincentives by mandate of the LGP could cause varying levels of economic burden. Various restrictions and sanctions could change the economics and development of the city. Some of the disincentive methods may be construed as exclusionary, segregationist, or unconstitutional. There will, no doubt, be individuals and corporations that will attempt to reverse or alter significantly the LGP. Attempts at alteration may be in the form of legal challenges in court or by means of lobbying for legislative amendment. The political and public pressure to change the LGP could be especially severe if the New City Bureau runs into snags or is unsuccessful in building a new city. Without development of a second new city, there will be no place for excess growth from Pedestria to be directed. Conversely, if the New City Bureau is successful in creating a second brand new city, it will take much of the expansion and growth pressure away from Pedestria. This will mean the number, duration, and intensity of disincentive programs can be reduced. This also will mean that negative impacts of the LGP will be fewer. Spawning of a second autoless city will make the LGP much more palatable, politically and economically.

Problems keeping the basic functions of the LGP intact will be a continuous challenge for Pedestria. Upholding the legal and enforceable mandates of this policy and all of the elements of the City Charter and



Comprehensive Plan are extremely important to the long range future of Pedestria. The sustainability and permanent high quality of life are at stake.

The successful implementation of the LGP could, at times, contribute to economic stagnation. It is meant to reduce or halt excessive expansive growth in the form of new incoming businesses and expanding existing ones. This is necessary due to the finite nature of the city. Remember, the LGP is not meant to put companies out of business, reduce their profits, limit production, halt modernization, or cause a rise in unemployment. However, halting new growth via governmental measures could induce some forms of artificial stagnation. This could be perceived by many as a problem. Its manifestations would be similar to those that occur in existing cities experiencing a stable or declining population, caused by a variety of circumstances. They typically are manifested as a shrinking or exiting of key industries, slow introduction of new businesses and new ideas, and the personal sense of limited opportunity. These phenomena are opposite of what takes place in a thriving, upwardly advancing "boom town". In Pedestria the slowing of the economy by the LGP is artificially induced and self inflicted in order to spare the city from the greater problems of uncontrolled growth. The intended effects of the LGP on Pedestria's economy could be seen by examining existing towns or cities that have had stable populations for a long period of time. Also, studying people's attitudes and coping mechanisms in existing stable cities could help reveal if similar psychological phenomena can be expected to occur in Pedestria, and if they are considered and/or treated as problems.

The question arises - Will the continued acceptance of this policy by the citizenry and the government of Pedestria be assured? Will the citizenry understand and embrace the long term positive value of this policy, or will it be significantly altered or abandoned over time?

### **ISSUES OF ECONOMIC STABILITY**

There are a number of economic issues in Pedestria that may become problems. These are in part, or entirely, a result of its finite design, its physical configuration, and its autoless nature. These potential problems are not significant enough to undermine the success of an autoless city, but they should be considered in the planning process.

One economic problem within a finite city is business competition. After Pedestria has reached its full capacity and most businesses have been established, it may be difficult for some new businesses to establish a foothold. This will be especially true for businesses that compete with existing businesses that strictly cater to a local market. Basically, a finite population equals finite markets. Establishing a locally oriented business during Pedestria's rapid growth period is primarily a function of filling a niche in an expanding market. Establishing the same locally oriented business after the city's initial development, and after most niches have been filled, will

be more difficult. It will require wresting market share from existing businesses. Companies in Pedestria dealing in national or international markets will not have their markets confined by Pedestria's limited size. However, they will have to compete for employees from a limited labor pool.

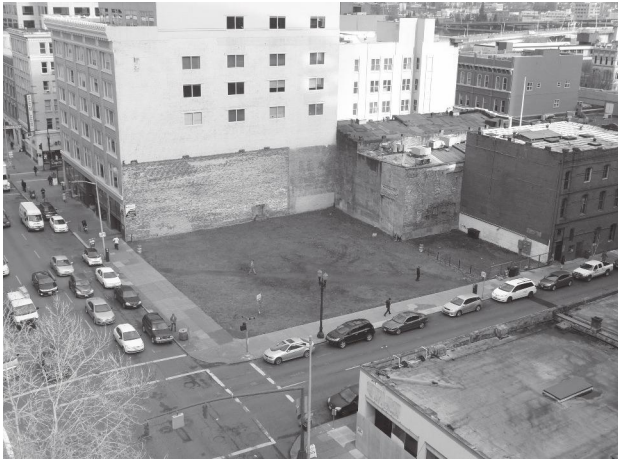
Once the city has reached capacity (full buildout), and target populations have been reached, emerging or expanding companies may find it difficult to hire sufficient numbers of new employees. Some possible solutions are to increase productivity and efficiency per worker, hire younger and older workers, outsource work to other locations, or outsource via the internet (depending on the type of work).

In addition to Pedestria's limited employee pool, it will also suffer from physical expansion problems. Low vacancy rates, high density (near total infill), and limited vacant land will be hindrances for businesses in need of space. This problem will be most acute after Pedestria has reached its maximum capacity (buildout). It may be especially difficult to find space that is adjacent, compatible, or retrofittable in a reasonable price range. This will also be problematic for big box stores, large grocery stores, and large companies wanting to make a move into Pedestria for the first time.

In comparison, auto oriented cities have an advantage in this regard. A large amount of parking space surrounding most businesses can easily be converted to building space. This allows companies to expand (within limits) in their current location at relatively low prices. In Pedestria, business expansion (in the physical sense) will usually require one of several options: upward expansion (building additional floors), leasing of nearby vacant floor space, or moving to an entirely new location with adequate space features.

There is at least one thing that can be done to remedy any future lack of available vacant building space and/or general lack of room for expansion of businesses. Pedestria has minimum and maximum height/square footage requirements/restrictions for all buildable properties. Buildings can be built smaller, as long as the foundation and structure are engineered and built to sufficiently accommodate future additional floors and square footage, up to at least the minimum requirements. Therefore, some buildings may be under built initially, but expanded upward without rebuilding or major retrofitting in the future. Buildings aren't restricted to the minimum height/square footage requirements; they can be higher/larger. This gives some latitude for Pedestria and for businesses in general to expand if the need arises. **In Pedestria, upward expansion is emphasized over outward expansion.**

In today's commercial and retail business environment, single story big box stores are very prevalent. Expanding these types of buildings upward can be very challenging from an engineering and construction point of view. However, in a Pedestria type city these issues will



**Downtown vacant land - Once Pedestria reaches final buildout of its developable lands, this type of property will be rare.**

have to be considered when companies create initial building plans. Big box stores in Pedestria will possibly resemble multi-story department stores of yesteryear. This type of structure will be more expensive per square foot than the single story big box. But that added cost can be at least partially, if not entirely, offset by a smaller building footprint and lack of an expansive parking lot with any necessary adjacent traffic signalization.

There is also the potential problem of local business monopolies. The physical configuration of autoless cities requires an urban design that is pedestrian oriented. The overwhelming convenience of shopping in one's own residential community commercial district may allow some businesses to take advantage of the situation. This physical configuration lends itself to the creation of a business climate with a captive clientele, and is prevalent mostly in the residential communities. The most common businesses to take advantage of this situation are likely those that sell volumes of goods that are difficult for pedestrians to carry long distances. Grocery stores are a primary candidate. Price gouging by a business in a particular community will undoubtedly be disliked by the local residents. Yet, the difficulty of traveling to other communities by transit or other means, and then returning with heavy sacks of groceries, will discourage many from comparison shopping. This is a potential problem that could face all the communities of autoless cities. Home delivery of groceries by stores or small private delivery companies could help alleviate this problem. Communities of sufficient size may be able to support two competing stores, thus breaking the monopoly. People could also hire freight haulers to take them and their groceries or merchandise home from a more distant and possibly less expensive shopping foray.

Another potential problem in Pedestria and autoless cities is that of entire communities being owned and developed by a single developer or corporation. The way private property is allowed to be bought and developed will effect how prevalent this type of ownership may be. Large corporations thrive on large projects with their

economies of scale and high profit potential. Yet, individual residents and citizens will overwhelmingly desire ownership of property or at least a wide choice of landlords. Therefore, Pedestria will want to attract both large scale property owners (mostly corporations) and individual property owners. The primary developer of Pedestria will be interested in expediting the construction of the city. This will likely cause them to favor large scale property owners, because of their greater resources for developing property. This may or may not be in the overall best interest of the people of Pedestria. If entire communities are developed and owned by single corporations, then everyone living and operating a business in that community is a renter or tenant. This is a similar situation to company towns, where a company owns the entire town and rents or leases to its employees. Whether there are advantages or disadvantages to this situation, or whether this should be encouraged or even allowed, are questions that the initial planners of Pedestria will have to address.

Pedestria's autoless nature will have a profound effect on the economic composition of the city. Most existing auto oriented cities in the U.S. have on average 10% of their employment base in auto and auto related industries. The majority of these are in blue collar fields. Without this same automobile base, Pedestria's job market is likely to be more white collar and/or service oriented. If the Active Growth Policy measures are successful in attracting a variety of job types, then issues of employment diversification will not be a problem. If it is not very successful in establishing strong employment diversification, then periodic slow downs in those few predominate industries will likely cause more severe economic repercussions throughout the city. This concern for having and maintaining a balanced economy increases the importance of the AGP.

## MISCELLANEOUS AND CITY SERVICE PROBLEMS

Pedestria will be faced with a variety of housing problems. The citizenry will desire and need good housing with a large variety of options, from low rent housing to mansions, from boarding houses to studio apartments, from dormitories to penthouses, from single family houses to high rise apartment complexes, from motel rooms to assisted living and nursing homes. Residential unit space options should range widely as well, with square foot areas as high as 2,000 sq. ft. per person to as little as 100 sq. ft. per person. People in different economic situations and at different stages of their lives require a full spectrum of housing options. A strong and vibrant city needs a good mixture of people in all these stages and situations.

If left entirely to the development industry and financial institutions, Pedestria would probably not contain this wide spectrum of housing options. This is due to varying profitability between different housing types.

These institutions favor the more profitable options; hence, a narrow selection of high profit housing options would become overly prevalent. Consequently, the city government should require a certain amount of diversity within its housing stock. This could be achieved through a variety of means, including zoning laws, density bonuses, tax incentives and building permit regulations. The amounts/percentages of different housing could be specified in the Comprehensive Plan.

The issue of quality housing versus quantity of housing as it relates to price and rents is another potential problem facing the city. Quality housing (and quality buildings of all types) is well engineered and well constructed, built with quality materials that are long lasting and easily maintained. The construction is safe and healthy to live in, aesthetically pleasing, and not excessively resource consumptive (wasteful of energy, water, land, building materials, etc.). It also provides sufficient living space, necessities, and amenities. All of these qualities are desirable and prudent, yet they accumulatively add cost. High quality standards, strict building codes, and harsh green construction standards (although good in purpose) may put housing costs out of reach for a segment of the population. Pedestria will be confronted with this dilemma between creating high quality housing with its subsequent exclusionary costs and the desire to create a socially and economically heterogeneous environment. Abatement of this problem can possibly be achieved through varying price subsidies, variable building codes, and the relaxing of green standards.

Pedestria and all autoless cities will encounter common city service problems experienced by most cities world wide. Some problems that Pedestria may very well be confronted with are: city budget crisis and funding shortages, schools and public education problems, hospitals and health care issues, city maintenance problems, crime, fires, job training issues, labor disputes and strikes, inflation or recession, power failures and energy shortages, environmental disasters, natural disasters, terrorism, and civil unrest.

Pedestria also has other problems common to all cities, but with particular consequences resulting from its autoless nature and unique urban design. For instance, the physical separation of its residential communities could have a profound effect on gang related activity. It is difficult to say whether Pedestria will have any gang activity, but because of the territorial nature of urban gangs and the very definitive nature of Pedestria's residential communities, if gang activity manifests itself it will most likely occur along these geographic lines.

On a positive note, the reasons that might make Pedestria's communities susceptible to territorial gangs also make these communities strong havens of community involvement, community watches, and community policing. Also, the fact that Pedestria's police bureau and judicial system don't have to expend large amounts of manpower and resources on automobile crime and traffic

violations means that more of their assets can be allocated to gang and crime prevention, and also for youth programs.

Pedestria's heavy dependence on its mass transit system creates a serious problem in the event of a major transit stoppage. A variety of events can occur that may significantly halt the flow of the transit system. These incidents include transit labor strikes, serious vehicle accidents, natural disasters, power failures, acts of war, civil unrest, and terrorism. Stoppage of the transit system for any length of time, for any reason, is a vital issue for the entire city. It is important that contingency plans and emergency procedures for these different occurrences be in place and practiced periodically.

Another group of problems that may be aggravated by Pedestria's physical design are those relating to open space. Problems of disorderly conduct, alcohol and drug abuse, and other more serious crime, can be prevalent in urban parks. The large amounts of open space, including the natural forested areas, could make these problems more prevalent than in existing cities. Possible solutions exist in the form of greater neighborhood involvement, neighborhood watches and patrols, and a police force that should have more time and manpower to devote to such matters.

Illegal garbage dumping might also become a problem in Pedestria's large park spaces. Overly expensive garbage service and/or an impoverished or unconcerned populace could contribute to this problem. The clandestine dumping of refuse is an expensive and disheartening proposition for the government and people of any city. Therefore, garbage collection and recycling is an integral part of Pedestria's sustainable nature. It supports permanent waste recovery industries, that provide jobs and usable resources.

Homelessness and vagrancy are problems facing many cities and will no doubt be faced by Pedestria. Homeless people and their living activities are often found in or adjacent to urban parks, in make shift camps where public places and amenities are used as personal living space. They contribute to crime, unsightliness, defoliation, health hazards, and the loss of public space available for the general public. The causes of this vagrancy are numerous, but are usually related to social, economic, or mental health issues. These activities are costly for police and social services to try to remedy. Homelessness is disheartening for the city, its citizens, and especially for the people caught in this destitution. As mentioned earlier, one possible solution is dedicating a large piece of land or an entire residential community for homeless living, related services, and helpful amenities. This could be established in the city's initial Comprehensive Plan. Pre-establishing land as a "homeless zone" or "camptown" would eliminate the conflicts inherent in trying to create such a zone adjacent to an existing community ("Not in my neighborhood!"). Pre-establishing this zone would also influence the development of surrounding properties. This would help assure that land uses and land values would be more in keeping with the types of activities, services and people that would inhabit the area. It would have its own transit stop and small shopping area. Self policing would

be a possible way to give greater dignity and control to this segment of society. Amenities such as rentable storage lockers, showers and restrooms, heated areas, and shelters with cooking facilities could help improve standards of living. A centralized location would enable public and private charitable organizations to focus their efforts in helping this population.

Another park and open space related problem is that of fire danger. The large amount of park and natural unkempt spaces are susceptible to dangerous urban wild fire conditions. The native forest types and the prevailing drought cycles are primary factors in this situation. Fire breaks between forested and developed areas, periodic thinning, fire prevention considerations in the city's building codes, and fire bureau preparedness are collective solutions.

## **FUTURE CHANGE**

Change is inevitable. Nothing stays the same. In today's world transformation of nearly everything is occurring at an accelerating pace. Science and technology advance from unimaginable fantasy to the consumer market in a matter of years. These technological improvements are constantly changing our lives. Our urban landscapes are also changing and evolving at a reckless pace. New construction of all kinds and shifting business and demographic patterns are occurring around us constantly. These affect our daily routines, our habits, and our sense of community and self.

Pedestria is not a utopia, nor is it an endlessly static entity. It, too, is subject to the forces of change. Designing Pedestria, or any autoless city, with anticipation of very specific future changes in mind is largely futile. Foreseeing the nature and results of future change is



**When this house was built the road in front was a 2 lane country road. Urban development and sprawl have engulfed the neighborhood. Traffic increases have necessitated the expansion of the road, resulting in this house being severely affected. The house has lost much of its front yard, looks out on a retaining wall and fence, and has lost vehicle access to the garage, all of which has resulted in property value decrease. All because of a changing urban environment**

difficult in the short term, and nearly impossible for the long term. The most the founders and designers of a brand new autoless city can strive for is to build the absolute best city they are capable of, given the most recent technology and knowledge. The most they can hope for is that this new city will adapt or incorporate future changes with minimal strain and expense.

Political and social changes are also inevitable in a pedestrian style new city. Political parties, political dogma, and political agendas will change like the months of the calendar. Social changes will ebb and flow throughout the decades, becoming eras of historical significance. These partisan and societal alterations will have lasting repercussions. Future political and social changes or upheavals may cause subsequent generations to want to change the initial guidelines and objectives for the city. This could impact the fundamental directions set forth in the City Charter, Comprehensive Plan, and other planning documents.

Pedestria's unique physical configuration and heavy reliance on mass transit make it sensitive to significant changes in public opinion. Changing emphasis and direction of Pedestria's major fundamentals (namely its transportation systems, land use patterns, and finite nature) could undermine previous efforts made to create this long lasting, sustainable city. Improvements, advancements, and renovations of some basic fundamentals are totally acceptable, and will be needed and expected periodically.



*Photo Credit - Courtesy of Imgur*

**Top photo - Shanghai, China 1990; bottom photo - Shanghai 2010. An incredible example of how quickly a city can grow into a huge modern metropolis.**

Yet, complete abandonment or massive alterations that could be irreversible and regrettable should be questioned in their prudence. This is particularly true if such changes are manifested because of a short term political aberration. This should be of concern to the founders of the city; methods to negate or prevent such occurrences should be considered in the city's initial planning stages.

Finally, there are foreseeable and unforeseeable advancements in specific fields that may shape the future of the city significantly. Some of these are advances in telecommunications and computers, advances in

transportation, future renewable energy, future exhaustion of finite energy resources, future medical advances with a subsequent increase in longevity, advanced materials, major global events, major environmental changes, and social and political upheavals. Many of these are areas of imminent change that are coming to the world without question; others may never occur. It would be advantageous for all citizens, and the city as a whole, to respond wisely to such events, and be flexible enough to incorporate them or adjust to them in a progressive manner.

# CHAPTER 7

## POSITIVE RESULTS OF PEDESTRIA AND AUTOLESS CITIES

This chapter discusses positive results that can be attributed to Pedestria and the autoless city concept. There are both direct and indirect outcomes of the city's various unique urban features. The positive results span a large spectrum of areas, from environmental issues to financial considerations to social implications. A major reconfiguration of urban development, as proposed by this concept, will have profound effects on people's lifestyles and society at large. **The autoless city concept is a multi-faceted problem solver.** Because no modern autoless city currently exists, these positive results are hypothetical, but are based on facts, observations, and deductions.

### AN AUTOLESS CITY IS SUSTAINABLE AND ENVIRONMENTALLY BENIGN

Pedestria is designed to be a very nearly sustainable city that has long lasting, permanent, and intergenerational qualities and functions within its physical limits with minimal adverse environmental impacts. It lowers consumption of renewable and non-renewable resources, both from its hinterland and around the world. It promotes human scale development and the efficient integration of urban activities. It is designed with a concern for its citizens and aims to reduce their exposure to pollution and health hazards. It instills a sense of community and place. It provides numerous opportunities for all its citizens, including employment, open space, culture, and education. In summary, a sustainable city is environmentally benign (non-polluting), energy efficient, resource neutral (minimal consuming), limited in its growth (finite), and economical to live in. Pedestria accomplishes all of these sustainable characteristics to a high degree, something never before achieved.

Pollution is a major problem facing mankind today. Our modern industrial oriented societies produce a multitude of pollution byproducts, and our consumptive lifestyles contribute to much natural resource depletion. Pedestria, a city that is transit and pedestrian oriented, autoless, and finite by design, will greatly reduce both pollution and natural resource depletion. Being environmentally benign is a major attribute of an autoless city.

