

**PEDESTRIAN POCKETS: A NEW SUBURBAN PARADIGM?**

by

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Submitted to the Department of Urban Studies and Planning  
in Partial Fulfillment of the Requirements for the  
Degree of

**MASTER OF CITY PLANNING**  
at the  
**MASSACHUSETTS INSTITUTE OF TECHNOLOGY**  
June, 1992

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Submitted to the Department of Urban Studies and Planning  
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This thesis explores the development and implementation of the Pedestrian Pocket concept. The Pedestrian Pocket is a comprehensive land use strategy put forth to address many of the problems associated with current land use practices, i.e. traffic congestion, air pollution, a lack of housing variety, and over-dependence on the automobile. Briefly stated, a Pedestrian Pocket is a physical planning strategy consisting of "a simple cluster of housing, retail space and offices within a quarter-mile walking distance of a transit system". The concept attempts to link land use and public transportation planning as part of a long-term effort to establish new and more responsive patterns of development. It is intended to address a wide range of social, economic and environmental problems.

Currently, the Pedestrian Pocket concept is awaiting approval for incorporation into the General Plan of the County of Sacramento, California. In Sacramento, the concept is to be utilized as part of a larger effort to address the relationship between land use patterns and air quality. Specifically, the concept is being utilized to support transit within the County and as a way to establish a land use pattern less dependent on the automobile. This raises several questions: What can the concept actually contribute toward improving air quality? Will the land use strategies inherent to the concept reduce auto use and be supportive of transit? Will the overall urban form created by the regional application of the concept be efficient both in terms of reducing the need to travel and providing

transit? And finally, are the strategies utilized in Sacramento to achieve this form appropriate?

The research conducted in this thesis revealed that the design strategies utilized in the Pedestrian Pocket are consistent with the intended outcome of their application. The answers to the questions above depend on a variety of other factors in addition to design. However, there is no reason to believe that the design strategies utilized in the concept, given the appropriate support from individuals and government, could not result in a land use pattern less dependent on the automobile and more supportive of transit. Further, the policies utilized in Sacramento County in conjunction with the Pedestrian Pocket concept are consistent with the stated objectives and should assist in achieving the desired urban form.

While the thesis primarily focuses on issues related to air quality and urban form, it is clear that application of the concept could accomplish far more in terms of community character and design. Developments constructed according to the inherent principles of the concept could produce attractive alternatives to conventional development.

Thesis Supervisor: Lois Craig  
Title: Associate Dean of Architecture and Planning

## **ACKNOWLEDGEMENTS**

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I would like to thank my thesis supervisor, Lois Craig who guided me through the thesis and provided valuable feedback. I would also like to thank Gary Hack and Phil Herr, the readers, who greatly helped guide the thesis as well as helped me to shape and formulate my analysis.

I should also like to thank Leighann Moffit at the County of Sacramento Department of Community Development and Planning, Ryan Fong of River West Developments, and Rick Williams of Calthorpe Associates for their time and contributions to the thesis.

This thesis is dedicated to Nora whose love, patience and support made this endeavor possible. Go raibh maith agat!

Special thanks to my parents and family for all their encouragement and emotional support.

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# *Introduction*

In recent years, the suburban pattern of development in the United States has come under increasing criticism. Characterized by low-density single-family housing and a dependence on the automobile, the suburban pattern in many areas has been overwhelmed by further decentralization of the population, business and commercial enterprises. With decentralization has come increased traffic congestion, air pollution, receding open space, and stressful social patterns. Coupled with changes in the makeup of households and changes in business practices, a profound mismatch between our culture, our patterns of settlement, and the way we plan for growth has emerged.

In response, several architects and planners have put forth concepts for future development. Notable among them are Duany, Plater-Zyberk's (DPZ) Traditional Neighborhood Development (TND) concept and Peter Calthorpe's Pedestrian Pocket concept. While both seek to create mixed use

pedestrian scaled communities, the concepts differ greatly in how they address regional issues. DPZ's vision focuses primarily on the social and aesthetic criticisms of the present pattern—only vaguely addressing issues of regional concern such as transportation and air quality. Calthorpe's vision, on the other hand, encompasses regional issues as a fundamental, explicitly stated concern. Specifically, the Pedestrian Pocket seeks to coordinate land use and transportation planning in conjunction with broader social, economic and environmental objectives. Considering the regional nature of these objectives, this thesis argues that the work of Peter Calthorpe is a more appropriate vision for suburban development and redevelopment.

The Pedestrian Pocket concept has recently gained considerable attention among planning authorities in California, most notably the County of Sacramento. As air quality in the state has worsened and the number of vehicle



miles traveled has steadily increased, planning agencies have been under increasing pressure to address the land use patterns with which these problems are associated—especially since the passage of the 1988 California Clean Air Act (CCAA). Under the 1988 CCAA, several strategies have been identified to assist in improving air quality, including changes in land development practices. In Regions such as Sacramento, where air pollution has been classified as "severe", the CCAA requires that a 5 percent annual reduction in emissions be achieved. In response, the County is in the process of incorporating the Pedestrian Pocket concept into its General Plan as part of a long-term strategy to reduce auto emissions. As applied in Sacramento, the concept is known as Transit-Oriented Development (TOD). The TOD concept is to be utilized to develop an urban form supportive of existing and planned public transit routes, as well as, to develop an urban form that could potentially reduce the number of vehicle miles traveled.