The automobile and its industrial complex are major contributors to air pollution. An autoless city's elimination of the private automobile, shrinking of the automobile infrastructure, reduction of freight and service

vehicle numbers and miles driven, plus the adoption of standard pollution control measures for remaining vehicles and stationary point sources will contribute to a nearly total elimination of air pollution. **An autoless city like Pedestria will have the cleanest urban air of any major city on earth.**

The different types/effects of air pollution that will be decreased are:

- Smog (a variety of compounds, including hydrocarbons, oxides, ozone, and particulates).
- Greenhouse gases (mostly carbon dioxide from burning carbon based fuels).
- Acid precipitation (rain, fog, or snow).
- Ozone depletion (the shrinking of the protective ozone layer).

Each of these contributes to a variety of related problems, including skin cancer, lung ailments, crop loss, forest and vegetation damage, building and monument deterioration, global warming, and ocean acidification. Currently there are hundreds of efforts being made around the world to solve these pollution maladies. Most of these attempts are focused on specific pollution sources and are aimed at stemming increases rather than wholesale elimination. None of these efforts address as many categories of pollution as substantially as does the autoless city concept.

The automobile and its industrial complex are major contributors to both surface and ground water pollution. Eliminating cars from a city would greatly reduce this problem. The absence of large numbers of cars and their corresponding large pavement areas would significantly reduce automobile chemicals and other debris found in urban runoff. It would also reduce storm water peak loading, erosion problems, and groundwater contamination.

Another type of pollution produced in significant quantities by the automobile is noise pollution. Automobile and truck traffic produce the vast majority of urban sound levels. Noise levels near busy roads or intersections can reach decibels in excess of 80db<sup>1</sup>. Noise levels over about 65db or higher are considered excessive for residential neighborhoods<sup>2</sup>. An autoless city will be a significantly quieter place to live than today's auto oriented cities. Although Pedestria will not be without loud voices and occasional blaring music, it will be rid of most vehicle noise.

Solid waste pollution is another problem exacerbated by the automobile. The classic contribution of automobiles to the waste stream problem is the hundreds

of million tires discarded each year in the US. The manufacturing and eventual discarding of each automobile, the consumption of numerous car related products during each car's life time, and the construction and reconstruction of automobile infrastructures all contribute to our landfill problems. An autoless city will, by its nature, be plagued far less by these problems than conventional auto oriented cities.

Other environmental problems plaguing us today are resource depletion and degradation. The automobile's consumption of natural resources is astounding. Oil is the most obvious resource consumed by the car, but fueling of the car is only part of this problem. Car production and manufacturing also consume natural resources. Land, water, minerals, and biotic resources are victims of our automobile age. Human resources are allocated to the automobile, such as labor, capital, and intellect. Urban sprawl, destruction of agricultural and timber lands, plus the reduction of natural habitats for man and animals are also part of our auto-urban legacy. An autoless city is a masterful way to consume fewer natural resources by being compact and intentionally finite. Reproductive by design, it exports this concept, thus spreading environmental progress elsewhere. This type of city helps preserve and safe guard resources and non-urban lands for ourselves and generations to come.

Another devastation wrought by the prolific usage of automobiles is the injury or death of human beings caused by accidents. The numbers are staggering. The losses to individuals, families, and society as a whole are immense. The incapacitation and death of a segment of the community is a problem that an autoless city will reduce by a sizable percentage. This improvement in morbidity and mortality alone is reason enough to consider the creation of autoless cities. Couple this improvement in public safety with a nearly pollution free environment, and it can be said that autoless cities are a major step in improving human health and life expectancy.

**The intentional limiting and predetermined reproduction of a large city exemplifies the realization that the world and its resources are finite, and that humankind must be able to live within that reality. The elimination of pollution evils and the reduction of our consumptive ways would be a welcome result of creating a sustainable and more livable autoless city.**

### **AN AUTOLESS CITY HAS COST AND QUALITY OF LIFE ADVANTAGES**

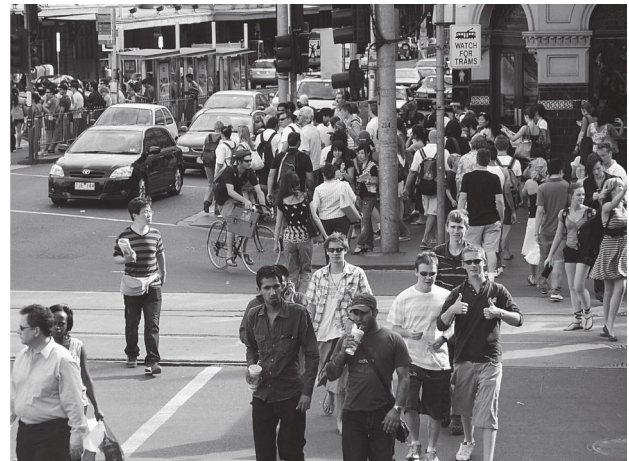
An autoless city's lack of automobiles and auto infrastructures, plus the compact nature of the city's design, give rise to some extraordinary economics. The elimination of a city's automobile nature changes a

variety of economic indicators for both public and private sectors.

As previously mentioned in Chapter 1 (page 30) and the "Cost of the Automobile" matrix (page 32), automobile transportation costs for the average American household are approximately 20% or 1/5 of their gross income<sup>3</sup>. By comparison, the amount of money spent for transportation by the average household in Pedestria will be considerably less. The transit system is free to all users (a totally fareless system)<sup>4</sup>. It is entirely financed by local taxes and some state and federal grants. These taxes represent approximately 4-5% of the average household's gross income<sup>5</sup>. Private automobile use within Pedestria is highly restricted; therefore, the average citizen will have little or no direct auto related expenses. However, there will be some other expenses for miscellaneous activities common in autoless cities, including: bicycle related expenses, the occasional cost of home delivery for large items, the occasional cost of car rental for out of city trips, extra walking apparel, and rain gear. These incidental outlays, plus the city transportation taxes, add up to an estimated 5% of the average household's gross income. **Therefore, reduced transportation costs in Pedestria result in an approximate 15% reduction in the cost of living compared to an auto oriented city.** This represents a significant savings, and will provide many profound benefits for those living in an autoless city.

Private businesses and corporations will also reap these same cost savings. In auto oriented cities businesses are heavy purchasers of automobilia. Their vehicles and fleets of vehicles cause them to incur all the same costs that private car owners incur. They may also incur additional expenses for large parking lots, parking structures, and related lighting, striping, drainage, security, etc.

In Pedestria the business community will be free from the majority of auto related expenses, which will help make them more cost effective and competitive.



**Pedestria will be a clean, safe, healthy, active, and prosperous city.**

Businesses struggling to survive in an auto oriented city would have fewer expenses and would stand a better chance of surviving in an autoless city. Profit margins will potentially be higher in an autoless city because of the absence of auto related expenses. A clean, healthy, amenity filled, and less expensive city will be instrumental in attracting and keeping an energetic and skilled labor force.

Pedestria should also be less sensitive to inflation rates in comparison to heavily consumptive automobile cities. Rising costs of fuel, vehicles, and automobile infrastructures will have a greater negative impact in existing cities than in the more streamlined Pedestria.

Traffic congestion and delays are another cost to individuals and society. As mentioned before, our roads and highways are becoming increasingly crowded. Nationwide traffic congestion causes 4.2 billion hours of delay each year, nearly one full week for every traveler<sup>6</sup>. The estimated cost to our nation in lost productivity and wasted fuel is more than \$87.2 billion dollars per year<sup>7</sup> (\$750 for every traveler), not including pollution and frayed nerves. With ever increasing numbers of vehicles on our roads these figures are destined to continue to rise. In Pedestria the situation is different. Its transit system is sized for the city's ultimate population, so delays, even at peak times, will be minimal or non-existent. Because of the city's finite nature this situation will remain unchanged essentially forever.

In existing automobile cities many trips are either lengthened or made necessary due to increasing sprawl, disjointed expanse, and decentralization. Many trips are also caused merely because of automobile ownership and the care and responsibility they require. For example, any trip to an auto parts store, gas station, licensing office, repair shop, or any other myriad of auto businesses, is time and money devoted to cars; in comparison to an autoless city where people don't need cars, it is time and money wasted.

An auto oriented city's transportation facilities and related infrastructures are numerous and a major drain on financial and labor resources. The types of transportation facilities that a city and its public agencies typically supply, either wholly or in part, are roads, highways, bridges, street signing, street striping, street lighting, road side landscaping, sidewalks, bike lanes, driveways, public parking lots, miscellaneous structures (i.e., retaining walls, noise mitigation walls), traffic signals, storm water sewer systems and treatment facilities, miscellaneous street-side paraphernalia (i.e., parking meters), buses and bus related amenities (i.e., stops, shelters), and fleets of public vehicles (i.e. motor pools). The city also provides transportation related services, namely emergency services (police, fire, and ambulance), traffic courts, snow removal, street cleaning, street design and construction, and maintenance for all of these facilities/services. Other miscellaneous auto related costs are right-of-way purchases for new automobile infrastructures and school busing costs for children

needing safe transportation to and from school over long and hazardous urban sprawl distances.

Pedestria will provide most of these same facilities and services, but the extent of transportation facilities will be greatly reduced. For a simple comparison, Fresno, California (comparably sized to Pedestria, with a population of 509,924 in 2013) has 5,385 lane miles of roadways<sup>8</sup>, including freeways, arterials, collectors, and local residential streets. Pedestria, on the other hand, only has 780 lane miles of roadways, a reduction of over 85% . Kansas City, Missouri maintains more than 6,000 lane miles of streets<sup>9</sup>, yet only has a population of 467,007 (2013).

There are equally dramatic decreases in other types of transportation infrastructure. In Pedestria there are 180 traffic signals (one signal per 2,778 people). In Pasadena, California there are 300 traffic signals<sup>10</sup> (one signal per 466 people), and in Portland, Oregon there are roughly 1,100 traffic signals<sup>11</sup> (one signal per 554 people). Comparing Pedestria to these two cities, Pedestria has over an 80% reduction in traffic signals (relative to population). Some types of infrastructure facilities, such as public parking lots and parking structures, are practically non-existent in Pedestria. Comparing Pedestria to comparably sized auto oriented cities, it is estimated that total public transportation facilities are reduced by approximately 70% to 80%. There is also a corresponding drop in public transportation infrastructure expenditures.

Another comparison between auto and autoless city transportation costs is that of traffic law enforcement. In automobile societies there are city departments and state or county agencies that oversee the enforcement of traffic laws and vehicle regulations. These consist of the city's police department, parking patrol and, to a degree, its fire and emergency services (responses to auto accidents).



Photo Credit - Pictometry International Corp.

**Fleets of company vehicles - will either be eliminated or greatly reduced in Pedestria.**

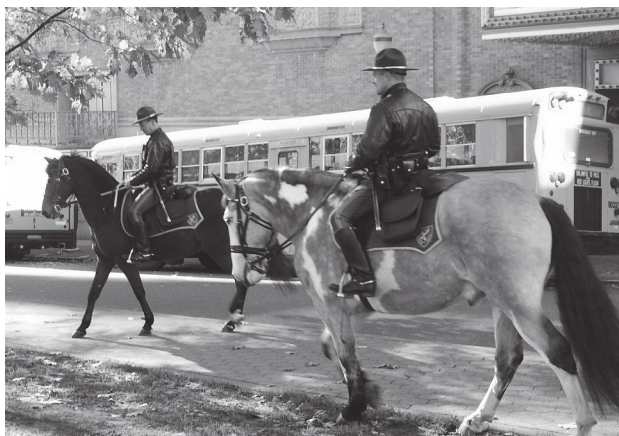


Among the state and county agencies are the county sheriff and state highway departments, motor vehicles department (for vehicle registration, driver testing, and licensing), department of environmental quality (for emissions testing), and city or county judicial and penal systems (for accident lawsuits and traffic court). These government funded services are heavily or completely involved with the enforcement of laws intended to control and govern the actions of drivers in vehicles on public right of ways. This is for the safety, protection, and common good of all. Traffic law enforcement is entirely different in Pedestria, where 85-90% of all vehicles are gone compared to auto cities. In Pedestria the police force will have only a handful of officers doing traffic duty at any given time. The remainder of the force will be able to concentrate on non-auto related activities, such as investigations, public relations, education, crime prevention, and neighborhood patrols on foot, horseback, bicycle, or by patrol car.

Parking patrols in Pedestria will be very minimal. Most parking problems will be truck and loading dock related, many of which could be controlled by local merchants. Traffic violations by private individuals will be nearly non-existent (since people who don't drive don't get tickets!), so traffic court will be minimized. The vast



**Policeman and police woman - on the walking beat.**



**Police officers - on horseback.**

majority of drivers in Pedestria will be professional (local truck drivers) or those who require a vehicle as a part of their business. A scattering of vehicles with experienced drivers on a handful of well designed roadways will translate to good and safe driving conditions for vehicles carrying the goods and services of the city. The rest of the population will walk, bicycle, or travel by bus.

There may be just as many intoxicated people in Pedestria as in other cities, but they will not be getting behind the wheel. Due to this, plus there being fewer vehicles in the city, there will be fewer accidents with resulting injuries and deaths. This will mean less need for police, fire, and emergency medical services.

Much of a city's crime is simply due to cars. It is often directed toward cars or is assisted by cars. Take traffic citations, for example (speeding, running red lights, etc.); these are law violations that cities spend huge amounts of dollars and resources on, both for prevention and deterrence. Prevention is enabled by good traffic signage, striping, signals, education, and roadway design features. Deterrence is attempted through policing, fining, impoundment of vehicles, suspension of licenses, and even the incarceration of chronic offenders. The vast numbers of vehicles in auto oriented cities mean there is a correspondingly high number of crimes against vehicles. Stolen vehicles, theft from vehicle break-ins, and vehicle damage (from fender benders to hit and runs) are a few examples. Automobiles are also accomplices in many crimes. Most burglaries, bank robberies, and kidnappings have a "get-away car". A large segment of local government resources are tied up in the bureaucracy of protecting individuals and society from the dangers of the automobile and the criminal manifestations that can be associated with an automobile society. Without private cars, the nature of crime and its prevention will take on a different complexion in Pedestria. Crimes against automobiles and crimes accompanied by automobiles will be practically non-existent in the autoless city.

Most municipal police departments dedicate large numbers of officers, equipment, and staff to automobile related divisions (traffic division). There are also large numbers of officers and support staff dedicated to motor vehicle theft. Judicial departments handle large numbers of auto related citations and crimes. Due to Pedestria's reduced law enforcement needs and corresponding judicial services, cost savings will be significant. Because so few of its law enforcement resources will be assigned to traffic and automobile related offenses, they will be able to concentrate more on crime prevention and hard to solve cases. The compactness of the city's built up areas lends itself to maximum use of foot, bicycle, and horse patrols. This has the added advantage of strengthening personal bonds between the police force and the people it serves. A personalized police force that works closely with neighborhoods, along with the city's compact nature, will help contribute to citizen participation in community crime watches and patrols.



**A private access (gated) apartment complex. Even the nature of private security will likely be different in Pedestria.**

**Private building security**



activities. Because elementary and secondary schools are centrally located within their respective communities or community groups, they are within easy and safe walking or cycling distance for their students. The exceptions are when buses are needed for special out of town field trips and for transporting teams and bands to school events. Colleges, private schools, and other regionally based schools rely on the city's excellent public transit system. The elimination of twice daily busing to and from school is not only a great savings for school budgets, but also gives kids a minimum of daily exercise, enhances their self-reliance, and frees communities from this burden.

These attributes could give Pedestria a very low overall crime rate and make it a very safe city indeed.

Other emergency services, such as fire departments and rescue services, will also be reduced and less costly than in comparable auto oriented cities. Departments in these cities respond to large numbers of auto accidents, auto fires, and auto related injuries and death. In Pedestria, the need for these same services will be considerably less, and the corresponding costs greatly reduced.

On average, in U.S. school districts, 3-5%<sup>12</sup> of the entire school budget is spent on getting kids to and from school. This includes the cost of purchasing, operating, and maintaining buses, the cost of drivers, and the cost of administration necessary for coordinating school busing. In addition to the costs school districts incur, families also incur costs getting their children to and from school. Today, huge numbers of children are driven to school by their parents in the family car. In 2009, 45% of K-12 grade students arrived by family vehicle<sup>13</sup>. This is a big added expense, hassle, and time commitment for parents, not to mention the added traffic congestion, pollution, and traffic hazards surrounding our schools every day. Plus, children are missing out on exercise, fresh air and independence by not walking or biking to school. In contrast, imagine a public school district that inherently has a 5% larger budget than a comparable district in an auto oriented city. And imagine a school district where parents are free of the burden of driving their kids to and from school.

Pedestria's centralized location of its schools within their respective districts, and the pedestrian nature of the city, means school districts do not have to bus any of their students. There is a complete infrastructure for alternative means of getting about. Walking and bicycling to school is made possible because of a network of sidewalks, paths, and lanes which facilitate these

In auto oriented cities automobile expenses are wrought by colleges, universities, and medical facilities. These enterprises have the usual automobile entities, such as parking lots, parking structures, access roads, etc. Nearly all of these expenses are eliminated in Pedestria.

Because of an autoless city's lack of automobile accidents and deaths, plus fewer pollution related ailments, medical and life insurance rates are likely to be lower than in other cities. This is good news for both individuals and businesses. Companies that pay these types of benefits for their employees will gain from lower premiums. Because of lower premiums, employees will more easily negotiate for better benefit packages. Self-insured individuals should also benefit.

County, state, and federal government agencies also have expenditures providing for the public's transportation needs. These agencies finance the construction, maintenance, and upgrading of this country's automobile infrastructures by disbursing huge amounts of tax payer money. These funds come from a variety of taxes and fees, including property tax, income tax, licensing fees, gas tax, etc. These monies go into such programs as the interstate highway fund, federal and state road improvement funds, local construction grants, etc. Of course, people in Pedestria will not be exempt from paying their share of taxes. Pedestria's reduced quantity of costly transportation infrastructure will, however, reap substantial benefits for citizens as far as taxes are concerned.

For all types of taxes and their disbursement for transportation projects, Pedestria's greatly reduced infrastructure needs will mean less burden on the state transportation budget. On both state and federal levels, Pedestria's primary impact on government funding of transportation projects will be to set a worthy example. It may help influence policy decisions and the direction of funding for future transportation projects. Extrapolating

the autoless city concept far into the future, it can be envisioned that numerous Pedestria-type cities could have positive effects on state and even federal budgets.

There are other government expenses and endeavors that can be directly or indirectly attributed to the United State's overwhelming dependence on oil and the mass use of the private automobile. Our national defense spending to protect international oil supplies is a prime example. A huge portion of this country's oil use is consumed by the transportation sector (most notably automobiles), and a significant amount of our oil comes from foreign sources.

As mentioned earlier in Chapter 1, page 37, the United States involvement in the Persian Gulf War in 1991 and the Iraqi War of 2003 are classic examples of the type of foreign policy that is linked to this country's prodigious use of foreign oil. The loss of life and wounds in these two conflicts numbered in the hundreds of thousands (on all sides), and the economic costs was in the trillions of dollars. Although there were a number of stated reasons the United States engaged in these conflicts, one underlying reason for involvement was that this region contains some the largest oil reserves in the world. If the Middle East had little or no oil, we would be no more involved there than we are in most of South American or Central Africa.

Although it is difficult to calculate with certainty the exact military expenditures used for securing and maintaining the flow of international oil supplies, it is certain that this nation has an enormous interest in stabilizing these supplies because of our large dependence on these resources. It is a fact that this country uses its military prowess toward these means and that they exact a heavy monetary cost upon the American people. Our dependence on gasoline for our automobiles exacts a far greater cost to each of us than just what we pay at the pump.

Although the existence of a single autoless city such as Pedestria would not eliminate this nation's thirst for petroleum, it would be a major exemplary step in the right direction. If hundreds of thousands of people did not own and drive cars, there would be much less gasoline consumed. Numerous future autoless cities and the gradual conversion of existing cities into modified autoless cities would mean a significant reduction in oil consumption and a corresponding reduction in public and private automobile infrastructure expenditures. This would help alleviate our foreign trade deficit, our burgeoning federal deficit, and our burgeoning individual private debt. It would also help eliminate our nation's need to become so diplomatically and militarily involved in dangerous foreign affairs in efforts to stabilize world oil prices and supplies.

A comparison of auto related costs in a car oriented city to those of Pedestria sheds light on the autoless city's advantage. Cost estimates for these different types of cities vary widely, and the bottom line is: An autoless city is far more cost effective than an auto oriented city. Exactly how these savings will affect individuals,

businesses and governments is difficult to predict.

**Emancipation from the automobile transportation system will have significant and permanent benefits for all.** The implications of an entire city incurring cost savings of approximately 15% are enormous. Some possible ramifications may be reduced taxes, better profit margins, more spending power, a shorter work week, earlier retirement, an increased standard of living, more financial freedom, and greater financial self-sufficiency. A cleaner, safer, and more stable environment are also added bonuses of an autoless city.

## **FINITE GROWTH MEANS STABILITY**

The finite nature of Pedestria will create some important positive attributes that other infinitely expanding cities do not enjoy. There are, of course, some negative characteristics of a finite city, but the positive benefits of a limited city should far outweigh the negative.

With sound planning of Pedestria's configuration, and with a functional limited growth policy, the city's urban infrastructures will not become unduly overcrowded. Facilities and infrastructures (such as transportation facilities, schools, shopping centers, parks, utilities, etc.) will not become overcrowded if they are sized properly for the projected population of the city. Overcrowding of a specific facility may occur at times during special or rare events, but most facilities will usually operate within their designed capacities. Future overcrowding will be eliminated or minimized significantly by Pedestria's finite nature.

Another quality of a finite city is the economic stability that it brings to the community. Businesses, industry, commerce, and services that cater to the local economy can gear themselves to a stable population and labor pool. They can concentrate on customer service and product enhancement rather than growth orientation and expansion. Corporations that deal heavily outside of Pedestria can gear themselves to the more limitless outside markets; however, they may have to adjust their markets in conjunction with the constraints of Pedestria's limited labor pool. A final advantage of a finite city is the reduction of continuously evolving urban landscapes. The hidden costs and wastes of premature building demolitions, traffic and utility capacity upgrades, divided/disrupted neighborhoods, and bypassed commercial districts are all negative consequences of the rapidly evolving automobile oriented landscape. A finite city built to its final proportions with its ultimate physical organization completed on the first go around will greatly alleviate these kinds of detrimental repercussions.

## ABSORPTION OF OTHER CITIES' UNWANTED GROWTH

A brand new city built from scratch on virgin ground will fill with an abundance of urban development spawned from venture capital and personal entrepreneurial energy. The development that will take place here would likely occur elsewhere in other cities if it were not for the founding of Pedestria or some other autoless city. All the housing, industry, and business channeled into this autoless city is development that would otherwise take an inefficient sprawled shape elsewhere. It would only add to the maladies of existing auto oriented cities.

Many municipalities are actively seeking new development within their boundaries, particularly clean or very stable industries. These municipalities may feel threatened by fierce competition from a new, low infrastructure, autoless city. On the other hand, there is a movement by some citizens and communities to limit their city's growth. These movements are pressing for a range of growth limitation initiatives. These communities could alleviate much of this burden by actively discouraging development and by encouraging it to move elsewhere, toward a burgeoning new autoless city. If anti-growth movements increase and restrictions on growth become more prevalent, businesses may be more inclined to move to cities eagerly welcoming growth (early stage autoless cities).

There is also an increasing amount of environmental restriction being imposed on new development in existing cities. The environmental degradation wrought by automobile oriented development is a primary cause. Results from these restrictions are helping reduce these maladies, yet at the same time are adding to business operating expenses and reducing business profitability. It makes economic sense for some businesses to limit their expansion or flee this type of restriction. There is much venture capital that has already fled the United States to foreign countries. Usually these countries' environmental restrictions are minimal or nonexistent, and their labor costs are small. **An environmentally benign city with fewer necessary pollution restrictions and fewer infrastructure expenses would be a welcome haven for businesses in this country.** Helping to curtail the outward migration of companies could be another positive outgrowth of creating autoless cities in the U.S.

The active growth phase of an autoless city will include the vigorous recruitment of people and businesses from other existing cities. Advertising campaigns, recruitment and information offices, touring displays, and extensive website displays are a few means of actively promoting this growth. Prime locations for such campaigning are cities that have set urban growth boundaries and cities that are experiencing negative impacts from overly abundant growth.

## THE BENEFITS OF AUTOLESS CITIES IN UNDERDEVELOPED NATIONS

The creation of autoless cities in underdeveloped countries could have some very important benefits. The efficiently organized and humane accommodation of millions of urban and rural people, as well as refugees and displaced persons, into desirable new autoless cities would be a significant benefit. Rural to urban mass migration has taken on astronomical proportions in developing countries in the last few decades. Large cities, ill-equipped to adequately accommodate the influx of millions, have been shouldered with this task. What these countries and poor people need is a relatively inexpensive way to assimilate urban bound masses into new cities that have expected future higher standards of living and low environmental impacts. Third world governments should plant the seeds of new autoless cities and watch them grow.

Developing nations have the opportunity to bypass the environmental mistakes that industrial nations have made during their quest for higher standards of living. Avoiding the infinitely evolving urban landscape, namely the automobile landscape, would be a wise alternative. Environmental degradation and over consumption of resources have been a hallmark of industrialized nations. Modern industrialized cities have gained the hard won knowledge that polluting first and cleaning up second is not a wise choice.

For developing nations, the creation of autoless cities could be as simple as laying out whole cities as squatter communities. This process would require at least the following operations: dedication of public right of ways; platting of private property; construction of rudimentary infrastructures; establishment of a municipal government; establishment of a few core employment centers; and the fair distribution of free land. These operations would not require a great deal of public investment. They would, however, require a good planning effort to assure a well conceived urban design. Rudimentary infrastructures could be as simple as a central public water well, cooking facility, public restrooms, solar hot water system, and space for a community market; plus, a gravel road network for buses and freight moving vehicles. This type of bare bones approach would provide millions of underprivileged people an opportunity to reach a decent standard of living with relatively little government assistance. This minimal infrastructure could gradually be improved over time to eventually be of the highest standard. This kind of development would avoid many of the pitfalls that modern auto oriented cities have suffered, particularly the consequences of poor planning and environmental degradation. It would also avoid inherent problems and inefficiencies of past squatter communities that have established themselves with little or no consideration for holistic urban planning.

There would likely be significant differences between autoless cities in developing nations and those

built by industrialized countries. Their rudimentary infrastructures would contrast with the types and quantities of infrastructure and amenities furnished in an autoless city in the United States or another wealthy country. It is presumed that different countries would develop new cities in keeping with their capacity to finance them. There have been, and may continue to be, exceptions to this. Poor countries have been known to build very lavish public works projects. However, industrial countries would most likely build brand new cities with greater amenities and more modern infrastructures, while developing countries would most likely build within tighter monetary constraints. Over a period of time, these deficiencies could be overcome and better standards of living could be achieved. As time passed, and the well being of people in these new cities improved, standards of living and levels of service and numbers of amenities would also increase. **It is conceivable that in only one or two generations standards of living in new third world autoless cities could rise to near industrial nation levels. This would be a remarkable achievement and would offer tremendous hope for the majority of the impoverished people on this planet. The inherent efficiencies of a well planned autoless city would help make possible these rises in standard of living.**

### **OPEN SPACE AND RECREATION**

One of the greatest advantages of Pedestria is the abundance and dispersion of open space and recreation facilities. **This is a city where numerous types of recreation and natural open spaces are within easy walking distance of absolutely all citizens. Nowhere in the world is there a city of this size that can boast such a quality.** The enjoyment and benefits of all forms of open space and recreation are immeasurable. People's standard of living and quality of life are integrally intertwined with the amount and availability of these outdoor amenities.

Areas of natural open space scattered throughout Pedestria provide natural beauty close at hand. This is an educational tool as well as a back drop for a variety of outdoor recreations (i.e., hiking, biking, horseback riding, bird and animal watching, plant identification, not to mention a setting for solitude and contemplation). The pieces of natural open space (wild space) scattered throughout all parts of Pedestria will give residents a first hand experience with the natural world and help create understanding of many of its wonders. This will give rise to an appreciation of nature and mankind's place on this planet.

The manicured park space throughout Pedestria also provides a lovely natural setting, along with opportunities for recreation and various park activities. These activities include lawn games, picnics, sunbathing, and relaxation. The athletic fields provide athletic opportunities and challenges for those interested in a variety of sports. Garden and orchard space provide another hobby/recreation opportunity and also can be the back drop for educational opportunities. Agricultural products from these urban gardens can help people be more self sufficient or can even provide them with a source of supplemental income. (This could be especially important in developing countries.)

Intertwining of all types of open space and built up areas is an important component of Pedestria's land use configuration. Open space serves as a geographic separation between residential communities. It provides the necessary land for pedestrian and bicycle pathways to safely access all parts of the city, and it provides an abundance of recreational amenities for every community and the entire city.

### **MISCELLANEOUS POSITIVE RESULTS OF AN AUTOLESS CITY**

The use of Pedestria's central core and neighborhood centers at all hours of the day and night will be a tribute to its strength and vitality. High density centers of mixed use, teeming with office, retail, transit, and residential space, will create a dynamic city. This is in contrast to many auto oriented cities whose downtown areas become devoid of people after the 5:00 pm exodus to the suburbs. This 24 hour vitality will create many advantages, from crime prevention to increased tourism to a stronger sense of community.

The compact and centralized downtown area will create a good climate for the business community, since it has excellent freight and transit systems as well as many different urban functions within close physical proximity. The existence of modern utilities, communication systems and abundant public infrastructures, along with an extremely livable environment, should generate considerable interest in this new city by business and financial institutions.

One advantage of building a city from scratch is that modern amenities can be put in place at the city's founding, and thus they can be implemented throughout the entire city. It is easier and more cost affective to incorporate features initially than to add them later on. An amenities implementation strategy begun at the conception of the city can be instrumental in achieving this. A good example would be the adoption of requirements similar to those established by the American Disabilities Act of 1990, which requires cities to construct architecturally barrier-free improvements. Such a requirement in Pedestria would assure access for the physically disabled throughout the entire city. These same types of strategies could bring other benefits to the

city, such as a city wide recycling program, a dedicated homeless community, or a city wide communications network (i.e., wi-fi).

Designing a city from scratch also has the benefit of giving the city an opportunity to deal with homelessness in a way that few cities can. As mentioned earlier, the designation of a part of town or even a complete community (camptown) for the homeless is a very real possibility. This would not only be beneficial to the city, but would better serve this segment of society than most existing municipal approaches.

By the nature and design of the city, Pedestrians (those living in Pedestria) will be more active, less sedentary, and generally more physically fit than people in auto oriented cities. Everyone in this city will have to walk. Walking considerable distances every day will be part of normal life. Although such activity doesn't guarantee great physical fitness, it does establish a baseline of exertion that will help prevent many of the health ills of a sedentary lifestyle. Because of this, it is likely that the citizens of Pedestria will have a very strong emphasis on good health and a vigorous desire for physical fitness.

Another miscellaneous benefit in Pedestria is the



People engaging in outdoor activities - Walking, jogging, cycling

overall value of citywide access for everyone. This high level of access is due to the efficient nature of the city's design and its mass transit system. **The ability for all citizens, rich or poor, athletic or handicapped, young or old, to have free and frequent access to all urban amenities and opportunities, is a virtue no other city can claim.** For individuals to be able to seek employment, education, or housing in any part of the city they so desire, without transportation barriers, it is a true measure

of total city wide mobility. Everyone has great access to everything, at any given time, with convenience, and at the best price (free at the fare box, but paid for via property taxes or other taxes).

## SOCIAL ATTITUDES AND ACCEPTANCE OF AN AUTOLESS CITY

One of Pedestria's greatest qualities will be its residents' attitude toward their city and their enthusiasm for a brand new urban lifestyle. All the positive attributes of this city will join together to make it an incredible urban environment with an unsurpassed quality of life. The accumulative value of these positive attributes, both large and small, will magnify the inherent quality of life. The initial concept of an autoless city may be met with skepticism, but as people actually begin to reside there, their attitudes will likely change. Pedestria's sustainability, its non-polluting and stable nature, and its abundant amenities, will all contribute to people's appreciation of the city.

One important attribute that has social implications is the significant decrease in the cost of living. In Pedestria, the reduction of individuals', and thus society's, overall costs by approximately 15% has significant implications. Virtually all urban problems can be addressed (at least in part) with the help of these monetary savings, if not directly, then indirectly through association.

Long term assurances of a high quality and sustainable urban environment filled with a multitude of amenities are important to people. Little things make life here more enjoyable: the absence of auto related hassles; safe and convenient access to community stores, services, friends, and neighbors; no need for parents to chauffeur their children everywhere because of street safety and fear of crime; and the ability for many citizens to travel throughout much of the city without regard to inclement weather. Employment, recreation, and natural beauty close at hand, educational and cultural opportunities accessible to all, community volunteerism, and a strong sense of community pride are all virtues that create an ideal community atmosphere.

Pedestria will be unique and like no other city on earth. Its physical arrangements and transportation systems will be distinct from all other cities, regardless of their size or cultural heritage. This uniqueness will be an attraction for tourists, people in search of new opportunities, and for those seeking a better lifestyle. Pedestria's clean, sustainable environment and its streamlined infrastructures, plus its less expensive nature will be a draw for both businesses and entrepreneurs of all types. This attractiveness will be important to Pedestria, particularly in its formative years.

## **REAL LIFE SCENARIOS**

To help the reader better understand life in Pedestria, I will give two examples of possible real life situations. The first is an example of a resident in a conventional auto oriented city whose occupation is dependent upon the use of a vehicle. The second is an example showcasing a typical family living in Pedestria. Both are intended to help illustrate daily life in this new city. Understanding how an autoless city truly works for families, individuals, and businesses is best done at this basic level.

### **VEHICLE DEPENDENT BUSINESS**

This example is that of a building contractor. In conventional cities, this occupation absolutely demands the use of a vehicle. It requires a minimum of one pickup truck, but for larger contractors it may also include a multitude of large and small trucks, vans, trailers, and motorized construction equipment (backhoe, dump truck, etc.). These vehicles, imperative for the occupation, are used to transport people, supplies, and equipment, and to do various types of work.

In Pedestria, need for these kinds of vehicles is recognized and allowed, since they are necessary for carrying out the duties of this and many other occupations. A building contractor would be allowed to own and operate vehicles and motorized equipment in Pedestria. However, the contractor would not be allowed to use these business vehicles for trips of a personal nature, including trips from home to the office or from home to the job site. The primary means of limiting the contractor and his employees from using these vehicles for personal use is to prohibit them from being parked at their homes. Parking throughout Pedestria is very limited, both in number of available spaces and in the allowed duration. Violations are firmly dealt with. Vehicles must be stored over night at either the company yard or in public or private storage yards. Company yards are located in the city's industrial district; public and private storage yards are located in either the industrial district or in the gateway communities (C5, I6, L3). In certain cases, construction permits will allow some vehicle storage at the construction site.

In Pedestria the building contractor is allowed to base his business at home, at least in part or on a small scale. Some aspects of the contracting business allowed in a home office are reception, accounting, etc. For a small scale contractor or handyman, a portable tool box that could be stored at home might be all that is needed to carry out business. However, for a larger scale contractor an actual business office is much more appropriate than a home office. Plus the storage of vehicles, equipment, and supplies at home are totally incompatible with residential land uses and are incompatible with the city's transportation goals. They are strictly prohibited. A contractor working out of his house or from an office

would, in either case, have to store his equipment and supplies at an appropriate location in the industrial sector or one of the gateway communities. The contractor and his employees would have to journey from home to the storage yard before driving their equipment to the job site. If the vehicles were stored at the job site itself (via special permit), the workers could journey directly from home to the job site or from the office to the job site. These business vehicle parking arrangements uphold the city's transportation goal of restricting personal mechanized vehicle travel.

### **DAY TO DAY FAMILY LIFE**

This next example is intended to show how an average family of 4 manages without automobiles in their daily lives. The main emphasis is not on the family's activities, but rather their journeys to and fro. Method of travel and travel time are discussed in terms of how they improve or reduce quality of life. Travel for special occasions and travel done collectively by the family are also discussed. Refer to side 1 of supplementary map for locations described in this narrative.

Our example family is the Smiths, a family of 4 who live in the residential community of Blue Jay (N5) in a townhouse apartment (A). The Smith family consists of the father, John, who is a blue collar worker in the city's industrial section; the mother, Nancy, who works part time in the central core; the 15 year old daughter, Brenda, who's a sophomore in high school; and the 4 year old son, Billy, who's in pre-school. They also have a family cat named Scratch.

On work days John gets up at 5:40 am and spends approximately 1 hour getting ready to leave for work (dressing, eating, and checking the computer for news and emails). His journey to work (B) consists of a 3 2/3 minute walk (1000 feet) to the community center bus stop; a maximum wait of 3 1/2 minutes for the bus (2 minute average); a 7 2/3 minute bus ride to the #2 central core terminal; and a 3 2/3 minute walk (1000 feet) to his work. On average, John's journey to work (door to work station) takes about 19 to 20 minutes. This is an average journey to work in Pedestria, for both time and distance.

John begins work by 7:00 am. His travel time is usually very consistent, but inclement weather, such as heavy snow or ice, does add to it. John, who lives toward the outer edge of the residential community, must dress for and walk in all kinds of weather conditions. John's journey home in the afternoon is basically the reverse of his trip in the morning, so the total trip time is approximately the same.

John takes a full hour lunch break. This gives him ample time to eat, as well as converse or play cards with his fellow workers, or read. If he needs to run an errand, the entire central core and most of the residential communities are within reach during that hour. Running an errand on the opposite side of the central core (C), would take approximately 45 minutes round trip just for travel. And it would, of course, be free. This journey

would consist of a 3 2/3 minute walk from his work (1000 feet), a bus ride (including wait and stops) of 9 minutes, and a 9 2/3 minute walk (2600 feet) to his errand destination. 45 minutes of travel time would leave him up to 15 minutes to complete his errand. This might force him to eat lunch on the bus, but for occasional important errands it might be necessary. Most of the central core is more easily accessed from John's work, so it would take less time, and he could also run errands after work during his trip home.

Nancy begins her day shortly after John. Rising at 6:15, she spends her morning eating her breakfast, serving breakfast to the children, and helping them prepare for school. Her high school aged daughter (Brenda) is off to school on her own, but her preschool aged son (Billy) needs to be taken. Nancy does part time work downtown in the mornings for a non-profit organization. On her way to the bus she drops Billy off at the local day care center in Blue Jay's (N5) community center. This is a 3 2/3 minute walk (1000 feet). She then goes to the bus terminal and has a wait for the bus of 2 minutes (average for this time of day). She then has a 12 1/2 minute bus ride to #7 terminal. From here the journey to her office building (D) and desk takes an additional 4 1/2 minutes. It consists of walking, moving sidewalk, escalator, elevator, and another short distance of walking. She works as a secretary in a 10 story building on the 5th floor, beginning at 9 am. Her total journey from door to desk (excluding time at the daycare) takes approximately 21 to 22 minutes. This travel time is very consistent and is free. She generally works four hours, until 1:00 pm. The return home takes approximately the same amount of time as the morning trip.

After work it is not uncommon for Nancy to run errands, shop, or meet a friend for lunch. She may do this downtown or back in Blue Jay's commercial district. After picking up Billy, they eventually return home early or late afternoon.