As the TOD concept has not yet been tested, several questions arise concerning its application in Sacramento. (It should be noted that the first development to utilize the principles of the concept, Laguna West, is currently under construction.) Specifically, what can the concept actually contribute toward reducing auto emissions? Will the land use strategies inherent to the concept reduce the number of vehicle miles traveled and be supportive of public transit? Will the overall urban form created by the regional application of the concept be efficient both in terms of reducing auto emissions and providing transit. Will the strategies utilized in Sacramento to achieve this form actually result in the form envisioned? These questions form the focus of this thesis.

## CHAPTER I:

### Background

This chapter provides a brief description of post World War II suburban America and the problems and frustrations associated with the pattern that it has assumed. The principles upon which the pattern is based and the development process and policies instrumental in its creation are discussed. A critique of the pattern is followed by a description of two recent "visions" proposed for future suburban development and redevelopment. The two visions are Duany, Plater-Zyberk's Traditional Neighborhood Development concept and Calthorpe's Pedestrian Pocket or Transit-Oriented Development (TOD) concept. Of these two, it is argued that the Pedestrian Pocket concept offers a better strategy for suburban development and redevelopment.

## CHAPTER II.

### Precedents of the Pedestrian Pocket Concept

In this chapter, the circumstances under which the Pedestrian Pocket developed and the precedents upon which it is based are discussed. These precedents include: the planning vision of the Regional Planning Association of America; the Garden City movement; the Radburn plan and the Neighborhood Unit concept.

## CHAPTER III.

### Implementation of the Pedestrian Pocket Concept

This Chapter reviews how the Pedestrian Pocket concept is being utilized in conjunction with other land use strategies in the County of Sacramento, California to assist in improving air quality. The chapter summarizes the Transit-Oriented Development Design Guidelines written by Calthorpe Associates for the County. Also, Laguna West, the first development to utilize the TOD concept is described.

#### CHAPTER IV:

##### *Air Quality, Mobility, and the TOD Concept*

In this chapter, the problems and issues which give rise to the air quality objectives of the Sacramento TOD Design Guidelines are discussed. Specifically, the objectives of reducing the number of vehicle miles traveled; facilitating the use of mass transit; and, creating a jobs / housing balance will be discussed. The intent of this exploration is to determine if the land use strategies utilized in addressing these objectives are consistent with the conclusions of related research.

#### CHAPTER V:

##### *Urban Form and the TOD Concept*

In this chapter, the TOD concept is analyzed in relation to the overall urban pattern that would result from the regional application of the concept. A theoretical model simulating the pattern is reviewed. This discussion is contrasted to recent research relating urban form with transport fuel efficiency (The

relation between urban form and transport fuel efficiency is directly related to the objective of reducing auto emissions). Additionally, the growth management strategies utilized in Sacramento to achieve the pattern envisioned are discussed and analyzed.

#### CHAPTER VI:

##### *Conclusions*

In this final chapter, the research findings are summarized as are the opportunities and shortcomings of the concept.

# **CHAPTER I:**

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## ***Background***

According to architect Daniel Solomon: many suburban residents have come to believe that the suburb is "the product of a set of dreams that are inherently self-nullifying; the more that is built according to these dreams, the less it is like what it was supposed to be" (Solomon in Kelbaugh 1989:21). In simplistic terms, these dreams are based on limitless economic prosperity and the opportunities it provides (Samuelson, 1992). The faith in prosperity combined with the individual freedoms guaranteed by the American political system form the basis of the American dream. In the physical environment, the dream is evidenced by what one critic, Anthony Downs, has called the elements of the "dominant vision" or development paradigm. Two elements in particular define this dominant vision: ownership of the single-family home and ownership of the private automobile. According to Downs, these elements or aspirations "represent the pursuit of an environment which maximizes one's own well-being without regard to the collective results of such behavior" (Downs,

1989:2). In all fairness to suburban residents, however, the problems associated with their individualistic behavior are a function of the supply-driven housing market that for expedient economic, regulatory, and political reasons has provided little choice in housing type (Neuman 1991).

The suburb is increasingly threatened by the collective results of uncoordinated individual decisions. The threat results not so much from the elements inherent to the dominant vision, but rather, from the pattern in which they have been realized. The problems associated with the pattern are regional in scale: traffic congestion, air pollution, and sprawl (defined here as discontinuous low-density development). Complicating efforts to address these problems is yet another element of the "dominant vision"—governance of the suburban environment. The desire of suburban residents to control local land use and other elements they perceive as related to the quality of life, often hinders efforts to solve problems that do not respect the

boundaries of local political jurisdictions (Downs, 1989). Many communities have initiated growth moratoriums—often in response to traffic congestion. Traffic congestion, however, is a regional problem and such measures only exacerbate the problem by pushing growth further out (Calthorpe in Kelbaugh, 1989; Cervero 1991b).

In many communities, congestion is the threat most residents identify as the primary problem in their environment (Bookout 1992; Cervero 1991b). In auto dependent areas like the suburb, mobility equals freedom—freedom to pursue all that one can afford. Daniel Solomon contends that suburban residents have learned to live with many of the inadequacies of their environment "but take away mobility, take away freedom, take away the great joy of driving—and there is big trouble. Comes gridlock; comes the revolution" (Solomon in Kelbaugh 1989:22). Suburban congestion signals profound changes in the structure of our culture and economy. It signals

the decentralization of the workplace and illustrates the new commuting pattern that has emerged as a result—suburb to suburb. With over 60 percent of the nation's office space now outside downtown cores, new pressures have been exerted on regional transportation systems (Cervero 1989a). Increasingly there is a discrepancy between commuting patterns and the geometry of the regional transportation system. Highways designed to funnel commuters into downtown areas do not accommodate the lateral and criss-cross commuting patterns common today.