Nancy does most of the family's major grocery shopping on a weekly basis. On that particular shopping day, after work, she will pick up Billy at day care, and the two of them will grocery shop at the local supermarket. It is the local supermarket's policy to allow patrons to push their shopping cart home with them. The store then hires a person to scour the community daily with a vehicle and pick up the shopping carts. Most grocery stores throughout Pedestria have adopted this policy. Nancy has a specially made plastic tarp that covers the shopping cart and protects its contents from rain while en route home. During winter days, when there is snow or ice on the ground, Nancy may pay one of the local delivery haulers (freight taxis) to deliver her groceries for her. However, snow days are not very common in Pedestria, and usually the snow is shoveled from sidewalks quickly.

For grocery or miscellaneous shopping trips in the central core or other residential communities, there are

several options for transporting sizeable or numerous packages. The Smiths own and use a small fold-up shopping cart for some occasions. In order to get home with heavy bags, they can take this type of cart on public buses. However, there are limits to the number and size of packages that are allowed on regular passenger buses. If their packages exceed the bus system's allowable limits, they can either have them delivered (if the place of purchase has home delivery which is common) or they can hire one of the local delivery services to drive them and their purchases home. This is usually accomplished with a small golf cart or a conventional pickup or van.

The Smiths also have occasional shopping forays that result in very heavy or cumbersome purchases. Since they have no automobile or pickup truck, this absolutely necessitates home delivery or hiring a delivery service. This is true for items such as refrigerators, sofas, washer and dryers, lumber, etc., and is not unlike what the majority of people in auto oriented cities must do. These types of purchases are usually infrequent for an average family like the Smiths.

Brenda, the Smith's 15 year old daughter, is a sophomore at Wet River High School (HS in N4). Brenda is mature enough to get herself up, eat breakfast, and prepare herself for the school day with only a little coaxing from her mother. She is off to school a few minutes after 7:00 am, and typically rides her bicycle. The journey to high school is 1.1 miles, and Brenda can get there in about 7 minutes. She has a basket on her bike and can carry a backpack to haul her books and things. To secure her bicycle at school, she has a high quality lock. She likes to get to school a little early to meet with friends and socialize.

During the winter months when daylight hours are fewer, Brenda's folks don't feel comfortable with her riding to school through the park in the dark. So during those months, she walks to Blue Jay's transit terminal, rides the bus to N4, and then walks from there to school. This takes a total of 14 1/2 minutes (door to door).

Like most teenagers, Brenda has a variety of after school activities: sports practices and games, studying in the library, after school clubs and plays, going to a friend's house, or occasionally coming straight home. Therefore, Brenda gets home at a wide variety of times during the school week. She can walk, bicycle, or use transit to get to and from all these activities, on her own, safely, and at no cost.

Billy, the 4 year old son, also has a weekday routine. While his mother is working, he is at the local community day care center. After she picks him up in the afternoon, he usually does one of the following: stays home with his mother, has a friend over to play, goes to a friend's to play, or takes a nap. For friends that live within sight of their home, Billy is old enough to walk by himself, but for further distances or after dark, Nancy walks with him. His mother's escorting via the bus does affect the frequency that Billy plays with more distant friends.



On weekday evenings, when most or all of the family has returned home and eaten dinner, the Smiths can enjoy some free time. Evenings may be filled with any number of activities. Weekends are similar to weekday evenings because they are less scheduled and are considered mostly free time. Activities for the Smiths are similar to those of most families and may involve part or all of the family. Many of these activities require a journey away from home. For trips in or adjacent to Blue Jay, travel may include walking or bicycling. For trips downtown or across town, bus trips are usually the fastest and easiest. If time and energy are sufficient and the weather is pleasant, then bicycling is also a possibility for these longer distances.

Periodically the Smiths have special occasions that break from the typical week and weekend routines. These infrequent events create special transportation needs. One of these is the Smiths' vacations, which are either spent at home or out of town. For out of town trips they have a number of transportation options. For distant trips they can fly, take a train or bus, or rent a car. For shorter trips they usually take the train or rent a car. In any case the Smiths must get their luggage or belongings to these points of departure (airport, train station, bus depots, or car rental companies). They can either carry or wheel them via the transit system, or on rare occasions when they have an exorbitant amount of luggage they can pay to have them hauled to their departure point by one of the local delivery services (of which there are many). Total one way travel time to the airport for the Smiths' is about 28 minutes. Travel time to the most distant point in Pedestria (J6) from their home takes about 50 minutes (one way).

None of the Smiths have driver's licenses, because they don't have a need for them in Pedestria. When renting a car for trips, Mr. or Mrs. Smith get a temporary license, plus temporary insurance. The car rental companies have a small practice area for neophyte or rusty drivers. Special use permits can be purchased when renting a car that allow the driver to take it home to pick up gear and passengers, and to unload it prior to returning the car. The special use permit and fee are a means of monitoring and limiting this occasional private use of automobiles in the city.

Other special occasions also warrant special transportation needs for the Smiths. Funeral processions in Pedestria are without the string of private automobiles being lead to the cemetery. In Pedestria the funeral home can provide vehicles and drivers or they can provide special bus transportation. The need for a procession can be eliminated all together by holding the entire service at the cemetery.

Another special transportation need for the Smiths is when they have a large family get together and Uncle Fred attends; Uncle Fred is in a wheelchair. Fortunately, Pedestria is one of the best cities for physically disabled people. The entire city, including the transit system, has been designed and built with these considerations in

mind. When Uncle Fred comes to town he is met at the airport by one or more family members and then accompanied to the Smith's home via transit. If Fred is not met at the airport he can ride transit to their house unaccompanied.

Inclement weather is another potential travel concern for the Smiths. Those who live in Pedestria's central core or in a residential community commercial district bordering covered streets are little affected by wet, snowy, or icy conditions. Although the covered streets may be unheated they afford pedestrians the luxury of leaving rain clothes, boots, and umbrellas home for most journeys throughout the city. The Smiths, on the other hand, live near the outskirts of the Blue Jay community. From there the nearest covered walk is 750 feet away. Therefore, taking precautions for varying weather conditions is part of everyday life for the Smiths.

## **RESULTS OF THE FIRST SUCCESSFUL AUTOLESS CITY**

In the event that an autoless city is built someday in the future, its success or failure would have lasting effects on the future of urban planning and would affect any additional attempts at autoless city development. A successful prototype would certainly renew interest in the "new town movement" and the development of more autoless cities. It would establish a standard and become a model for future new towns to emulate and improve upon.

A successful autoless city would also have positive effects on future urban planning in existing automobile oriented cities. Some of these effects could be beneficial in helping reduce dependence on automobiles, and helping become more environmentally benign, sustainable, and human oriented. Other possible effects on existing cities could be a new urban growth emphasis based on compaction, consolidation, and clustering of development; establishment of firm city boundaries; establishment of stringent growth management programs, including no growth policies; the eventual participation in a reproduction program for new autoless cities; a new emphasis on mass transportation; and development of regional master transportation plans. With a proven example to follow, existing cities would have a variety of new directions to take in trying to improve their urban environments.

The complete effects and ramifications of a successful autoless city on existing cities is a fascinating but overly broad topic, beyond the scope of this book. A successful autoless city would hopefully generate attempts to replicate its success. Copying the first city's design features, city charter, and administrative organization would be paramount for those wishing to build other autoless cities. Imitation of this prototype, along with customization for local geography, culture, and economy, would be a good thing and should be encouraged and assisted. The development of subsequent

autoless city projects in the U.S. or abroad would be advanced by the availability of detailed documentation of the first autoless city's development. This documentation might include explanations, narratives, recommendations, and examples. It might discuss topics such as goals and objectives, events and proceedings, problems and successes, design intentions, and schedules and milestones, all valuable information to designers of subsequent autoless cities. Sharing this developmental information would speed the creation of more sustainable cities throughout the world. The recording of historical and procedural documentation of the first autoless city could initially be the responsibility of the city's prime developer and could be funded as a part of the city's overall development. Eventually the responsibility of updating, archiving, and disseminating this developmental record could be handed over to the new city government and could be a function of the city's reproductive bureau. This valuable information would be another positive result of the first autoless city.

# CHAPTER 8

## **AN AUTOLESS CITY BECOMES A REALITY**

The final chapter briefly discusses many procedural elements necessary for creating a brand new autoless city. It is not intended to be a complete dissertation on this topic; entire books could be written about building a new city with all the ramifications necessary to accomplish such a feat. This chapter only expresses the main steps for establishing a new autoless city and highlights a few recommendations.

### **WHEN IS A NEW AUTOLESS CITY APPROPRIATE?**

There are a number of situations when it is either appropriate or absolutely necessary for a brand new city to be built. All of these have occurred in the past in various parts of the world, and it is likely they will occur again. The most compelling reasons for building brand new cities have been, and still are: to attempt to alleviate overcrowding in existing cities; to attempt to increase economic opportunities; and for the reconstruction of cities destroyed by war, natural disaster, or dam reservoirs.

Reconstruction of war torn cities in Europe led to the development of several new town projects. The British New Towns Act of 1946 was the most notable catalyst of this development. Many of the new towns were built as satellite-cities (adjacent to existing large urban areas), but some were stand alone. These communities were helpful in alleviating overcrowding, stemming development pressures elsewhere in their respective countries, providing new housing, and creating new economic opportunities.

The creation of new economic opportunities has always been a goal in building new cities. Economics always plays an important role in any kind of development, whether it is the development and construction of one building or the assemblage of an entire city. Profit motive, real estate speculation, the development of new industries, alleviating unemployment, and stimulation of the overall economy, all fall into the economic opportunities category. Historically, most new towns, satellite cities, large planned unit developments and the like have been built with speculation and profit motive in mind. This trend will continue and could someday be an important justification for developing an autoless city. National governments and large development corporations have both attempted development of new towns and have been met with various degrees of success.

Settling new territories and sparsely populated regions is another incentive for building new towns or cities. This was done quite commonly during colonization of the frontiers of North and South America during their

formative years. A more recent example of this is the development of Brasilia, Brazil during the 1960s and 1970s. Brasilia, as a new national capital, was in part created to open up some of the interior of the country.

Another appropriate time and reason for developing a new city is when an existing city is relocated because of large public works projects. Dam construction is a primary example. There are a number of small and large cities throughout the world that have been relocated and rebuilt because of a rising reservoir. The construction of the Three Gorges Dam in China, which forced the relocation of numerous villages, towns, and cities, is a good modern day example of this.

Another reason for building a new city is that of relocating a national capital. Brasilia, Brazil and Canberra, Australia are two modern and prominent examples of governments building large cities to house their national government. The relocation of a nation's capital might be based primarily on economic reasons, but might also be based on the need to modernize or boost national pride. The relocation of smaller government units, such as state or provincial, might also warrant the building of a new city.

A final reason for building a new city is because of disaster, whether natural disaster or manmade. Over the centuries both have occurred on a frequent basis. Natural disasters include earthquakes, floods, fires, volcanoes, tsunamis, and hurricanes. Manmade disasters causing widespread urban destruction are either conventional or nuclear warfare. All of these disasters have struck with sufficient force and devastation to destroy entire cities. When these disasters strike and the time comes to rebuild, it is an opportunity to rethink the old city configuration and update to a modern autoless city.

### **ORGANIZATIONS INVOLVED IN NEW CITY DEVELOPMENT**

A variety of organizations could become involved in the creation of a new autoless city. In large scale developments, there could be dozens of companies and organizations providing input and assistance. However, there might be only a handful that are qualified and interested in becoming the primary developer or prime contractor. Primary developers organize, control, and oversee the numerous processes involved in creating a new city from start to finish. They can be governments, government agencies, or private organizations, either for profit or non-profit. The primary developer could also be a consortium of organizations.

Governments and/or their different branches could be primary developers in new city development, including municipal, state, federal, and special agencies. A variety of government agencies have been created in the U.S. and foreign lands to promote, facilitate, and create new development. In the U.S., some notable examples are: Federal Housing Administration (FHA); U.S. Department of Housing and Urban Development (HUD); and the Army Corps of Engineers. They have created large housing developments, urban renewal areas, planned unit developments, and large scale public works projects.

Private organizations have also been involved extensively in creating new towns and large planned developments. Profit is most often the driving motivation behind these large real estate projects. Private companies have a long history of private property development and various large scale urban development projects. They include real estate developers, construction companies, engineering and planning firms, and large investment firms (banks and insurance companies). Large private property owners might also be involved.

There is also the possibility of non-profit organizations becoming involved in large scale urban development projects. There are several non-profit organizations that are well funded and have important agendas which they wish to promote. The development of a project like the creation of a new city might advance these agendas very well. Religious and environmental groups are two such non-profit organizations that may have the capital and interest to become involved. Currently there are few large scale examples of communities created by non-profits. However, there are some small scale community developments that have been created by religious organizations. These are usually small close knit communities developed for their members. Creation of an environmentally benign and sustainable city certainly runs parallel with some environmental groups' goals. Creation of a large scale autoless development could lead the way to a better urban arrangement and better human living conditions, setting a developmental example for the world. This type of project could be part of the logical progression of the environmental movement.

The possibility also exists that developing a brand new city of Pedestria's magnitude will be accomplished by a multitude of these different organizations (government, private, non-profit, etc.). A complex and massive undertaking of this nature will require an equally large and complex effort to succeed. This effort will need extensive organization, planning, financial backing, government cooperation, public input, construction management, etc. Therefore, a consortium of several different types of organizations, each contributing specialized expertise, will most likely be the best means of creating a brand new autoless city.

## **DEVELOPING AN AUTOLESS CITY**

The following is a generalized list and discussion of planning stages and milestones that are necessary for the

realization of a brand new autoless city. These are important steps that need to take place prior to the actual construction. They are listed in roughly chronological order, but may be worked upon concurrently.

### **INITIAL PLANNING STRATEGIES**

When an organization(s) takes on the challenge of building the first autoless city, it must decide upon a number of important planning strategies prior to actually designing the specifics of the city. Initial planning is the conceptualizing and formulation of goals, strategies, and ideas that will be the general basis for development. Most initial planning strategies should be in place prior to acquiring the city site. Some of the first questions to be resolved will be: What are the extent and details of preliminary design and planning? How detailed must the initial comprehensive plan, city charter, and other early stage planning documents be to ensure a workable and successful new city? How much planning will be purposely left for the city's government to handle later? What are the limits of public planning, and how do they interact with private property planning? What are the boundaries between government regulation of private property and the personal rights of private property owners in exhibiting their own decision making powers? Other major concerns early in the planning process are: Should the city incorporate finite strategies (like those discussed in Chapter 5)? If so, can all surrounding jurisdictions be in agreement (legally bound) to maintain the autoless and finite nature of the city? Can a single and separate city government entity be created for this brand new city? What are the expected roles and impacts of private enterprise, land speculation, and other economic issues upon the development of the city? Preliminary thought should also begin on issues such as the city size, configuration, and transportation systems.

The primary developer will have to make calculated estimations and predictions about which strategies to pursue. An in-depth understanding of the possible avenues to follow will be a prerequisite to good preliminary design work. Contingency plans for unexpected circumstances should also be explored. There may be many ways in which to achieve the overall desired outcome.

The following is a list (for the primary developer) of important planning and development milestones for the creation of an autoless city. The order of this list is subject to variation, and many of these tasks can be worked on concurrently. This is not an exhaustive list.

- Define the overall end goal for the city and specific minor goals sought along the way.
- Map out a strategy for goal achievement.
- Research potential sites.
- Acquire financing for procuring the site.
- Make county, state, and federal government arrangements.
- Create a city charter and have it approved by the state legislature.
- Procure the site (the land).

- Create city policies and mandates, such as the Comprehensive Plan, Active Growth Policy, Limited Growth Policy, and Reproductive Policy.
- Design and engineer much of the city's public infrastructure in detail.
- Plan the site's phases and staging.
- Secure financing and/or funding sources for necessary infrastructure expenses.
- Create other legal ordinances and statutes.
- Begin construction of the initial infrastructures, including transportation systems, utilities, and even some municipal buildings.
- Promote investment and development by private enterprise.
- Sell and/or give away property to individuals and businesses (small and large).
- Establish the city government.
- Turn municipal operations over to the newly formed city government.
- Document all the proceedings, methods, and details considered in the founding of the city, and make them available to the public.

#### FINANCING THE LAND AND THE CITY

The type of organization that takes on the role of primary developer may affect the methods of financing that are pursued and the way in which they are secured. Prospective financiers may include: federal and state agencies; investment groups such as banks, insurance companies, consortiums of developers, real estate firms, private investors, and pension funds. Other possible methods of financial procurement are stocks, bonds, grants, donations, tax revenues, and special levies. Creative financing avenues may include profit sharing arrangements, direct land trades, and international or national debt for land trades. All of these methods are applicable to securing a large tract of land for developing a brand new city.

One of the most important sources of financing in a new autoless city will be private individuals and corporations. Private enterprise will purchase and develop the majority of developable property within the city. As in most cities an autoless city's total private sector investment will be far greater than its public sector investment. These private investors must first become aware of the autoless city concept and its attributes. They must become thoroughly convinced that investing here would be a prudent venture. (This is equally true for public financiers.) A strong incentive and promotional effort will have to be undertaken by the primary developer to create a genuine interest in investing and relocating to this city.

Advertising the advantages and virtues of an autoless city in numerous media outlets would help spread the word about the city. Special news reports and feature articles on the opportunities available in a Pedestria type city could be a powerful means of promulgation. The primary developer

should take advantage of and maximize these venues to their fullest.

Special incentives may also be needed to attract interest and commitment toward an unproven concept such as an autoless city. Lucrative incentives would be the most affective and could help overcome skepticism and uncertainty. Economic incentives could range from direct subsidies for design and construction, to providing public infrastructure with little or no private property assessments. Examples of economic incentives include reduced or deferred taxation incentives, land give-a-ways, minimum start-up building requirements, and relaxed start-up building codes. Inducements such as these would require guidelines to insure fairness. In particular, free or no cost incentives would need strings attached to assure compliance with the city's long-range goals; these would likely include financial performance guarantees and performance bonds. Rules for minimum start-up building requirements also need enforcement to ensure future compliance with final/ultimate building requirements. Undersized or substandard construction of temporary housing could be allowed initially, but eventually complete building code compliance would need to be achieved to avoid a penalty.

Another means of helping finance a new autoless city, after initial start up has been successful, is to direct profits or collected taxes into the later stages of the city's development. Directing monies back into the improvements of the city (recapitalization) can be done by the primary developer, the newly formed city government, or by private corporations. This may be voluntary, or it may be involuntary via taxes and fees designated for recapitalization. From the city government's point of view, putting tax monies back into capital improvements and city services is simply a government responsibility. From a non-profit organization's (as primary developer) point of view, this is adherence to the basic philosophy of philanthropic action. From a profit-oriented developer's point of view, redirecting profits back into expansion is sound business.

#### ACQUIRING THE LAND

A major task in creating an autoless city from scratch is the acquirement of land (or mass assemblage of land) for the city. Regardless of who or what type of organization develops the first autoless city, there are numerous aspects to be considered in purchasing the site. There are also a variety of ways in which property can be procured.

Site selection is the first order of business in acquiring land. Prospective properties must be chosen based on research of their desirable characteristics. Initial surveys and inventories of resources and attributes must be carried out. Also, necessary assurances from local, state, and federal governments to facilitate the administrative needs of the new municipality must be judged. Issues such as the preservation of non-urban land outside of the new city's boundary and the granting of the city's charter are of

utmost importance. The site selection process must analyze and compare the pros and cons of each prospective location. The more pertinent and detailed the information about all potential sites prior to making a legally binding commitment, the wiser the decision, and ultimately the better for the new city.

Alternatively, there is also the possibility of purchasing a small existing, incorporated, auto oriented city with the goal of converting it and vastly expanding it into an autoless city. Outright purchasing of the city may not be necessary if the citizens and the town's governing body are thoroughly committed to an autoless and finite format. Redesign and reconstruction of an existing small town or city into a much larger autoless city has advantages and disadvantages.