The congestion problems that now exist in the suburb would certainly not surprise members of the Regional Planning Association of America (RPAA) who anticipated this outcome some 60 years ago. (N.B. the RPAA and the RPA are two different organizations. The RPA was formed in 1929 as an outgrowth of the work of Thomas Adams and his staff on the Regional Survey of New York and its Environs (Schaffer

1982). Founded in 1923 by a distinguished group of professionals including Clarence Stein, Henry Wright, Frederick Ackerman, Benton MacKaye, Lewis Mumford and Catherine Bauer, the RPAA viewed the "destructive forces of congestion and decentralization " as one and the same process (Schaffer, 1982). Clarence Stein observed during the 1920s that "the 'arteries' of transportation in the nation's congested cities were 'clogged', and it seemed 'inevitable that the end of this gradual clogging of movement' would be an outward migration of population. But the suburbs were 'no escape': 'they merely trade the disadvantage of congested and inadequate homes for inadequate and congested transportation'" (RPAA 1927 in Schaffer 1982:70). While the RPAA favored decentralization, it was felt that it should be based on a regional planning process and garden city principles—a process that would "limit the amount of profits, people, and congestion" (RPAA 1927 in Schaffer 1982:70).

Although the RPAA considered decentralization to be an inevitable outcome of the problems of the city, the organization was uncertain "whether twentieth-century technology and social conditions would lead to the development of an unstable one dimensional suburban environment that would eventually fall victim to the same problems plaguing the city; or whether technology and social policy would result in an efficiently planned aesthetically pleasing stable and harmonious environment" (Schaffer 1982).

Decentralization, especially that which occurred in the 1980s, has resulted in the one dimensional suburban pattern the RPAA predicted—a pattern that embodies some of the problems that once plagued the industrial city, i.e. congestion and pollution. Instead of the decentralized clusters of development envisioned by the RPAA, decentralization has, in recent years, produced a pattern of dispersed and uncoordinated developments. Largely the product of

government policy, economic expansion, and public opinion (the American dream), a suburban pattern has emerged that epitomizes short-term gain at the expense of the natural environment and, according to some critics, at the expense of community values.

Post World War II expansion in the United States transformed the nation's urban areas from contained compact forms into sprawling metropolises dependent on cheap energy, land and the automobile. It has often been suggested that the automobile was the root cause of this land-intensive pattern. The automobile, however, was only one element of what created sprawl. In combination with the policies and subsidies of the government, the abundance of cheap energy, and the values of the society (the American dream), the automobile facilitated the development of this pattern (Hanson 1992). Policies of the federal government, in particular, encouraged decentralization through the construction of the Interstate

Highway system, the largest public works program in the history of the nation. In addition, generous government mortgage insurance programs, although successful in providing housing, helped create a housing industry dependent on cheap land and energy. Finally, American society following the war was characterized by a pent-up demand for housing, considerable individual savings, rising incomes, and the formation of new families (Van der Ryn & Calthorpe 1986). These conditions combined with well intentioned government policies, the lure of the suburban lifestyle, and the lack of comprehensive planning ultimately led to suburban sprawl. Generally regarded as discontinuous low-density development, sprawl is considered by some researchers to be the most expensive land use pattern in terms of economic and environmental costs as well as social inequity (Real Estate Research Corporation 1974).



Prior to the post war suburban expansion, street patterns in many American cities were laid out along grid survey lines. Little attention was placed on the actual width of streets, although generous rights-of-way were considered to be beneficial in terms of providing light and air to residential areas. Once the automobile had become the major mode of transportation, the existing grid street pattern was quickly overwhelmed by high-speed traffic. As traffic volumes increased, the grid pattern was blamed for the consequential congestion and traffic fatalities. In response, the suburban planning ideas of Olmsted, in particular the curvilinear street patterns, were "rediscovered" by Stein, Wright and Perry and utilized in the development of a functional hierarchy of streets—arterials, collectors and local—that protected neighborhoods from through-traffic.

From the 1950s onward, this hierarchical system of street arrangement became standard practice. Subdivisions

developed accordingly are characterized by cul-de-sacs and curvilinear roadways with few connections to main road networks. Coupled with the strict separation of land uses, the suburban environment has as a result evolved into a pattern highly dependent on the automobile. In some areas, other modes of travel, such as walking and cycling, have been hindered by circuitous circulation routes and long distances. Thus, the pattern that has evolved not only requires excessive use of the automobile but also makes it more difficult as roadways are overwhelmed by increasing volumes of traffic and a limited and indirect system of circulation (Deakin 1990).

Three building types emerged within this pattern, the office park that serves as the work place, shopping centers that serve as the market place, and large residential enclaves that serve as the dwelling place. As each is accessed solely by automobile, parking areas consume large land areas. Consequently, parking has become a major component of the economic

equation for both office buildings and shopping centers (Solomon in Kelbaugh 1989).

In recent years the pattern has been increasingly criticized for a variety of reasons.

- First, for what Daniel Solomon has termed "the victory of the private over the public". Solomon, like many critics of the suburban pattern, argues that the quest for individual gain has produced an environment void of opportunities for human interaction or "public life". Mobility and privacy are seen as having taken over what was once shared public ground—those aspects of the community which allowed interaction such as a pedestrian environment, public parks, and neighborhood shops.

- Second, for the lifestyles that have resulted from this pattern—particularly by the way in which they are influenced by excessive travel demands.

- Third, for the manner in which this pattern segregates housing and therefore people according to income and "market sector". Housing in the current pattern is not adequately provided for the range of low-to-high paying jobs now found in many suburbs. Additionally, in many areas the cost of housing has risen such that it is unaffordable to many people—including double income households.

- Fourth, for the manner in which this pattern impacts the natural environment through excessive auto use and land consumption (Solomon in Kelbaugh 1989).

Such criticism has led to the call for a new vision—one that addresses the local and regional issues noted above. In response, several architects and planners have developed physical design concepts that they believe address these issues—although some more successfully than others. Notable among them are the Florida firm of Andres Duany and Elizabeth Plater-Zyberk (DPZ), and the California firm of Calthorpe Associates. (It should be noted that the Calthorpe concept was originally developed in the context of Van der Ryn, Calthorpe Associates, a firm which has since dissolved. Since then, Peter Calthorpe has refined the concept in his firm, Calthorpe Associates.)

The concepts put forth by DPZ and Calthorpe share several localized objectives. Both concepts espouse compact development patterns and highly integrated land uses. Both encourage the location of business and commercial facilities in close proximity to residential areas. Both seek to create pedestrian scaled environments and to provide public spaces and amenities. Both seek to address a variety of social problems associated with current land use patterns. However, the concepts differ greatly in the strategies utilized to accomplish these objectives. DPZ's vision primarily addresses the social and aesthetic criticisms of the present pattern—only vaguely addressing issues of regional concern such as transportation and air quality. They also differ in that the TND concept depends on private developers for implementation, while the Pedestrian Pocket requires significant government intervention. Furthermore, DPZ seems reluctant to fully accommodate modern commerce and employment facilities in the TND concept.

DPZ's concept, known as Traditional Neighborhood Development (TND), is based on a re-creation of the early 20th century American village or suburban commuter town replete with its architectural language, grid street pattern, formal public spaces, strategically sited public buildings, and neighborhood shopping.

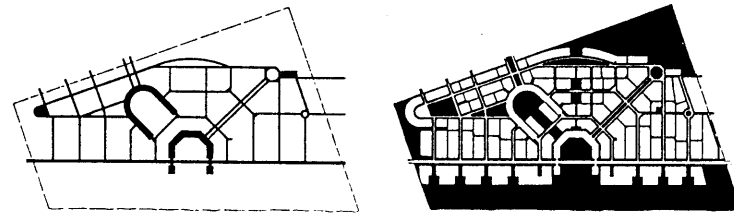


Figure 1.1: Seaside, Florida—the best known TND. Street pattern (left), Open space and parks (right)

DPZ claim that if suburbs were built in concentrated towns according to the TND concept, problems such as traffic congestion and air pollution would be minimized. Despite the

regional nature of these problems, they offer no explanation of how the TND concept would be coordinated with regional land use and transportation strategies. Due to the lack of emphasis placed on regional issues, it is unclear what type of urban form would evolve from the widespread application of this concept. Some researchers speculate that it could lead to more sprawl as the grid pattern is repeated over large areas (Knack 1989).

The vision of Calthorpe, on the other hand, encompasses regional issues as a fundamental, explicitly stated concern. While it does offer specific design recommendations, aesthetic issues are not the primary element of the concept. Calthorpe states: "Given the social, economic, and environmental forces of our time, some new synthesis of these three systems is necessary. The problem is to introduce the needs of the pedestrian and transit into the auto-dominated regions of our metropolitan areas, not to return to the fiction of small-town America" (Calthorpe 1991).

In his 1954 article "The Neighborhood and the Neighborhood Unit", Lewis Mumford declared that "if the problem of urban transportation is ever to be solved, it will be on the basis of bringing a larger number of institutions and facilities within walking distance of the home" (Mumford 1954:264). Although Mumford was referring to the central city, this statement could arguably be applied to the current suburban context. And this is precisely the argument utilized by Calthorpe in the development of the Pedestrian Pocket concept.

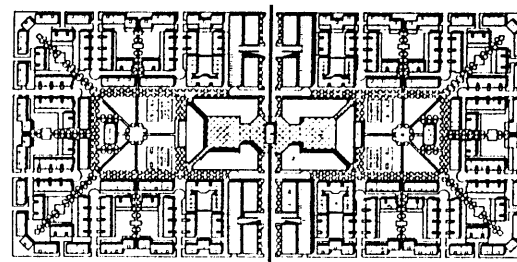


Figure 1.2: Diagram for a 60-acre Pedestrian Pocket

The Pedestrian Pocket speaks to a wide range of environmental, economic and social concerns. Briefly stated, a Pedestrian Pocket is a physical planning strategy consisting of "a simple cluster of housing, retail space and offices within a quarter-mile walking distance of a transit system" ranging in size from 40 to 160 acres (Kelbaugh, 1989; Calthorpe, 1990, 1991).

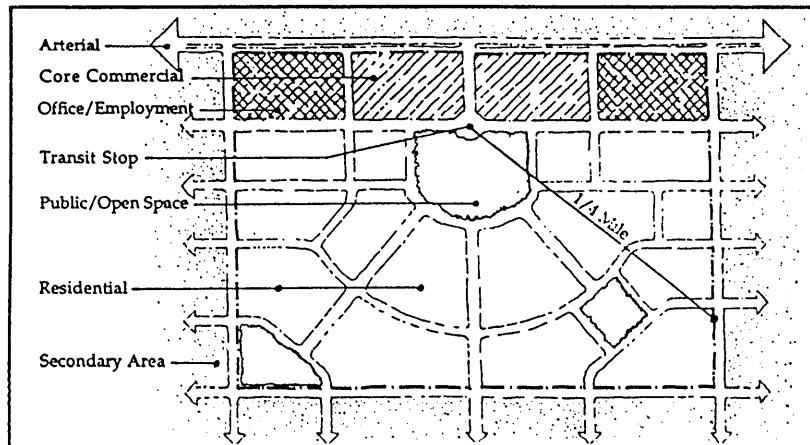


Figure 1.3: Generic Pedestrian Pocket Diagram

The Pedestrian Pocket is based on changes in the American economy and society, which, in Calthorpe's view, render the present pattern of suburban development obsolete.