For one, it can eliminate the purchasing and transferring of some of the land. Also, if most of the existing streets, buildings, and infrastructures can be easily incorporated into the large autoless city configuration, then considerable savings can be made. There are also advantages to having a pre-existing employment base, particularly if unemployment is high. A sizeable unemployed yet skilled populace would represent an available work force for the primary developer. It could also make the citizenry of the town more receptive to experimenting with this new concept of the autoless city. However, the high unemployment figure might also make potential investors skeptical.

There are also significant disadvantages in trying to incorporate an existing city into the plans of a future autoless city. The chief difficulty is getting the citizenry and the governing body to be thoroughly committed to the idea, since it is an unproven theory. It requires a very long term, steadfast commitment, and it also poses a high degree of personal and economic risk for the community. This scenario of existing city conversion might be a better possibility for subsequent autoless cities rather than for the very first one. Once the concept of a new autoless city has been tried, succeeded, made familiar, and been documented, it will be much easier to convince a town's population to undergo such an endeavor. The challenges of converting a small or large auto oriented city can then be attempted.

The method and timing of property acquisition are of great importance to a new city's successful outcome. The property necessary for Pedestria (a city of 500,000 people) is 37.61 square miles (24,072 acres). This is a very large piece of real estate, and its procurement would be a major hurdle for the primary developer. Obviously, an autoless city designed for fewer people would be proportionately smaller in area.

The primary developer can take a number of approaches to acquiring a large parcel of property. The main options are outright purchasing, land for debt or land for land trades, donations, and assignment of rights.

One of the best means is the outright purchase of one or more properties to make up the entire site. Purchasing several very large properties rather than numerous smaller properties can speed and simplify the process, plus keep

costs down. The timing of many small purchases and the possibility of certain sellers holding out for larger sums of money can complicate matters. Contingencies for all properties are likely to be needed. Simultaneous closing and successful municipal incorporation are two important contingencies for all the properties being purchased.

There is also the possibility of a land trade with private individuals, companies, or even the state or federal government. This could include a land for land trade or a debt for land trade. Land for land trades are a strong possibility with the federal government. Because of its many scattered holdings, the government is occasionally conducive to trading property or selling property to consolidate its land. This can reduce the government's administrative and maintenance costs. Land for land trades and out right purchases have been done in the western U.S. with Bureau of Land Management and National Forest Properties.

Debt for land trade is a recent phenomenon that is occurring with increasing frequency in developing countries. Environmental groups have pioneered this technique. They have paid off substantial international debts in trade for the preservation of large tracts of land for wildlife and botanical reserves. This same concept could be applied to acquiring tracts of land for the purpose of creating a new city.

Land donations are another possible means of assembling the necessary real estate for a new city. There are tracts of private and corporate owned land large enough for an entire city. Donation of such a property or a mutually beneficial arrangement for such a property with the primary developer would be a huge bonanza. Other real estate donations, large or small, near or far, could be traded for other property or sold for money to be used in the purchase of a site appropriate for the city. Land donations would save the primary developer a great deal of up-front expense and could be instrumental in establishing the first autoless city.

It is also possible that the site isn't owned outright by the primary developer prior to the planning and construction of the city. With proper legal arrangements the primary developer could avoid having to buy the land. An individual, company, or government could hold title to the desired property. If the owners of the property were thoroughly committed to the development of this progressive urban scheme they could assign the development rights to the primary developer and/or the eventual incorporated city. The donator of a large piece of property could assign the ownership or development rights to the primary developer. They could also retain for themselves the development rights and ownership of some parts of the soon-to-be city. This would be a form of real estate speculation with development and profit in mind. The land still held by the donors could be sold or developed after the city had begun to take root and property values had increased. This could result in larger profits than if the entire property was sold as undeveloped rural land. For the primary developer this could eliminate the cost of much of the land needed for the city and would

defer it to subsequent individual investors and future land owners.

For governments, condemnation (eminent domain) is a property acquiring option. This aggressive technique is tempered by financial rebates (just compensation). For mass assemblage of numerous properties, this is a proven technique<sup>1</sup>. However, there is often a strong adverse public reaction. Future property give-back options and/or stake holder shares could also be techniques employed to facilitate acquisition of properties.

### CITY CHARTER AND INCORPORATION

This section is not intended to be a comprehensive discussion of all variations and intricacies of a proposed city's government and its legal framework. Nor is it intended to debate or justify the constitutionality of various proposed methods by which an autoless city could regulate its size and population. Rather, it is intended to provide a brief discussion of some important options regarding city charters and other legal/government documents.

In the United States, the city charter is the legal document granted by the state legislature that establishes and authorizes a city's governmental powers. This instrument of incorporation, along with a fixed boundary and the governmental institutions needed to carry out the legal powers granted within the charter, are all necessary to become a fully functional legal city. There are a variety of city charter types, including special charters, general charters, classified charters, optional charters, and home rule charters. Being a municipal corporation gives a city authority to carry out many legal functions, including legislating of laws, election and appointment of officials, and revenue collection. Therefore, the primary developer of an autoless city will need to consider incorporation by the state. A draft of the desired city charter and the request for incorporation should be submitted to the state government at an early date. This will allow time for state review, negotiations, and changes. City charter ratification will be a major contingency in the purchase agreement of the property. Without legal sanction, there is no point in buying property for the city, and the search for another potential site must begin, as well as another attempt at incorporation.

The primary developer will have the responsibility of deciding the type of city government (commission, council, etc.), and also facilitating the creation of numerous legal instruments, including statutes, ordinances, comprehensive plan, policies, codes, laws, mandates, and possibly even a constitution. The city's various agencies will carry out the mandates set forth in these instruments. The municipal government will add, amend, or alter this legal framework as the city matures.

Outside the United States municipal incorporation may vary widely from country to country. But in all attempts at creating a brand new autoless city, incorporation proceedings will need to be given strong consideration.

### DETAILED PLANNING AND DESIGNING OF THE CITY

Once the actual site of the city has been secured, its city charter granted, and its basic legal framework established, then the actual detailed planning of the city can continue in earnest. The overall configuration is the first order of business. Gradually, as the major components of the design come together, greater and greater detail is added. The following is an unranked list of important items which should be taken into consideration early in the design/planning process:

- Final population size of the city
- Overall physical design
- Transportation
- Government (local, state, and federal)
- Location of urban entities
- Zoning and land use planning
- Economics
- Environment and ecology
- Financial constraints
- Construction aspects
- Technology
- Demographics
- Social and public services
- Public works facilities and maintenance
- Energy and waterworks
- Sewage and solid waste disposal
- Private and public utilities
- Cultural considerations
- Growth promotion
- Growth phasing and limitation
- Building construction standards and codes
- Administration

All of these areas of concern are important to the success of the city. Some will require more detailed planning and more intense and immediate effort than others. This will be a huge planning effort requiring a large team of skilled people. A great deal of resource material and information will be necessary to make proper choices and wise planning decisions.

Some important areas requiring concerted effort are the creation of city codes, standards, and policies (building codes, zoning regulations, city policies, etc.). These development restrictions and standards are the genetic material of the city. They pattern the future growth of the city, and therefore are of prime consideration.

An important factor in the planning process that must be addressed is the issue of public participation. At this early stage of an autoless city's development, there are no citizens or residents. There is no "public" in a brand new city prior to its establishment. Yet, public participation is a key element in the vitality of the city and in the voicing of concerns and needs of the future community and its citizens. In what forum will this participation be manifested? There are a number of possibilities. Citizens

from other cities could be selected or volunteer to form a "citizens committee". This could be a network of people from many walks of life who could provide valuable input into planning the city. Another possibility is to hold public forums in various cities around the country(ies) to gather ideas, and possibly volunteers. These could be advertised events inviting city officials and citizens to participate in the gathering of facts and opinions.

Another potential idea for generating outside input is to request help from universities, companies, and specific individuals. This help could range from expert opinions to complete designs for residential communities. University departments of planning, architecture, and engineering might be interested in participating in the design and development of a brand new city. This would be a powerful learning experience for students, particularly in starting from the ground up. This help in designing the city could be mutually beneficial to both the primary developer and the participating schools.

The development of private property is an important issue for a new city's primary developer. Private land owners, individuals, corporations, and families will build most of this new city, one property at a time. Initially, the new city's primary developer will either own the entire area of the city outright or will have legal control of it. Before planning and construction of improvements can commence on individual properties, they must first be conveyed or encumbered by legal means to private individuals, corporations, or the city government. People will not invest time or effort into development plans for property that they don't own or have a legal path to own.

The primary developer can convey ownership of developable parcels by several means. Selling of property to the highest bidder is one possible way. The proceeds of these sales can help finance the planning and construction of the city's many public infrastructures. For a profit motivated primary developer, the proceeds of land sales can cover expenses and produce profits. The sale of properties may also be apportioned over time in different parts of the city, thus maximizing revenues by waiting for parts of the city to become well established before selling off adjacent parts. This speculation could be instrumental in financing public infrastructure and could be an incentive for a company or an organization to become primary developer.

Another means of conveying developable lands to private owners (particularly in the first autoless city) is simply to give some of the property away. This is definitely a non-profit approach and would certainly not be wanting for prospective owners/recipients. Giving away land would be a powerful incentive for prospective property owners and developers. The most important questions regarding this strategy are: What are the best and fairest way to give property away? Are there any special groups that would be best qualified to receive free property? What type of strings are attached? Lotteries could resolve fairness issues; meeting minimum property

ownership criteria could help resolve questions of who is best qualified to receive property.

A variation of the giveaway scenario is to give some land away initially, particularly select parcels, and then sell the remaining parcels later. The initial giveaway would be during the earliest years of the city's development, when doubts of its success might be highest and interest lowest. Once a considerable number of parcels are given away, and the recipients are fully committed and investing their time, effort, and finances into the development of their property, then the selling of subsequent properties might begin.

A very simplified example of the free giveaway scenario is as follows: The primary developer wants to generate interest and investment in the new city by initially giving away selected properties to private parties and/or businesses. Applications for the free property are solicited. There are certain requirements for each applicant, such as income level, employment history, and background check. Diversity quotas must also be met. Once a person is awarded a property certain requirements must be fulfilled before being granted title to the property. If these aren't fulfilled within the time allowed, the applicant forfeits all rights to the property, and the primary developer resumes control. Successful applicants are required to develop the property, that is, to build a house or building that meets all city zoning requirements, building codes, etc. During this process, there are milestones and target dates that the owner needs to meet; for example, proof of financing or a construction loan by a certain date and ground breaking by a certain date. Hopefully the primary developer will stand hard to the requirements to be fair to all applicants and to encourage compliance, but will also be flexible in extenuating circumstances. After all, the goal of the primary developer is to get the city built.

In actuality, a legal contract between the applicant and the primary developer will be necessary for the property giveaway to be successful. This document will be rather complicated and will require a considerable staff to oversee and administer it. Lots of specific details will need to be included or negotiated, such as the right of applicants to camp or occupy the site prior to ground breaking and the transferability of the property prior to completion.

Requirements for the conveyance of private property will help assure that development of property will meet the city's numerous land use restrictions, building codes, and other requirements/goals. Requirements for conveyance of free land may include: approval of preliminary and final plans by all appropriate city agencies; minimum size of development with provisions for expansion; bonding and licensing; time limitations; and progress reports. These requirements may be different for families, individuals, corporations, and hardship cases. Relaxing of requirements or extension of time limits may be necessary in some cases. Limitations on the number and size of parcels a single entity can purchase or be given may also be imposed.



Other means of conveying developable land to private owners and prospective developers is through the use of standard and creative financing methods. Some of these are partnerships, deferred payment schemes, conventional construction loans, and even the sale of stocks and investment funds.

One of the best scenarios for the primary developer (for both profit and nonprofit) would be to sell all or most of the developable properties, particularly if the proceeds could partially or fully pay for the public infrastructure in the city.

### CONSTRUCTION AND PHASING OF THE CITY'S GROWTH

As part of any large urban development project such as Pedestria, provisions need to be made for phasing of development and construction. It is essential to meter out capital outlays over time, spread out the planning effort and construction work load, and allow time for feedback and correction of problems that occur in the early phases.

Staging plans and their accompanying stipulations will be created and implemented by the primary developer and then incorporated into the city's growth policies. They will contain detailed maps illustrating the geographic phasing of the city, as well as legal documents and specifications that explain the obligatory conditions of the staging plans. Phased construction of both public and private infrastructures will begin after these conceptual and detailed plans are complete.

Two important mechanisms for achieving phased development are found in the city's Active Growth Policy. They are the early development minimum height restrictions and substandard building codes. These are in essence time effective exemptions that allow for less than full development standards and relaxed restrictions during the city's formative years. They result in easier and quicker development of the city. Eventually, however, ultimate standards and restrictions are imposed. These are acknowledged and agreed upon by all individual property developers prior to initial development. Compliance with



In its initial stages, Pedestria would see a huge wave of construction.

the ultimate standards is required for conveyance of property from the primary developer to individual property owners and smaller property developers.

The construction of a huge project like Pedestria will require mobilization of scores of small and large contractors. A massive labor force will have to be brought in and temporarily housed until a significant segment of the city is complete. It is likely the organization(s) involved in the city's development and construction will relocate some of their operations (maybe even their headquarters) in the new city. This would be helpful in bringing additional jobs and people into the city and would help stimulate further migration of people and businesses to the city during its formative years. It would also exemplify the organization's strong and pragmatic commitment to achieving the goals inherent in this city.

Development will occur in only limited locations simultaneously and will be metered out in an orderly manner. The city will be divided up into different areas which will be developed at different times. For example, several communities within a residential loop and select portions of the central core might have construction activity occurring simultaneously. Other areas of the city might not have construction begin until these first areas are nearing completion. Habitation will occur as these areas are completed.

The drawing on page 171 is a graphic representation of a possible early stage phasing plan for Pedestria. It is anticipated that the city's development will be continuous, with no planned stoppages. There may, however, be occasional slow downs in activity due to an economic recession or other significant influence. Planning and construction should progress until the final development stages of the Active Growth Policy have been completed and the Limited Growth Policy has been fully invoked.

### **RECOMMENDATIONS FOR DEVELOPING THE FIRST AUTOLESS CITY**

This author's ideal recommendation for a primary developer is a non-profit organization that has the expressed goal or mission of establishing a successful new autoless city. Such an organization would enjoy the tax exemptions of a non-profit. That status would allow it to focus on its benevolent goals for a new city more than a profit seeking organization would. The altruistic ideals for a new city would be best promoted by an organization whose primary goal is to create the best city possible, rather than to maximize profits.

Another recommendation for primary developer is a consortium of environmental and conventional development groups. This organization could be staffed and financed by environmental, development, and other related groups. Historically these groups have had an adversarial relationship, but such a union would utilize the expertise of both groups and increase the chances of

success for developing a benign and sustainable autoless city. Combining these groups into a single concerted team would reap significant benefits for society at large. If the design of this first city adheres to basic autoless city principles, then solutions to a multitude of environmental and societal maladies would ensue. **A partnership between conventional development interests and the environmental movement would be an unprecedented union. It is time for these two groups to come together and set a new standard in design and construction of an environmentally benign urban development.**

A new or existing environmental organization(s) being involved in the creation of a brand new autoless city would be a logical progressive step for the conservation movement. One of the primary missions of the environmental movement is the conservation of all types of natural resources. There is a vested interest in reducing direct and indirect human impacts on these resources. In recent decades, the wider realization that Earth's resources are bound by finite limits has prompted many environmental organizations to advocate sustainable human systems, self-sufficiency, and the elimination of further environmental degradation as primary goals. This philosophy embraces regional and broader ecosystem approaches to environmental issues.

Environmental organizations have been creative in their approaches to promote different causes. They have been instrumental in pioneering new ways to conserve natural resources and open the public mind to environmental awareness, from direct confrontation with fishing fleets on the high seas to swapping international debt for national park formation. Such creative approaches show a willingness to perform whatever legal steps are necessary and effective in reaching their goals. The desire to create an environmentally sound and nearly sustainable urban configuration is in direct concordance with these goals. Creating an exemplary environmentally benign city in either a developed or undeveloped country would be a noble and worthwhile endeavor.

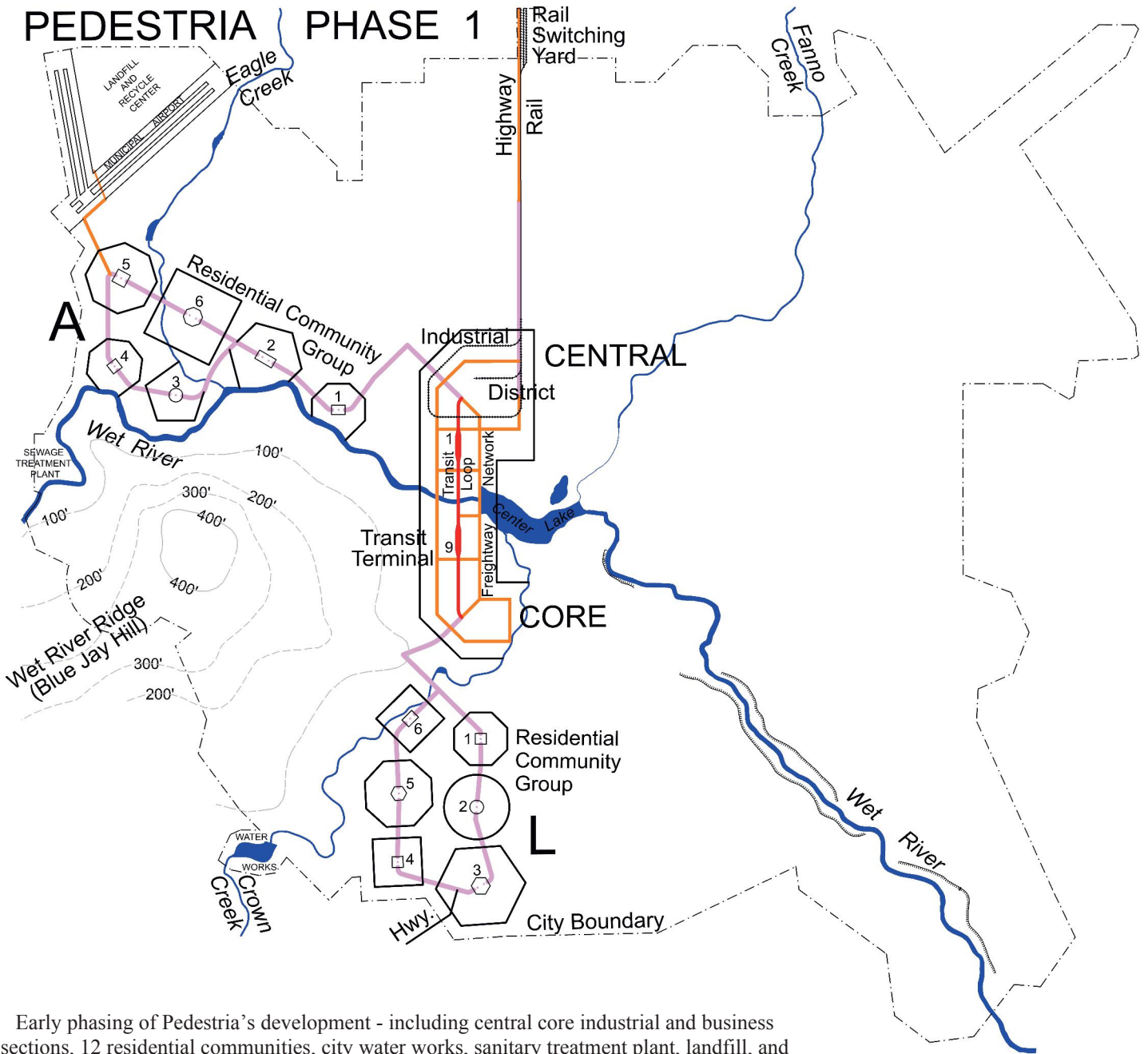
A large scale conventional urban developer(s) involved in the creation of a brand new autoless city, in a joint effort with environmental groups, would be a new

and different role for this industry. Large developers working toward a strong environmental agenda is a rather rare occurrence. Development companies, along with related construction and design firms, are deeply involved in construction of urban entities. Their primary motivation (unlike the environmental groups), is that of profit, but their knowledge and expertise in property development would be very useful in creating a new autoless city. All the buildings and infrastructures necessary in a new city have great potential for corporate profit making and for employing large numbers of construction workers and support services. The construction of autoless cities could become a major growth industry, and that should please conventional development interests.