Calthorpe writes:

The current round of suburban growth is generating a crisis of many dimensions: mounting traffic congestion, increasingly unaffordable housing, receding open space, and stressful social patterns. The truth is, we are using planning strategies that are forty years old and no longer relevant to today's culture. Our household makeup has changed dramatically, the work place and work force has been transformed, real wealth has shrunk, and serious environmental concerns have surfaced. But we are still building World War II suburbs as if families were large and had only one breadwinner, as if jobs were all downtown, as if land and energy were endless, and as if another lane on the freeway would end congestion (Calthorpe in Kelbaugh, 1989:3).

In response to these issues, the concept calls for moderate and high density housing, public services, neighborhood retail and commercial uses to be concentrated in mixed-use developments strategically located along existing or proposed transit routes. It is claimed that the link established between land-use and transit will: result in an efficient development

pattern and the population densities necessary for supporting a regional transit system; assist in efforts to reduce traffic congestion and the pollution associated with it; foster environments responsive to pedestrians; and finally, allow growth to occur with fewer environmental and social costs.

The concept also seeks to address social issues related to the changing demands placed on households, the workplace, and the environment. Housing issues are addressed by the inclusion of a broad range of housing types in close proximity to services and public transit and by responding to the needs of a growing number of households composed of elderly, single people, and single-parent families. In response to changes in business practices, the Pedestrian Pocket is intended to serve as a location for fast-growing service sector enterprises, which can be located near, and benefit from, services, shopping, housing and public transit. Pedestrian Pockets are also intended to address environmental concerns by reducing traffic

congestion through the provision of public transportation and rational land-use planning. Clustering development is intended to preserve open space as well as decrease dependence on the automobile by locating a wide variety of services and amenities within close proximity of one another.

In short, the Pedestrian Pocket is:

the search ....for nothing less than a new American dream—one that restores public life to our communities, that trades half its 10,000 miles of automobile trips per person per year for light rail and exchanges television and computers for face-to-face communication, that recovers the mixed use of Main Street, that delivers true pedestrian accessibility, that again promises the pleasures of high-speed mobility.....and that preserves the open countryside and farmland which provide emotional and physical sustenance and relief to city dwellers and serve as the lungs and liver for congested cities (Kelbaugh 1989:ix).

The Pedestrian Pocket addresses not only localized aesthetic and community issues, it is intended to function as a component of regional planning efforts. Pedestrian Pockets are meant to "form a network offering long-range growth

within a region" (Calthorpe in Kelbaugh, 1989). The concept accommodates growth by locating small clusters of new development within or adjacent to an existing metropolis. The concept therefore seeks to influence the overall pattern of a metropolitan area by ensuring that new growth is coordinated with the existing pattern. It attempts to utilize existing infrastructure efficiently and direct growth so that it forms a more compact urban form. A compact form is assumed to be efficient in terms of infrastructure provision and utilization as well as in the provision of transit. Additionally, a compact urban form is inherent to the concept's goal of creating environments that encourage walking and cycling as a forms of transportation. As for regional transportation, the Pedestrian Pocket seeks to reorganize current notions of suburban transit. Instead of linking low-density suburban development with downtown commercial areas, the Pedestrian Pocket concept calls for a polynucleated suburban pattern linked via transit.

Thus it may be concluded that the TND and the Pedestrian Pockets concept differ most in how they address issues of regional and for that matter even global importance. Considering the global environmental ramifications of the current American land use pattern, any new concepts for site specific development and redevelopment must be coordinated with larger regional objectives. As the producer of 1/4 of the total global carbon emissions, most of which may be attributed to its automobile intensive land use pattern (Alcamo 1990), the United States must begin to address the environmental impacts of land use patterns in a more comprehensive manner. And the Pedestrian Pocket seems to be a step in the right direction due in part to its multi-faceted (environmental, social and economic) approach to addressing the problems associated with current land use patterns.

## **CHAPTER II:**

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### *Precedents of the Pedestrian Pocket Concept*



### Origins of the Pedestrian Pocket concept

The development of the Pedestrian Pocket Concept can be traced through the work done in the early 1980s by Sim Van der Ryn and Peter Calthorpe. Specifically, it can be traced to the interest that they as architects had in the environmental movement and the concept of sustainable development. As the state architects during the late 1970s, Van der Ryn and Calthorpe were active in the development of the California energy code and the exploration of solar architecture. Following their tenure in Sacramento, Van der Ryn and Calthorpe formed their own firm and continued to research environmentally-sound building and community design.

In 1986 they jointly published Sustainable Communities, A New Design Synthesis for Cities, Suburbs, and Towns. The publication outlines the proceedings, findings and design recommendations of the Westerbeke conference—a conference held in California in 1980 to explore environmentally sensitive

community design. It is in Sustainable Communities, that the origins of the Pedestrian Pocket concept can be found. The concept, as the title of the book would suggest, began and remains an environmentally motivated response to the problems associated with current practices of land development.

It is from the perspective of sustainability that the Pedestrian Pocket evolved. Although sustainability has a variety of definitions and meanings, including the one provided below by Van der Ryn and Calthorpe, it remains a rather illusive idea. To truly adopt the concept as a method of developing and redeveloping urban areas would require more than just changes in the physical environment. It would require a complete restructuring of the economy and society—something visionaries like Van der Ryn and Calthorpe did not even wish to take on. Thus, the Pedestrian Pocket concept represents a compromise. It is a first step toward more

environmentally sound communities without changes in current economic practice or major changes in societal values.