There is, however, the danger of profit motive taking priority over the benevolent goals inherent in a brand new city. Sound design, careful planning, and quality construction often come at a higher price than nearsighted development. It should be understood that profit motive should not be the principal agenda, and benevolent goals should not be overly compromised. The creation of an effective and efficient human habitat is far more important. **Profit-oriented design decisions may not reflect the best interest of a future city and may create negative impacts felt long after any profits are spent.**

Whether the first and subsequent autoless cities are built by large scale developers, environmental groups, a consortium, or a government agency, the results will be similar: a new and modern city that is economical, efficient, and environmentally benign; that provides lasting hope and opportunity for its citizens; and promises improved lives of individuals, and even the strengthening of whole nations. It will stand as a model for others to emulate and improve upon. The autoless city concept and the exemplary design of Pedestria hold many promises for the future. Its realization would prove that simple alternatives to many of our present urban ills are possible. **The autoless city is an idea that is sorely needed and long over due. It is time to build an autoless city.**

# PEDESTRIA PHASE 1



Early phasing of Pedestria's development - including central core industrial and business sections, 12 residential communities, city water works, sanitary treatment plant, landfill, and municipal airport. The remainder of the city will gradually fill in over time.

# APPENDIX

## **TRANSIT SYSTEM - TABLE 1 RESIDENTIAL COMMUNITY GROUP, PEAK HOUR BUS INTERVAL**

Average number of one way transit trips per person per day - 2.0<sup>1</sup> (or one round trip to downtown and back)  
Percentage of total passenger transit trips during peak hour (5-6 pm) - 10.0% (See Hourly Transit Demands, page 174)  
Average total population per residential community group (6 communities) - 28,906 people  
Total passenger transit trips during peak hour per residential community group - 5,781 trips (2.0 x 28,906 x 10.0%)  
Crunch carrying capacity of articulated buses - 170 passengers (See Pedestria's Articulated Buses, and Articulated Passenger Bus Specifications, page 51, for details.)  
Number of buses needed to carry total passenger transit trips during peak hour per residential community group - 34.0 buses (5,781 ÷ 170)  
Interval of buses needed to accommodate this peak load - 60 minutes ÷ 34.0 buses = 1.76 minutes

## **TRANSIT SYSTEM - TABLE 2 NUMBER OF BUSES REQUIRED FOR ENTIRE CITY AT PEAK HOUR**

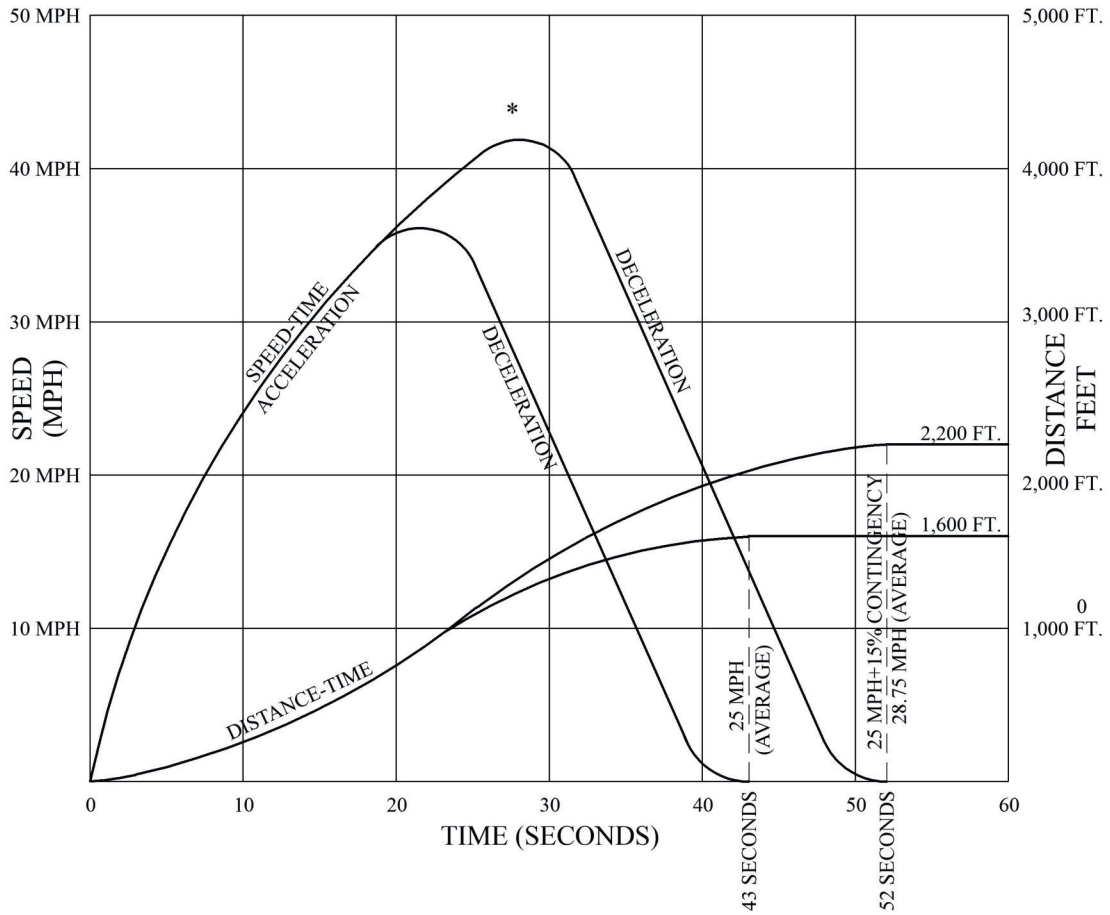
Average distance for bus routes - 11.64 miles (5.81 miles for central core loop + 5.83 miles for average community loop)  
Traveling time for buses at 25 mph average speed<sup>2</sup> for 11.64 miles - 27 min. 56 sec.  
Average stopping time for central core transit stops - 45 sec.  
Average stopping time for community transit stops - 30 sec.  
Total travel time for average length bus route (includes stops) - 37 min. 41 sec. (37.68 min.), (27 min. 56 sec. + 6 min. 45 sec. [9 central core stops, 45 sec. each] + 3 min. [6 community stops, 30 sec. [each]])  
Peak hour bus interval (number of buses required to handle passenger transit trips for each community group during peak hour, 5-6 pm) - 21.41 buses (37.68 min. total travel time ÷ 1.76 min.)  
Total number of articulated buses during peak rush hour - 327 (21.41 buses x 15 community groups + 6 airporter buses)  
Total number of buses in city fleet - 458 (327 buses in service during the peak hour, plus a 40% contingency for out of service and maintenance)

## **TRANSIT SYSTEM - TABLE 3 BUS INTERVAL AT CENTRAL CORE TERMINAL DURING PEAK HOUR (excludes airporter)**

Total number of buses required for the entire city during peak rush hour, less the airporter buses - 321 articulated buses.  
(See Table 2 above)  
Total travel and stopping time for average length bus route - 37.68 min. (see Table 2)  
Percentage of time buses spend in the central core loop (including travel and stopping time) - 55% (5.81 miles x 2.4 min. per mile (25mph) + 9 transit stops x .75 min. each = 20.69 min. (20.69 ÷ 37.68 = 55%))  
Total number of buses in the central core loop during peak hour - 176.55 buses (321 buses x 55%)  
Number of buses in the central core loop during peak hour, traveling in one direction - 88.275 buses (176.55 buses ÷ 2)  
Spacing of buses in the central core loop, in one direction, at peak rush hour - 14.06 sec. (20.69 min. ÷ 88.275 buses)  
(actual spacing between buses will vary, but will average about 14 seconds)

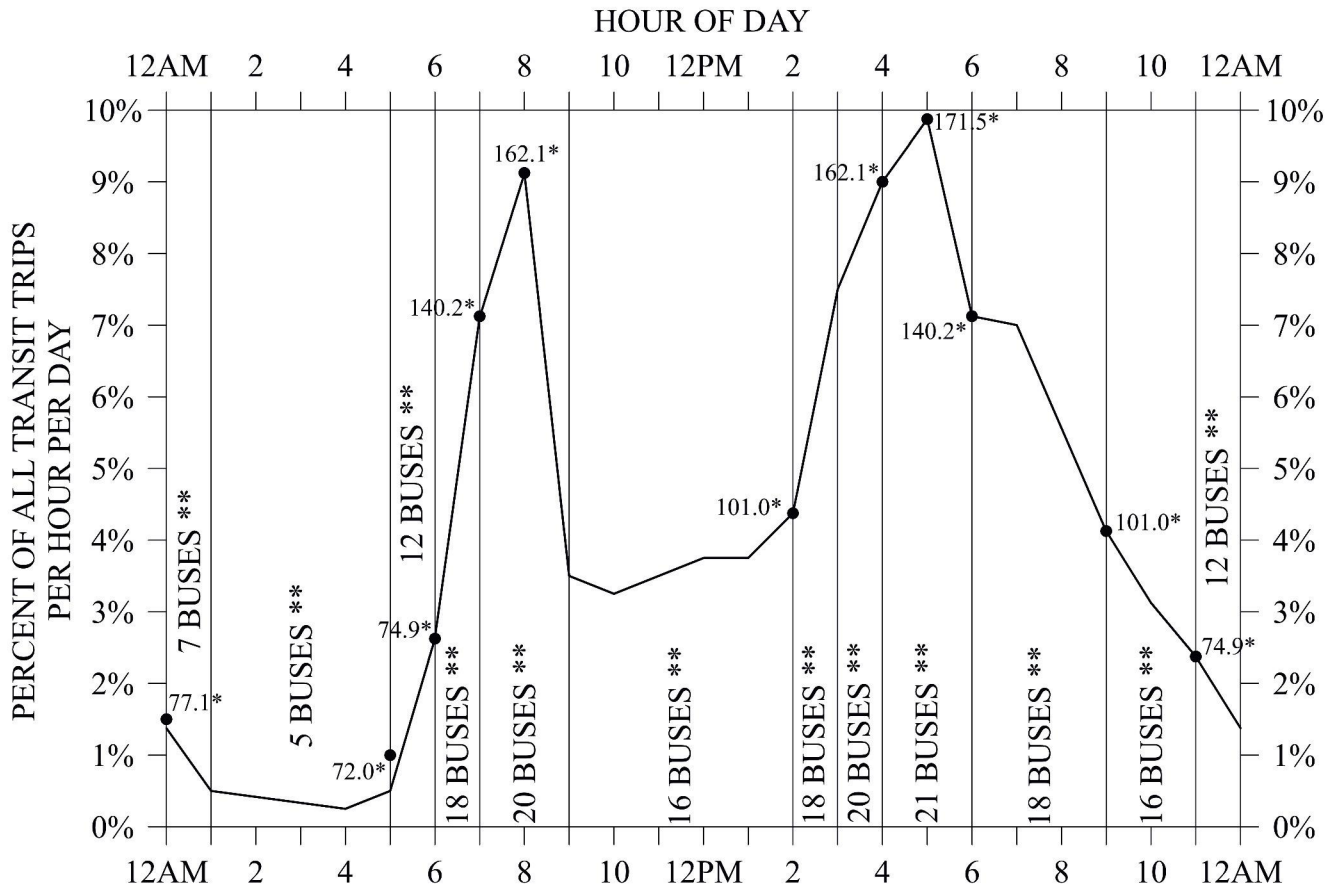
# PEDESTRIA'S ARTICULATED BUS

## SPEED/DISTANCE PERFORMANCE CURVE<sup>3</sup>



\* Note: Pedestria's maximum posted speed limit for the central core and the residential communities is 45 MPH.

## HOURLY TRANSIT DEMANDS AND CORRESPONDING NUMBERS OF BUSES<sup>4</sup>



\* Average number of passengers on each bus during that time of day, with the corresponding number of buses in service per bus route.

\*\* Minimum number of buses needed per bus route during that time of day.

Low and high bus usage examples:

During the 1-5am period, passenger transit trips are less than 1% of citywide total (per hour). At 1% of citywide total, and with 5 buses in service per transit route, the estimated passenger count per bus is 72.0. This translates to 17 sq.ft. of space per passenger on the city's articulated buses. With 5 buses in service for each transit route, this calculates to a bus interval in the residential communities of one bus in each direction every 7.5 min. In each central core transit terminal, this translates to one bus in each direction every 1.0 min.

During the 4-6pm period, passenger transit trips are 9%, 10%, and 7% of citywide total (each hour). At 10% of citywide total, and with 21 buses in service per transit route, the estimated passenger count per bus is 171.5 passengers. This translates to 2.0 sq.ft. of space per standing passenger on the city's articulated buses. With 21 buses for each transit route, this calculates to a bus interval in the residential communities of one bus in each direction every 1.8 min. In each central core transit terminal, this translates to one bus in each direction every 25 sec. See pages 51 and 172 for additional details on this peak hour crush capacity.

**EMPLOYMENT - TABLE 1 ESTIMATED EMPLOYMENT CALCULATIONS FOR PEDESTRIA**

TARGETED POPULATION FOR PEDESTRIA - 500,000  
 PERCENTAGE OF PEOPLE EMPLOYED (FULL TIME & PART TIME) - 46%<sup>5</sup>  
 NUMBER OF PEOPLE WORKING IN PEDESTRIA - 500,000 x .46 = 230,000  
 PERCENTAGE OF PEOPLE WORKING OUTSIDE THE CENTRAL CORE (i.e., RESIDENTIAL COMMUNITIES, AIRPORT, RECYCLE CENTER, ETC.) - 25%<sup>6</sup>  
 NUMBER OF PEOPLE WORKING OUTSIDE THE CENTRAL CORE - 230,000 x .25 = 57,500  
 NUMBER OF PEOPLE WORKING INSIDE THE CENTRAL CORE - 230,000 - 57,500 = 172,500

**BREAKDOWN OF PEDESTRIA'S CENTRAL CORE EMPLOYMENT**<sup>7</sup>

OFFICE WORKERS - 45%	.45 x 172,500 = 86,250
COMMERCIAL/RETAIL/MISCELLANEOUS - 35%	.35 x 172,500 = 60,375
INDUSTRIAL/WAREHOUSE - 20%	.20 x 172,500 = 34,500

**CENTRAL CORE SQUARE FOOTAGE FOR EACH TYPE OF BUILDING**<sup>8</sup>

OFFICE - 300 SQ.FT. PER PERSON	86,250 x 300 = 25,875,000
COMMERCIAL/RETAIL/MISCELLANEOUS. - 700 SQ.FT.	60,375 x 700 = 42,262,500
INDUSTRIAL/WAREHOUSE - 2,000 SQ.FT.	34,500 x 2,000 = 69,000,000
RESIDENTIAL - 500 SQ.FT.	66,400 x 500 = <u>33,200,000</u>
TOTAL SQUARE FOOTAGE NEEDED FOR HOUSING AND EMPLOYMENT IN THE CENTRAL CORE.	= 170,337,500
PLUS 5% VACANCY FACTOR	<u>x 1.05</u>
ESTIMATED SQUARE FOOTAGE OF ALL BUILDINGS WITHIN PEDESTRIA'S CENTRAL CORE NECESSARY TO ACCOMMODATE THE EMPLOYMENT NUMBERS AND RESIDENCES LISTED ABOVE.	=178,854,437

Note - As mentioned on page 121, the roughly estimated total building square footage for the entire central core is 346 million sq. ft. This is based on the block sizes and the minimum building height requirements as shown on the "Central Core Detail" (side 1 of the supplementary map) and extrapolated across the entire central core. This figure is over 93% larger than the 178.85 million sq. ft. necessary to accommodate the employment and residences in the central core.

What this means is the central core is more than sufficient in size. It could have been designed smaller, with lower height requirements, with more residences, with a greater vacancy factor, with greater employment space requirements, with lands set aside in reserves, or with any number of other parameters being changed. It is better to have too much space in the central core than not enough. It is these types of figures that will have to be thoroughly researched, refined, and accounted for in the actual designing of the first autoless city.

## **U.S. MEASUREMENT UNITS USED IN THIS BOOK**

1 Foot (plural Feet)  
1 Mile = 5,280 Feet  
1 Acre = 43,560 Sq. Feet  
1 Sq. Mile = 640 Acres

## **U.S. / METRIC CONVERSIONS**

### **U.S.                      Metric**

1 Foot = 0.3048 Meters  
1 Mile = 1.609 Kilometers  
1 Acre = 4,046.9 Sq. Meters  
          = 0.4047 Hectares  
1 Sq. Mile = 2.590 Sq. Kilometers  
              = 259.0 Hectares

### **Metric                      U.S.**

1 Meter = 3.28 Feet  
1 Kilometer = 0.6214 Miles  
1 Hectare = 2.47 Acres  
              = 0.0038 Sq. Miles  
1 Sq. Kilometer = 247.11 Acres  
                      = 0.3861 Sq. Miles



# FOOTNOTES

## CHAPTER 1 - THE AUTOMOBILE

<sup>1</sup> U.S. Federal Highway Administration, “*Licensed Drivers, Vehicle Registrations, and Resident Population: Chart DV-1C*”, <http://www.fhwa.dot.gov/policyinformation/statistics/2010/dv1c.cfm> (accessed Feb. 7, 2013).

<sup>2</sup> U.S. Federal Highway Administration, “*Licensed Drivers by Sex and Ratio to Population -2009*” <http://www.fhwa.dot.gov> (accessed Feb. 10, 2012).

<sup>3</sup> U.S. Federal Highway Administration, “*State Motor Vehicle Registration – 1950 Table MV-1*”, 1950 <http://isddc.dot.gov/OLPfiles/FHWA/013253.pdf> (accessed Feb. 10, 2012).

<sup>4</sup> “*U.S. Population Through History*”, July 21, 2011 <http://geography.about.com/od/obtainpopulationdata/a/uspop.htm> (accessed Feb. 10, 2012).

<sup>5</sup> U.S. Federal Highway Administration, “*Estimated annual vehicle - miles of travel in the United States 1949 – 1955*” <http://isddc.dot.gov/OLPfiles/FHWA/013325.pdf> (accessed Feb. 11, 2012).

U.S. Federal Highway Administration, Highway statistics series, “*Annual vehicle - miles of travel, 1980 – 2010 Table VM-202*” <http://www.fhwa.dot.gov> (accessed Feb. 11, 2012).

<sup>6</sup> Daniel Tencer, “*Number of Cars Worldwide Surpasses 1 Billion; Can the world handle this many wheels?*” The Huffington Post Canada, 10/24/2011, [http://www.huffingtonpost.ca/2011/08/23/car-population\\_n\\_934291.html](http://www.huffingtonpost.ca/2011/08/23/car-population_n_934291.html) (accessed 3-18-12).

<sup>7</sup> Worldometers, *Cars produced in the world*, <http://www.worldometer.info/cars/> (accessed 2-10-2012).

<sup>8</sup> Ibid.

<sup>9</sup> Sean P. McAlinden, Kim Hill, Bernard Swiecki, Center for Automotive Research, “*Economic Contribution of the Automotive Industry to the US economy – An update*”, Table 3.3, Fall 2003, <http://www.google.com/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&ved=0CCAQFjAA&url=http%3A%2F%2Fwww.cargroup.org%2F%3Fmodule%3DPublications%26event%3DDownload%26pubID%3D57%26fileID%3D66&ei=WpUhVLHUGIuNoQSFwIG4CA&usq=AFQjCNFvT7CREEsWYimpYH2PvALBUGLs3Q&sig2=eL3k79h9dLNqA-U2AT8JBw&bvm=bv.75775273,d.cGU> (accessed 9-18-2011).