Sustainability implies different solutions for different places. Like the word "appropriate," "sustainability" is qualified by its context. Sustainability implies that the use of energy and materials in an urban area be in balance with what the region can supply continuously through natural processes such as photosynthesis, biological decomposition, and the biochemical processes that support life. The immediate implications of this principle are a vastly reduced energy budget for cities, and a smaller, or more compact urban pattern interspersed with productive areas to collect energy, grow crops for food, fiber and energy, and recycle wastes. New urban technologies will become less dependent on fossil fuels and rely on more information and a careful integration with biological processes. This will mean cities of far greater design diversity than we have today, with each region developing unique urban forms based on regional characteristics that have long been overridden by cheap energy, the great leveler of regional diversity and unique character of place. A sustainable community exacts less of its inhabitants in time, wealth, and maintenance, and demands less of its environment in land, water, soil and fuel (Van der Ryn & Calthorpe 1986:ix).

Although the Pedestrian Pocket is rooted in modern environmental concepts like sustainability, many of its inherent principles are based on the land use strategies and planning

philosophy borrowed from previous visions of community planning. These visions represent reactions to the problems of the industrial economy and the environment that resulted therefrom. The visions that will be discussed in this section include: the planning concepts espoused by the Regional Planning Association of America (RPAA), in particular the ideas of Patrick and Benton MacKaye; the principles of Ebenezer Howard's Garden City; the land use planning strategies of the Radburn Plan and the Neighborhood Unit concept. The intent of this discussion is to gain a better understanding of the values and assumptions upon which the Pedestrian Pocket concept is based.

### *Regional Planning and the RPAA*

In its call for regional planning, the Pedestrian Pocket looks to the ideas espoused by the RPAA, the second of two Garden City Associations in the United States (the first was dissolved). The RPAA sought to address the problems of urban America through the application of Garden City principles as a comprehensive scheme for balanced regional and national growth. Specifically, the RPAA sought to "improve living and working conditions [of the city] through comprehensive planning of regions including urban and rural communities and particularly through the decentralization of vast urban populations" (Stein 1923 in Schaffer 1982:55). Lewis Mumford articulated their mission as the "building of balanced communities, cut to human scale, in balanced regions, which would be part of an ever widening national, continental, and global whole, also in balance." (Mumford in Schaffer 1982:55).

The RPAA felt that the solution for cities "resided in the garden city, placed within the regional fabric tailored by Geddes" (Schaffer 1982:55). Patrick Geddes had espoused a theory of regionalism and decentralization in which he maintained that development should follow the local occupations and customs. The regionalist movement stood for preservation of provincial characteristics, government decentralization, regional universities, conservation of historical monuments and support of local arts, crafts, and industries. According to Geddes' theory, cities should relate to their region in order to achieve a balance between city and region. Geddes believed that 19th century technology had destroyed this balance by wrecking the landscape and environment with selfish interests and profit motives. He felt, as did Mumford, that 20th century technology had the potential to correct this situation.

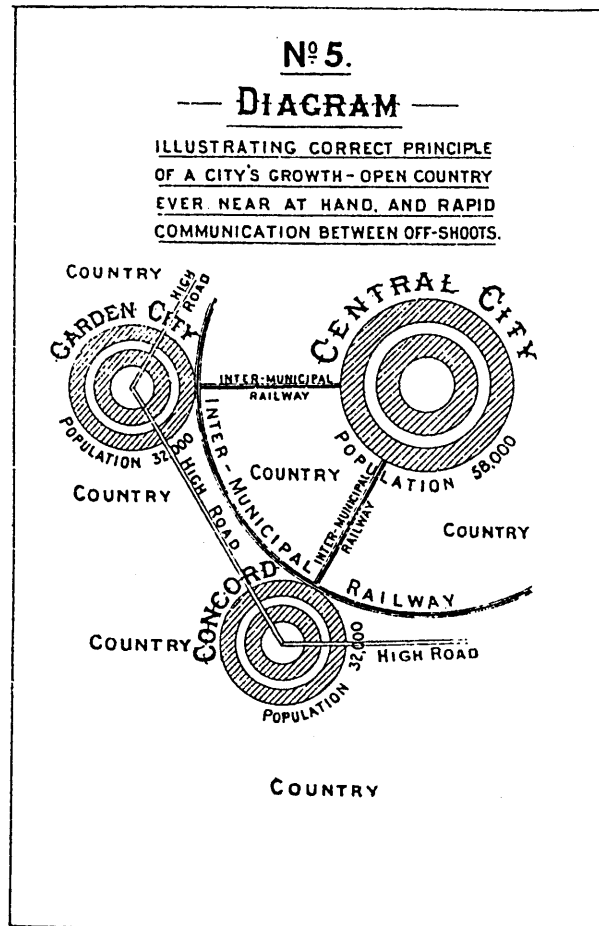


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## **DISCLAIMER**

**MISSING PAGE(S)**

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**Figure 2.2: Polynucleated settlements based on Garden City Principles were central to the RPAA's vision of Metropolitan growth.**

While the Pedestrian Pocket does not call for radical changes in land ownership or control, it does share common themes with the regional planning strategies of the RPAA. Like the RPAA, the Pedestrian Pocket seeks to centralize dispersion. However, instead of calling for the centralized dispersion of central city populations and services, the Pedestrian Pocket, seeks to centralize the unplanned dispersion that has taken place since World War II. Rather than advocating new towns or garden cities, the Pedestrian Pocket, out of necessity, reorganizes the existing pattern. In terms of the overall urban form, they both seek to establish a polynucleated pattern of development, but vary in the scale and intention of the pattern. Members of the RPAA envisioned a regional pattern of autonomous settlements, replete with a wide range of employment, commercial and service facilities. The Pedestrian Pocket, on the other hand, is intended to play a role in establishing an urban pattern which facilitates transit and movement between clusters. It is therefore less autonomous

and more interconnected than the pattern envisioned by the RPAA.

### The Garden City

The reform measures of the RPAA were themselves based on the work of Ebenezer Howard, father of the Garden City concept. Just as the Pedestrian Pocket represents a reaction to the problems of the post-industrial suburb, the Garden City concept embodies Howard's reaction to the problems of 19th century English cities. Appalled by the living conditions of 19th century London, Howard sought to solve the problems of pollution and overcrowding by creating a series of new communities removed from the existing metropolis. (His ideas addressed the social implications of industrialization more than environmental—the effects on the working class, their physical health and their equity in the economy.) Linked by a regional railway system, these communities were intended to form a pattern of polynucleated settlements relatively self-sufficient in nature. Each community was to contain industry,

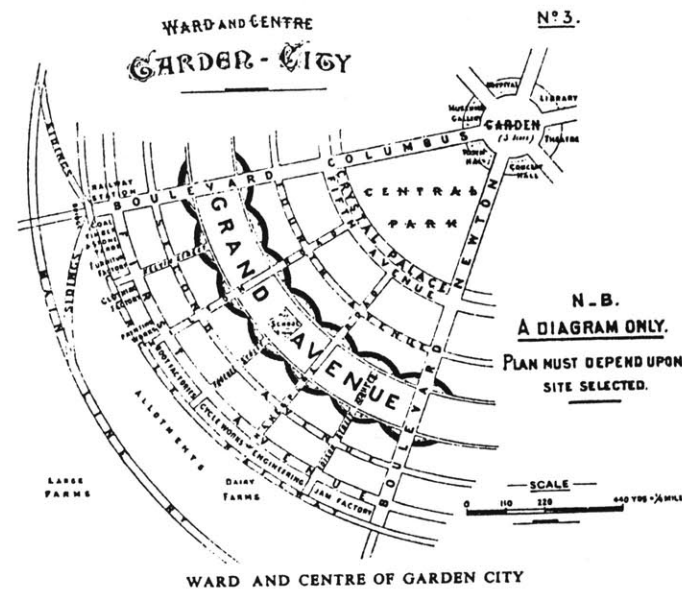


Figure 2.3 Ward and Center of Garden City

retail, housing, social and cultural institutions. Howard's plan called for communities of approximately 6000 acres, 1000 of which would contain a concentrated settlement of 30000

people. The remaining 5000 acres would be a "greenbelt" or an area devoted to agricultural and recreational purposes. The greenbelts were also intended to prevent the overdevelopment of the countryside. All land was to be held in common ownerships and all would pay rent. This would cover the primary debt service, costs of improvements, and finally health care and pensions for all workers. Thus, Howard sought to combine public ownership of land with private enterprise.