<sup>10</sup> Robert Longley, About.com Guide, “*Americans Now Spend Over 100 Hours a Year Commuting*” April 2005, <http://usgovinfo.about.com/od/censusandstatistics/a/commutetimes.htm>, (accessed 2-16-2012).

<sup>11</sup> U.S. Department of Energy – Energy Efficiency and Renewable Energy – Vehicle Technologies Program - 2010 *Facts of the week – Fact #613*: March 8, 2010 Vehicle Occupancy Rates (accessed 2-16-2012).

<sup>12</sup> This percentage is a reasonable guess by the author. An exact number is very difficult to come by. It has often been cited that 50% of the land area of Los Angeles and most American cities is used by the automobile and its accompanying infrastructures and businesses. There is an excellent article in the Dec. 2005 Journal of Urban Planning and Development, by Michael Manville and Donald Shoup, called “Parking, People, and Cities”. This article refutes this 50% figure. Although many studies are cited by Manville and Shoup, in the end they conclude that “most region-wide estimates of the percentage of land given over to the automobile in LA and elsewhere are simply guesses”.

This author’s reasonable guess of 40% is based on his own studies and calculations. He has done two detailed calculations of automobile land use, one in downtown Los Angeles (100 city blocks), and another in downtown Portland, Oregon (100 city blocks). In both these studies, the amount of land used by the automobile was just over 50%. The author has also done numerous smaller surveys of other urban districts that were not downtown business areas (i.e., residential, commercial, industrial, etc.). The automobile land usage in these studies varied greatly. Commercial areas were almost

always the highest, with figures around 60-75%. Downtown business areas were next, around 50%; industrial lands followed, but had a great deal of variation: 20-40%. Residential areas had the least amount of land dedicated to the automobile, but also varied greatly: 15-35% (from large lot suburban to high density urban). The exact boundaries in these types of studies can make a huge difference in the results. The exact types of land and the detailed composition of the land use, if included in the automobile area or not, can also greatly influence the statistical outcome. The bottom line is that this figure of 40% is only a reasonable estimate, yet is realistic and very pertinent to discussion in this book.

<sup>13</sup> AAA American Automobile Association road map data.

<sup>14</sup> Ibid.

<sup>15</sup> Ibid.

<sup>16</sup> Tian Ying, “China Ends U.S.’s Reign as Largest Auto Market” (Update2), Bloomberg News, 1-11-10 [http://www.bloomberg.com/apps/news?pid=newsarchive&sid=aE.x\\_r\\_19NZE](http://www.bloomberg.com/apps/news?pid=newsarchive&sid=aE.x_r_19NZE) (accessed 2-12-2012).

<sup>17</sup> John Madslie, “India prepares for automotive boom”, BBC News, 4-3-2007, <http://news.bbc.co.uk/2/hi/business/6521909.stm>, (accessed 2-12-2012).

<sup>18</sup> BRICS from Wikipedia, the free encyclopedia, <http://en.wikipedia.org/wiki/BRICS> (accessed 2-12-2012).

<sup>19</sup> US Energy Information Administration, “Short-Term Energy Outlook”, 1-12-2010, <http://www.eia.gov/forecasts/steo/archives/jan10.pdf,m> (accessed 2-12-2012).

<sup>20</sup> Ibid.

<sup>21</sup> Mississippi Department of Environmental Quality, “Used Motor Oil”, copyright 2007, [http://www.deq.state.ms.us/mdeq.nsf/page/Recycling\\_UsedMotorOil](http://www.deq.state.ms.us/mdeq.nsf/page/Recycling_UsedMotorOil) (accessed 2-12-2012).

<sup>22</sup> Nicholas Smith, “What Types of Materials are Used to Build Cars?”, eHow, [http://www.ehow.com/list\\_7386533\\_types-materials-used-build-cars\\_.html](http://www.ehow.com/list_7386533_types-materials-used-build-cars_.html) (accessed 2-12-2012).

<sup>23</sup> Nasreen Tasker, editor, US Asphalt Overview – Trends and the 2010 Picture, Argus Asphalt Report, Feb. 2011, “US asphalt production and demand”, [http://www.hotmix.org/big\\_files/11mcon/sdo/Nasreen%20Tasker.pdf](http://www.hotmix.org/big_files/11mcon/sdo/Nasreen%20Tasker.pdf) (accessed 2-12-2012).

<sup>24</sup> Ibid.

<sup>25</sup> U.S. Energy Information Administration, “How much oil does the United States consume per year? Frequently asked questions”, last updated 6-6-2011, <http://www.eia.gov/tools/faqs/faq.cfm?id=33&t=6>, (accessed 3-21-2012).

<sup>26</sup> U.S. Energy Information Administration, “Figure 93. Liquid fuels consumption by sector, 1990-2035”, Release date April 2011, <http://www.eia.gov/forecasts/aeo/excel/fig93.data.xls> (accessed 10-8-2011).

<sup>27</sup> U.S. Central Intelligence Agency, “The World Factbook”, 2010, <https://www.cia.gov/library/publications/the-world-factbook/geos/> (accessed 2-17-2012).

<sup>28</sup> The “Energy Policy Conservation Act of 1975 was added to the Motor Vehicle Information and Cost Savings Act of 1972. It contains “Corporate Average Fuel Economy” (CAFÉ). This is the sales weighted average fuel economy of a manufacturer’s fleet of cars and trucks. The near-term goal was to double new car fuel economy by model year 1985. Source: National Highway Traffic Safety Administration (NHTSA), CAFÉ Overview, <http://www.nhtsa.gov/cars/rules/caf%e/overview.htm> (accessed 2-17-2012).

<sup>29</sup> U.S. Bureau of Transit Statistics, “Table 1-11 Number of U.S. Aircraft, Vehicles, Vessels, and Other Conveyances”, 2011, [http://www.bts.gov/publications/national\\_transportation\\_statistics/html/table\\_01\\_11.html](http://www.bts.gov/publications/national_transportation_statistics/html/table_01_11.html) (accessed 3-18-2012).

<sup>30</sup> U.S. Federal Highway Administration, “*Annual Vehicle Distance Traveled in Miles and Related Data – 2009*”, Table VM-1, By Highway Category and Vehicle Type, <http://www.fhwa.dot.gov/policyinformation/statistics/2009/vm1.cfm> (accessed 2-17-2012).

<sup>31</sup> *ibid.*

<sup>32</sup> *Ibid.*

<sup>33</sup> Sean P. McAlinden, Kim Hill, Bernard Swiecki, Center for Automotive Research, “*Economic Contribution of the Automotive Industry to the US Economy – An Update*”, Appendix 1, page 35, Fall 2003, <http://www.google.com/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&ved=0CCAQFjAA&url=http%3A%2F%2Fwww.cargroup.org%2F%3Fmodule%3DPublications%26event%3DDownload%26pubID%3D57%26fileID%3D66&ei=WpUhVLHUGIuNoQSFwIG4CA&usg=AFQjCNFvT7CREEsWYimpYH2PvALBUGLs3Q&sig2=eL3k79h9dLNqAU2AT8JBw&bvm=bv.75775273,d.cGU> (accessed 9-18-2011).

<sup>34</sup> *Ibid.*

<sup>35</sup> *Ibid.*

<sup>36</sup> *Ibid.*

<sup>37</sup> Copper Development Association Inc., “*Copper in your Home: Innovations & Technology*”, <http://www.copper.org/consumers/copperhome/Technology/>, (accessed 2-18-2012).

<sup>38</sup> Sean P. McAlinden, Kim Hill, Bernard Swiecki, Center for Automotive Research, “*Economic Contribution of the Automotive Industry to the US Economy – An Update*”, Appendix 1, page 35, Fall 2003, <http://www.google.com/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&ved=0CCAQFjAA&url=http%3A%2F%2Fwww.cargroup.org%2F%3Fmodule%3DPublications%26event%3DDownload%26pubID%3D57%26fileID%3D66&ei=WpUhVLHUGIuNoQSFwIG4CA&usg=AFQjCNFvT7CREEsWYimpYH2PvALBUGLs3Q&sig2=eL3k79h9dLNqAU2AT8JBw&bvm=bv.75775273,d.cGU> (accessed 9-18-2011).

<sup>39</sup> American Galvanizers Association, “*Facts about Zinc*”, <http://www.galvanizeit.org/hot-dip-galvanizing/what-is-zinc/facts-about-zinc>, (accessed 2-18-2012).

<sup>40</sup> Facts and Figures '97, American Automobile Manufacturers Association (Detroit), 1995, p. 54 quoted in Transportation Cost and Benefit Analysis – “*Resource Consumption External Costs*”, p.5.12-5, Victoria Transport Policy Institute, <http://www.vtpi.org> (accessed 7-29-2004).

<sup>41</sup> *Ibid.*

<sup>42</sup> *Ibid.*

<sup>43</sup> U.S. Environmental Protection Agency, “*Basic Information – Scrap Tires*”, <http://www.epa.gov/osw/conserves/materials/tires/basic.htm> (accessed 10-9-2011).

<sup>44</sup> Author’s calculation from the following data: 290 million scrap tires per year (see previous endnote) x 20 pounds per tire (averaged from Michelin Tire Co. data) ÷ by 2000 pounds (1 ton) = 2.9 million tons per year. Additional tonnage (not calculated) for hoses, belts, gaskets, etc..

<sup>45</sup> Facts and Figures '97, American Automobile Manufacturers Association (Detroit), 1995, p. 54 quoted in Transportation Cost and Benefit Analysis – “*Resource Consumption External Costs*”, p.5.12-5, Victoria Transport Policy Institute, <http://www.vtpi.org> (accessed 7-29-2004).

<sup>46</sup> Wikipedia, the free encyclopedia, “*Natural Rubber – Current Sources*”, [http://en.wikipedia.org/wiki/Natural\\_rubber](http://en.wikipedia.org/wiki/Natural_rubber) (accessed 2-18-2012).

<sup>47</sup> Source – Industrial Rubber Goods, How Stuff Works – “*Top 5 Materials Used in Auto Manufacturing*”, <http://www.auto.howstuffworks.com/under-the-hood/auto-manufacturing/5-material-used-in-auto-manufacturing4.htm> (accessed 2-17-2012).

<sup>48</sup> United States Geological Survey, “*Nonfuel Mineral Production in the United States – Table 1*”, [http://minerals.usgs.gov/minerals/pubs/commodity/statistical\\_summary/mb1-2009-stati.pdf](http://minerals.usgs.gov/minerals/pubs/commodity/statistical_summary/mb1-2009-stati.pdf) (accessed 2-18-2012).

<sup>49</sup> Nelson, T.I; W.P. Bolen (June 2008). “*Construction Aggregates*”, *Mining Engineering* 60: 25-26, quoted in Wikipedia, [http://en.wikipedia.org/wiki/construction\\_aggregate](http://en.wikipedia.org/wiki/construction_aggregate) (accessed 2-18-2012).

<sup>50</sup> United States Geological Survey, “*Nonfuel Mineral Production in the United States – Table 1*”, [http://minerals.usgs.gov/minerals/pubs/commodity/statistical\\_summary/mb1-2009-stati.pdf](http://minerals.usgs.gov/minerals/pubs/commodity/statistical_summary/mb1-2009-stati.pdf) (accessed 2-18-2012).

<sup>51</sup> Rivera, Han, Wang, Center for Transportation Research, Argonne National Laboratory, Oct. 2011, “*Updates to Petroleum Refining and Upstream Emissions*”, <https://greet.es.anl.gov/files/petroleum>, (accessed 3-15-2012).

<sup>52</sup> Source: Natural Resources Conservation Service (NRCS) of the U.S. Dept. of Agriculture – Data from 1982 to 1997, quoted in Numbers USA, “*U.S. population growth is a key factor in paving the world’s breadbasket*”, <http://www.numbersusa.com/content/learn/issues/farmland/us-population-growth-key-factor-paving-w.htm> (accessed 2-21-2012).

<sup>53</sup> Car-Accidents.com, “*Car Accident Statistics*”, <http://www.car-accidents.com/pages/stats.html> (accessed 2-21-2012).

<sup>54</sup> Ibid.

<sup>55</sup> Ibid.

<sup>56</sup> Ibid.

<sup>57</sup> Medicine Table 1: “*Risk of dying in transportation accident on a population basis*”, <http://www.medicine.ox.ac.uk/bandolier/booth/risk/transportpop.html> (accessed 2-21-12).

<sup>58</sup> Ibid.

<sup>59</sup> Roger Geller, “*Four Types of Cyclists*”, <http://www.portlandonline.com/transportation/index.cfm?a=2647468c=44597> (accessed 2-21-2012).

<sup>60</sup> Mark Matthew Braunstein, “*U.S. Roads Kill Million a Day – Driving Animals to their Graves*”, <http://www.culturechange.org/issue8/roadkill.htm> (accessed 2-22-2012).

<sup>61</sup> Gary Bogue, Pets and Wildlife – “*One million dogs hit by cars each year*”, Sept. 11, 2008, <http://www.ibabuzz.com/garybogue/2008/09/11/one-million-dogs-hit-by-cars-each-year-does-it-have-to-happen/> (accessed 3-21-2012).

<sup>62</sup> Clean Air World, “*Vehicles and Fuels*”, (Nov. 6, 2010) <http://www.cleanairworld.org/TopicDetails.asp?parent=24> (accessed 12-25-2013)

<sup>63</sup> Air miles from LA Center to Grand Canyon Village, measured via Google Earth.

<sup>64</sup> Kathy S. Law and Andreas Stohl, *Science*, March 2007, Vol.315 no.5818 pp.1537-1540, “*Arctic Air Pollution: Origins and Impacts*”, <http://www.sciencemag.org/content/315/5818/1537> (accessed 2-22-2012).

- <sup>65</sup> Kuwait Oil Fires – “*Gulf War Oil Wells Among Worst Disasters*”, <http://www.thedailygreen.com/environmental-news/latest/Kuwait-oil-fires> (accessed 2-23-2012).
- <sup>66</sup> U.S. Environmental Protection Agency, “*What is Acid Rain?*”, <http://www.epa.gov/acidrain/what/> (accessed 2-23-2012).
- <sup>67</sup> U.S. Environmental Protection Agency, “*Effects of Acid Rain*”, <http://www.epa.gov/acidrain/effects/index.html> (accessed 2-23-2012).
- <sup>68</sup> Wikipedia, the free encyclopedia, “*Ozone Depletion*”, [http://en.wikipedia.org/wiki/Ozone\\_depletion](http://en.wikipedia.org/wiki/Ozone_depletion) (accessed 2-23-2012).
- <sup>69</sup> Ibid.
- <sup>70</sup> Ibid.
- <sup>71</sup> Ibid.
- <sup>72</sup> Ibid.
- <sup>73</sup> Steve Connor, Global Warming: “*The Final Warning, Carbon Dioxide Rate is at Highest Level for 650,000 Years*”, Published by Independent/UK Feb. 3, 2007. <http://www.commondreams.org/headlines07/0203-03.htm> (accessed 2-22-2012).
- <sup>74</sup> National Oceanic and Atmospheric Administration, Pacific Marine Environmental Laboratory, “*The Other Carbon Dioxide Problem*”, <http://www.pmel.noaa.gov/co2/story/The+other+carbon+dioxide+problem>, (accessed 11-12-14)
- <sup>75</sup> Ibid.
- <sup>76</sup> National Oceanic and Atmospheric Administration, Earth System Research Laboratory, Global Monitoring Division, “*Trends in Atmospheric Carbon Dioxide*”, <http://www.esrl.noaa.gov/gmd/ccgg/trends/global.html>, (accessed 11-12-14).
- <sup>77</sup> National Oceanic and Atmospheric Administration, Pacific Marine Environmental Laboratory, “*What is Ocean Acidification?*”, <http://www.pmel.noaa.gov/co2/story/What+is+Ocean+Acidification%3F>, (accessed 11-12-14)
- <sup>78</sup> Ibid.
- <sup>79</sup> Daniel A. Lashof, Benjamin J. DeAngelo, John Harte and Scott R. Saleska, “*Terrestrial Ecosystem Feedbacks to Global Climate Change*”, submitted for publication to the Annual Review of Energy and the Environment, 1997 edition, volume 22. quoted in “*Feedback Loops – The Potential to Amplify Global Warming Beyond Current Predictions*”, <http://www.andweb.demon.co.uk/environment/globalwarmingfeedback.html> (accessed 2-23-2012).
- <sup>80</sup> Mississippi Department of Environmental Quality, “*Used Motor Oil*”, [http://www.deq.state.ms.us/mdeq.nsf/page/Recycling\\_UsedMotorOil](http://www.deq.state.ms.us/mdeq.nsf/page/Recycling_UsedMotorOil) (accessed 2-24-2012).
- <sup>81</sup> Groundwater Foundation, “*Groundwater Contamination Concerns*”, <http://groundwater.org/gi/contaminationconcerns.html> (accessed 2-24-2012).
- <sup>82</sup> Wardsauto Group, copyright 2012, “*U.S. Vehicle Sales, 1931-2011*”, <http://wardsauto.com/keydata/historical/UsaSa01summary> (accessed 2-24-2012).
- <sup>83</sup> Kars4kids.org, “*How many cars were recycled last year*”, <http://www.kars4kids.org/blog/how-many-cars-were-recycled-last-year-infographic/> (accessed 2-24-2012).
- <sup>84</sup> U.S. Environmental Protection Agency, Common Wastes and Materials – “*Scrap Tires*”, <http://www.epa.gov/epawaste/conserva/materials/tires/index.htm> (accessed 2-23-2012).

<sup>85</sup> *ibid.*

<sup>86</sup> Environmental Protection Agency, Municipal Solid Waste in the US, 2009 Facts and Figures, Figure ES-5. “*Number of Landfills in the United States, 1988-2009*”, <http://www.epa.gov/osw/nonhaz/municipal/pubs/msw2009rpt.pdf> (accessed 2-26-12)

<sup>87</sup> Ecoevaluator.com, “*Landfill Statistics*”, <http://www.ecoevaluator.com/lifestyle/recycling/filling-our-landfills.html>, (accessed 2-25-12)

<sup>88</sup> Environmental Protection Agency, Municipal Solid Waste Generation, “*Recycling and Disposal in the US; Facts and Figures*”, 2005, page 13. <http://www.epa.gov> (accessed 2-25-12)

<sup>89</sup> Sean P. McAlinden, Kim Hill, Bernard Swiecki, “*Economic Contribution of the Automotive Industry to the US Economy – An update*”, Fall 2003, Table 3.3 Total Motor Vehicle Related Employment Represents 10 Percent of U.S. Employment – 1998-2001, Center for Automotive Research (accessed 9-18-2011).

<sup>90</sup> Fortune 500 2011, <http://money.cnn.com/magazines/fortune/fortune500> (accessed 2-25-12).

<sup>91</sup> Bureau of Labor Statistics, 1999-2010 Consumer Expenditure Survey, “*Our Nation’s Highways, Transportation Expenditures at the Household Level*”, <http://isddc.dot.gov/OLPFiles/FHWA/013504.pdf> (accessed 3-2-12).

<sup>92</sup> American Automobile Association, 2010, “*Your Driving Costs, How much are you really paying to drive?*” <http://teendriving.aaa.com/files/file/DrivingCosts2010.pdf> (accessed 2-27-12).

<sup>93</sup> US Federal Highway Administration, Highway Statistics Series, “*Average Annual Miles per Driver by Age Group*”, <http://www.fhwa.dot.gov/ohim/onh00/bar8.htm> (accessed 2-29-12).

<sup>94</sup> U.S. Office of Energy Efficiency and Renewable Energy, “*Fact #618: April 12, 2010 Vehicles per Household and Other Demographic Statistics*”, <http://energy.gov/eere/vehicles/fact-618-april-12-2010-vehicles-household-and-other-demographic-statistics> (accessed 2-28-12).

<sup>95</sup> US Census Bureau, “*Quick Facts*”, Median household income, <http://quickfacts.census.gov/qfd/states/00000.html> (accessed 2-28-12).

<sup>96</sup> As examples, if using AAA’s 2010 “*Your Driving Costs*” average mileage per year numbers of 10, 15 & 20 thousand miles, and using the middle number of 15,000, this calculation would equal 26.4%. On the other hand, the Bureau of Labor Statistics 2010 “*Average Annual Household Expenditures*” number for “*car ownership and operating expenses*” is 15%, <http://teendriving.aaa.com/files/file/DrivingCosts2010.pdf> (accessed 2-27-12) and <http://www.bikesatwork.com/carfree/cost-of-car-ownership.html> (accessed 2-27-12).

<sup>97</sup> U.S. Energy Information Administration, “*Figure 93, Liquid fuels consumption by sector, 1990-2035*”, Release date April 2011, <http://www.eia.gov/forecasts/aeo/excel/fig93.data.xls> (accessed 10-8-2011).

<sup>98</sup> U.S. Energy Information Administration, “*How dependent is the United States on foreign oil?*”, Frequently asked questions, <http://www.eia.gov/tools/faqs/faq.cfm?id=32&t=6> (accessed 3-1-2012).

<sup>99</sup> U.S. Energy Information Administration data, quoted by Elizabeth Shogen, Jan 24, 2012, “*Foreign oil imports drop as U.S. drilling ramps up*”, NPR, <http://www.npr.org/2012/01/24/145719179/foreign-oil-imports-drop-as-u-s-drilling-ramps-up> (accessed 3-1-2012).

<sup>100</sup> Final report to the U.S. Congress by the U.S. Department of Defense, April 1992, Appendix P. Quoted in [http://people.psych.cornell.edu/~fhoran/gulf/GW\\_cost/GW\\_payments.html](http://people.psych.cornell.edu/~fhoran/gulf/GW_cost/GW_payments.html) “*How much did the Gulf War cost the U.S.?*” (accessed 3-1-2012).

<sup>101</sup> Robert Fisk, *“The Great War for Civilisation”*, The Conquest of the Middle East (fourth estate, 2005), p853

<sup>102</sup> U.S. Bureau of Economic Analysis, *“U.S. International trade in goods and services”*, Sept 2014. Trade deficit of \$43 billion. <http://www.bea.gov/newsreleases/international/trade/tradnewsrelease.htm> (accessed 11-9-14)

<sup>103</sup> Dan Alexander (Forbes) *“The World’s Largest Debtor Governments, 2013”*, 11-08-13, <http://www.forbes.com/sites/danalexander/2013/11/08/worlds-largest-debtor-governments-2013/>, (accessed 11-13-14).

<sup>104</sup> The Wall Street Journal, 3-14-12, Market data center – Auto sales – Overview charts, *“Sales and share of total market by manufacturer”*, [http://online.wsj.com/mdc/public/page/2\\_3022-autosales.html#autosalesE](http://online.wsj.com/mdc/public/page/2_3022-autosales.html#autosalesE) (accessed 3-14-12)

<sup>105</sup> Jerry Taylor, 4-22-10, *“Oil Import Make Believe”*, <http://www.cato.org/blog/oil-import-make-believe> (accessed 3-1-12)

<sup>106</sup> Wikipedia, Interstate Highway System (accessed 3-13-12).

<sup>107</sup> US Federal Highway Administration, Highway Statistics Series, *“Highway Statistics 2012 & other years, 5.2.1, 7.3.1 and other documents”*, <http://www.fhwa.dot.gov/policyinformation/statistics.cfm> (accessed 9-27-14).

<sup>108</sup> Ibid.

<sup>109</sup> Los Angeles County Metropolitan Transportation Authority (LACMTA or Metro), *“2009 Long Range Transportation Plan”*, [http://media.metro.net/projects\\_studies/images/final-2009-LRTP.pdf](http://media.metro.net/projects_studies/images/final-2009-LRTP.pdf) (accessed 9-27-14).

<sup>110</sup> Texas A&M Transportation Institute, *“Economic factors tap the brakes on traffic congestion”*, July 8, 2009, statistic is from 2007, <http://tti.tamu.edu/2009/07/08/economic-factors-tap-the-brakes-on-traffic-congestion/> (accessed 12-28-13).

<sup>111</sup> Ibid.

## CHAPTER 2 - AN OVERVIEW

<sup>1</sup> US department of Transportation, Federal Highway Administration, Highway Statistics 2009, Washington DC *“2011, Table VM-1 Annual vehicle distance traveled in miles and related Data 2009 by highway category and vehicle type”*, (accessed 3-10-12) and Bureau of Transportation Statistics, *“Table 4-3 Passenger-Miles: 1990-2005. Pocket Guide to Transportation”*, (accessed 3-10-12) and traffic counts done by the author. The author’s traffic counts consist of hundreds of counts taken over many years, on many different freeways and arterial streets, in different cities, at different times of the day, and on different days of the week. Most counts were taken as 10 minute samples. Traffic was counted either in both directions simultaneously or in each direction counted separately. All counts were done visually and with two tally counters. All counts were conducted distinguishing between vehicles that would exist in Pedestria and those that would not.

<sup>2</sup> See Chapter 1 endnote number 12

<sup>3</sup> This number is based on the author’s traffic counts that distinguish between vehicles that would exist in Pedestria and those that would not.

<sup>4</sup> See Chapter x, endnote number x, page xx.

## CHAPTER 3 - TRANSPORTATION

<sup>1</sup> Baerwald, John Edward, Institute of Transportation Engineers, “*Transportation and Traffic Engineering Handbook*”, Prentice-Hall publishers, 1976, pages 209, 211-213.

<sup>2</sup> Ibid.

<sup>3</sup> Ibid.

<sup>4</sup> Ibid.

<sup>5</sup> Brian McKenzie & Melanie Rapino, U.S. Census Bureau, “*Commuting in the United States: 2009 American Community Survey Reports*”, Issued September 2011, Page 4, <http://www.census.gov/prod/2011pubs/acs-15.pdf> (accessed 12-13-2014)

<sup>6</sup> Elaine Kurtenbach, New York Times, “*Bicycles a mainstay in China*”, published July 2008, <http://www.nytimes.com/2008/07/07/business/worldbusiness/07iht-bike.1.14289892.html?pagewanted=all> (accessed 10-9-2012)

<sup>7</sup> Xinhua, China Daily, “*Number of cars in China hits 100m*”, September 2011, [http://www.chinadaily.com.cn/bizchina/2011-09/17/content\\_13725715.htm](http://www.chinadaily.com.cn/bizchina/2011-09/17/content_13725715.htm), (accessed 3-5-2012)

<sup>8</sup> National Highway Traffic Safety Administration, “*Traffic Safety Facts – 2009 Data*”, released 2010, <http://www.bhsi.org/stats.htm>, (accessed 3-8-2012)

<sup>9</sup> Federal Highway Administration, “*2009 National Household Travel Survey, Table 27 General Commute Patterns by Mode of Transportation 1977, 1983, 1990 NPPTS, and 2001 and 2009 NHTS*”, <http://nhts.onl.gov/2009/pub/stt.pdf>, (accessed 3-6-2012)

## CHAPTER 4 - DESIGN & DEVELOPMENT

No footnotes

## CHAPTER 5 - FINITE & REPRODUCTIVE

<sup>1</sup> Ebenezer Howard, “*Garden Cities of To-Morrow*” (London, 1902. Reprinted, edited with a Preface by F. J. Osborn and an Introductory Essay by Lewis Mumford. (London: Faber and Faber, 1946).

## CHAPTER 6 - ISSUES & PROBLEMS

No footnotes

## CHAPTER 7 - POSITIVE RESULTS



<sup>1</sup> Chris Corbisier, U.S. Department of Transportation, Federal Highway Administration, Public Roads, “*Living with Noise*”, August 2003, <http://www.fhwa.dot.gov/publications/publicroads/03jul/06.cfm>, (accessed 12-13-2014)

<sup>2</sup> Washington State Department of Transportation, “*Traffic Noise, What is the difference between sound and noise?*” 2014, <http://www.wsdot.wa.gov/Environment/Air/TrafficNoise.htm>, (accessed 12-13-2014)

<sup>3</sup> See Endnote number xx for Chapter 1.

<sup>4</sup> Although Pedestria’s transit system is fareless, it is funded through various taxes. See page xx for more details.

<sup>5</sup> Because there are no existing autoless cities to make a direct comparison, this percentage is a rough estimate. It has been calculated using the following information:

Total operating budget for Portland, Oregon’s Transit Authority for 2013 (Tri-Met) \$489,192,559.

Divided by population of Pedestria (500,000) = \$978 per person.

Multiplied by average number of people per household in the U.S. in 2013 (2.58 people) = \$2,523 per household.

This number is divided by the average annual U.S. household’s income (\$51,939) = 4.86%

<b>Comparison:</b>	<b>Portland TriMet*</b>	<b>Pedestria Transit Authority</b>
Area of coverage:	532 sq. miles	37.61 sq. miles
Population served	1.5 million	500,000
Number of bus lines	79	16 (15 residential, 1 airporter)
Number of buses	603 (40 ft. buses)	458 (60 ft. articulated buses)
Number of light rail lines	4	N/A
Number of light rail vehicles	127	N/A
Number of commuter rail lines	1	N/A
Number of commuter rail vehicles	5	N/A
Number of lift buses/vans	253/15	0 (but they are an option for Pedestria)
Number of trips taken per year	100 million	365 million (total pop. x 2 [transit trips per day] x 365 days)

\* All the TriMet information was gleaned from TriMet’s “*Your Transit System At-a-Glance 2014*”, <http://trimet.org/pdfs/publications/TriMet-At-a-Glance-2014.pdf>, (accessed 12-1-2014)

<sup>6</sup> Texas A & M Transportation Institute, Saving Lives, Time and Resources, July 2009 “*Economic factors tap the brakes on traffic congestion*”, <http://tti.tamu.edu/2009/07/08/economic-factors-tap-the-brakes-on-traffic-congestion/> (accessed 12-4-2014).

<sup>7</sup> Ibid.

<sup>8</sup> State of California – Business, Transportation and Housing Agency, Department of Transportation, “*2010 California Public Road Data – Statistical information derived from the highway performance monitoring system*”, Derived from Tables 2 and 3, <http://www.dot.ca.gov/hq/tsip/hpms/hpmslibrary/hpmspdf/2010PRD.pdf> (accessed 12-2-2014).

<sup>9</sup> Kansas City Missouri – Statistics, “*Public Infrastructure – Kansas City will invest in the maintenance of streets*”, Traffic Signal Maintenance, <https://kcstat.kcmo.org/stat/goals/kxt7-x84m/veqw-pdn7/gczs-887q> (accessed 12-3-2014).

<sup>10</sup> The City of Pasadena, Department of Transportation, “*Intersections Controlled by Traffic Signals – Traffic Signal Operations in the City of Pasadena*”, [http://cityofpasadena.net/Transportation/Traffic\\_Signals/](http://cityofpasadena.net/Transportation/Traffic_Signals/) (accessed 12-3-2014).

<sup>11</sup> Portland Bureau of Transportation, “*Traffic Signal Maintenance*”, <https://www.portlandoregon.gov/transportation/article/193227>, (accessed 12-3-2014).

<sup>12</sup> This number is calculated from information from: National Center for Education Statistics, Institute of Education Sciences, “*Fast Facts - Expenditures*”, <http://nces.ed.gov/fastfacts/display.asp?id=66> and “*Fast Facts – Transportaion*”, <http://nces.ed.gov/fastfacts/display.asp?id=67>, (accessed 12-4-2014).

<sup>13</sup> National Center for Safe Routes to School, “*Safe Routes – How children get to school, School travel patterns from 1969 to 2009, Usual travel modes to school as reported by parents*”, page 4, [http://www.saferoutesinfo.org/sites/default/files/resources/NHTS\\_school\\_travel\\_report\\_2011\\_0.pdf](http://www.saferoutesinfo.org/sites/default/files/resources/NHTS_school_travel_report_2011_0.pdf), accessed 12-6-2014.

<sup>14</sup> See Chapter 1 endnote #100 for details.

<sup>15</sup> See Chapter 1 endnote #101 for details.

<sup>16</sup> Joseph E. Stiglitz and Linda J. Bilmes, Washington Post, “*The True Cost of the Iraq War: \$3 trillion and beyond*”, September 5, 2010. <http://www.washingtonpost.com/wp-dyn/content/article/2010/09/03/AR2010090302200.html>, (accessed 12-13-2014)

## CHAPTER 8 - BECOMING REALITY

<sup>1</sup> Cornell University Law School, Legal Information Institute “*Fifth Amendment, Rights of Persons, National Eminent Domain*” Overview and just compensation, [http://www.law.cornell.edu/anncon/amdt5b\\_user.html#amdt5b\\_hd23](http://www.law.cornell.edu/anncon/amdt5b_user.html#amdt5b_hd23) (accessed 11-28-14)

## APPENDIX

<sup>1</sup> This number is derived from halving the U.S. Bureau of Transportation Statistic of 4 one way trips per person per day or 2 round trips per person per day. In Pedestria it is being assumed that one of these round trips is a transit trip and the other a walking trip (on average). Therefore, in Pedestria it is being assumed each person makes one round trip journey per day, via transit. For example, a person riding downtown from a residential community, working 10 hours at their job then returning home in the evening would qualify as one round trip journey.

U.S. Bureau of Transportation Statistics, “*National Household Travel Survey Daily Travel Quick Facts*”, 2016, [http://www.rita.bts.gov/bts/sites/rita.dot.gov.bts/files/subject\\_areas/national\\_household\\_travel\\_survey/daily\\_travel.html](http://www.rita.bts.gov/bts/sites/rita.dot.gov.bts/files/subject_areas/national_household_travel_survey/daily_travel.html) (accessed 1-27-2016).

<sup>2</sup> Pedestria’s maximum posted speed limit for the central core and the residential communities is 45 mph. With acceleration and deceleration factored in, average speeds between transit stops are about 25 mph. (See Speed/Distance Performance Curve, page 165).

<sup>3</sup> Baerwald, John Edward, Institute of Transportation Engineers, “*Transportation and Traffic Engineering Handbook*”, Prentice-Hall publishers, 1976, page 216.

<sup>4</sup> Ibid., 163

<sup>5</sup> This percentage is derived from information from:  
U.S. Bureau of Labor, Bureau of Labor Statistics, “*Labor Force Statistics from the Current Population Survey*”, extracted December 2014, <http://data.bls.gov/pdq/SurveyOutputServlet>, (accessed 12-13-2014) and  
U.S. Census Bureau, “*US and World Population Clock*”, <http://www.census.gov/popclock/>, (accessed 12-13-2014)

<sup>6</sup> This percentage is derived from combined information from:  
U.S. Bureau of Labor, Bureau of Labor Statistics, “*Labor Force Statistics from the Current Population Survey*”, extracted December 2014, <http://data.bls.gov/pdq/SurveyOutputServlet>, (accessed 12-13-2014) and  
U.S. Census Bureau, “*US and World Population Clock*”, <http://www.census.gov/popclock/>, (accessed 12-13-2014) and  
from estimates of Pedestria’s residential community commercial districts’ building square footage relative to the central core’s building square footage.

<sup>7</sup> Ibid.



# DRAWING AND PHOTOGRAPH INDEX

All drawings in this book, including Side 1 and Side 2 of the supplementary map(s), were created by the author. They were produced in TurboCAD®, versions 11, 17, and 2015 Designer.

All photographs in this book were taken by the author except the following:

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Page 148, Shanghai, China - 1990 and 2010. Imgur. These images were cropped and modified to greyscale.

## ABOUT THE AUTHOR

Doug Windes (pronounced Wines) has been interested in urban planning and design since a teenager. He has always been an avid observer of cities and the human condition. Born in 1952 in Portland, Oregon, he grew up in a modest suburban home with woods and a small creek out back (a wonderful place to play and explore). He walked to school every day from kindergarten up until high school. Shortly after starting high school in Portland, he moved to Santa Clara, California to train with swim coach George Haines. He boarded with several different families, and attended Santa Clara High School. He then attended the University of Southern California on a swimming scholarship, and trained with coach Peter Daland. He graduated with a joint degree in Urban Studies and Geography. After college Doug returned to Portland and has lived there ever since.

After college, Doug began working for a small planning firm. He then worked for an aerial mapping company (doing photogrammetry), after which, he began a 30 year career with the City of Portland in its Transportation Department. Here he worked as a draftsman, beginning with hand drafting, then transitioning to computer aided design and drafting. Occasionally Doug worked with city survey crews, did street construction inspection, took samples for the testing lab, and also, helped manage contract compliance.

Doug began driving at the age of 14 and has owned cars ever since his first car at 19. He has owned numerous makes and models, domestic and foreign. Doug is all too familiar with freeways, parking lots, tire chains, rush hour traffic, parking tickets, traffic court, accidents, traffic tickets, and long lines at the DMV. But he is also aware of the freedom a car can provide: camping trips, road trips, and years of driving in the city, whenever and wherever.

During Doug's working years he has been an avid cyclist. He was a year around bicycle commuter (rain or shine, light or dark) for over 30 years. For much of that time, he had an 18 mile round trip for work. Doug is very familiar with the freedom, exhilaration, and near zero cost of bicycling. During times of severe weather (snow and ice), Doug rode public transportation (city buses) to and from work.

Over the years Doug traveled extensively throughout the United States and had multiple visits to Canada, Mexico, Europe, Australia, and one trip to China.

Doug has lived in a variety of housing situations throughout his life, beginning with a single family suburban home. He has also lived 2 story apartment buildings, a 6 story apartment, a multi-story dorm, and a 16 story high rise. He has also lived for short periods of time in a rural setting.

The idea of an autoless city first manifested itself to Doug in 1968 (during high school). Living in Santa

Clara, California, he saw the last vestiges of the "Prune Capital of the World" being paved over by a thin veneer of pavement and sprawl. He felt it was a shame to have such rich agricultural land destroyed by a few inches of asphalt and a relatively small population spread over hundreds of square miles, all of which required thousands of miles of roads and tens of thousands of polluting and consuming automobiles to exist.

Doug began work on the autoless city idea throughout college and the 1970's. With a major in Urban Studies and Geography, and residing in the automobile, smog, and sprawl capital of the world (Los Angeles), the idea and need for an autoless city was reinforced.

During this period, much of Pedestria's preliminary design was completed. The residential community, bus transit system, and central core business district were all extensively designed. The formation of the finite and reproductive aspects of the city were also conceived at this time. A detailed outline for the text was created, plus some photography was taken.

Beginning in the late 1970s, employment, family responsibilities, and other diversions halted work on the book. It was not until retiring that Doug found sufficient time and enthusiasm to once again try to finish the job.

Doug is very excited to finally publish Pedestria - An Autoless City. In his opinion, this book conveys an important concept that could be instrumental in changing the nature of human habitation and could facilitate a significant improvement of mankind's enormous environmental impact. Plus, it could have profound implications on improving the living conditions for many people world wide. In fact, in Doug's opinion, it could set the standard for future urban development.

# PEDESTRIA

## AN AUTOLESS CITY

**Pedestria is a city designed specifically to function without the mass use of the private automobile. It is:**

- Autoless (but not vehicleless)**
- Transit, pedestrian, and bicycle oriented**
- Environmentally benign**
- Finite in size**
- Reproductive**

**Pedestria is a hypothetical design illustrating the unique nature of an autoless city.**

**In Pedestria anyone can go anywhere, anytime, quickly and conveniently, for FREE.**

**Pedestria is a better city without automobiles. It is nearly non-polluting, sustainable, economical, and human in scale. It is an urban design that offers great hope for improving future human conditions throughout the world.**

**Included with this book are 2 large format maps (22" x 34"). These maps illustrate the design of the city and are the most important part of this book.**

**Non-Metric, English Unit Version – inches, feet, acres, miles**



**For more information visit:  
<http://www.autolesscity.com>**