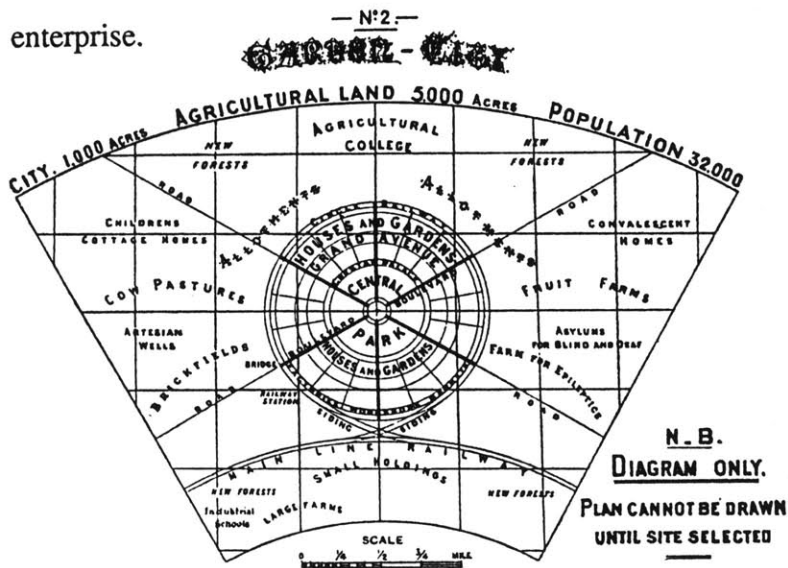


Figure 2.4: The Garden City and the Rural Belt

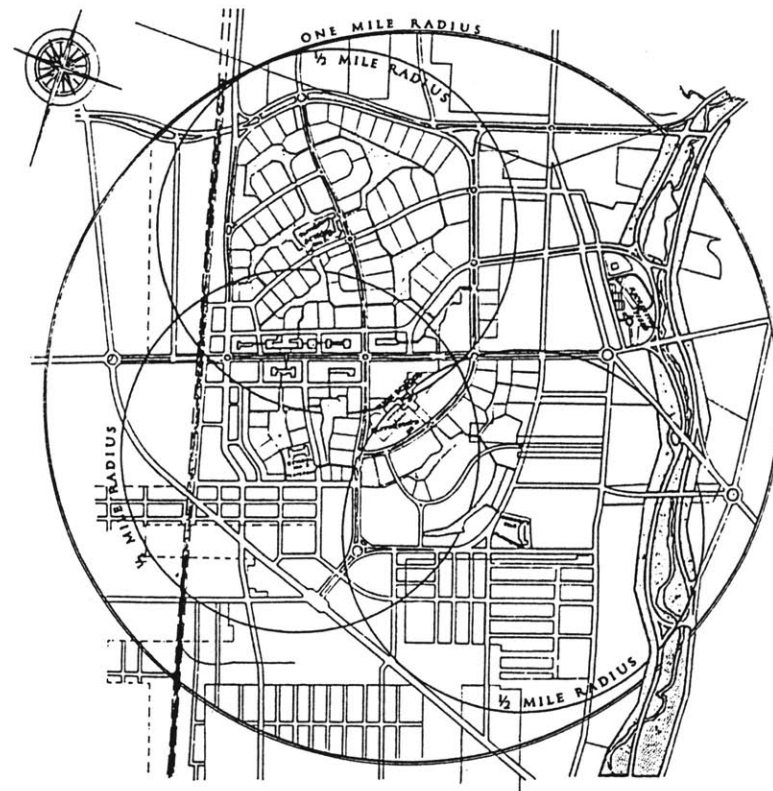
In the following statement, Calthorpe sums up what he thinks are the positive aspects of the Garden city:

As a stand against both congestion and sprawl, his [Howard's] concepts are relevant to the environmental movement; as a social reform they can be meaningful in relation to the current housing stress; as compact mixed-use towns, they represent a solution to transit problems; and their vision of incorporating agriculture offers an alternative to our large-scale agribusiness (Calthorpe in Van der Ryn and Calthorpe 1986:200).

Several Garden city principles are apparent in the Pedestrian Pocket concept, most notably the idea of linking new pockets of development together via a regional rail network. While early descriptions of the Pedestrian Pocket called for regional pattern of decentralized clusters similar to that of the Garden city concept, it has since been altered based on the requirements of a regional light rail network, i.e. the pockets are closer together. Additionally, the Pedestrian Pocket is similar in that it seeks to create a mixed-use pedestrian scaled community.

### *The Radburn Plan*

The garden city principles were realized in England in the new communities of Letchworth and Welwyn. Although the RPAA never completed similar towns in the United States, fragments of the garden city principles were incorporated in the design of Radburn, Sunnyside Gardens, Chatham Village, and Forest Hills Gardens. The best known of these, Radburn, was intended to be a full garden city but several key aspects of the concept were never completed. For example, the greenbelt was never purchased, thus leaving Radburn to be surrounded by typical suburban expansion. Similarly, the industrial areas called for in the original plans were never developed due to inconvenient access to the site and the economic decline during the depression (Radburn opened in 1929). Consequently, Radburn never developed as a garden city, rather it became known for its innovative site plan which represents one of the first attempts to accommodate the needs of both pedestrians and automobiles. The site plan utilized superblocks with



**Figure 2.5: The Radburn Plan (illustrating pedestrian scale)**



interior greens and cul-de-sacs to separate pedestrian and auto traffic. Pedestrian paths were concentrated in the interior greens and where necessary to cross streets, underpasses were constructed for the pedestrian paths. House plans were turned inward toward the internal green rather than the street.

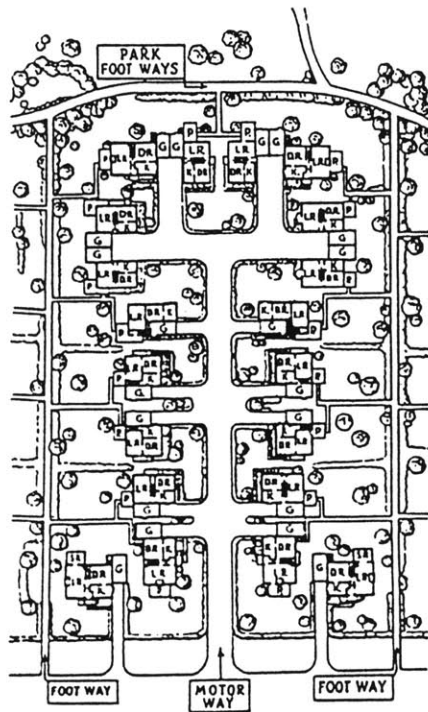


Figure 2.6: The Superblock

Calthorpe sums up his views of Radburn below:

Radburn's contribution lies in re-establishing the pedestrian environment and reducing auto dependence. But lacking in the primary destinations of work places and large retail districts, the area is a suburb with a large commuting population. (Calthorpe in Van der Ryn & Calthorpe 1986: 226).

[The lasting innovations of the Radburn site plan are] the common open space, the dual system for cars and pedestrians, and the complete separation of the automobile from the semi-private open space. The negative aspects of the plan were its inward quality, its disconnection from surrounding towns and the isolation resulting from its limited focus....The concept of the Pedestrian Pocket corrects and reorients much of what Radburn started. With high-density housing, common open spaces are more critical than with typical low-density suburban types. More significantly, the Pedestrian Pocket extends the destinations of pedestrian paths beyond the Radburn model by arranging retail, mass transit, jobs, entertainment, and recreation within a walkable radius (Calthorpe in Kelbaugh 1989:48).

### *The Neighborhood Unit*

Central to site organization of the Radburn Plan is the Neighborhood Unit, a physical planning concept developed in the 1920s in conjunction with the Russell Sage Foundation's effort to develop a regional plan for New York and its

environs. Based on several social paradigms and rooted in garden city principles, the concept sought to guide urban growth incrementally by directing it into a series of subunits. Although the underlying principles inherent to the concept are the work of many minds, the physical planning aspects of the Neighborhood Unit were quantified by the sociologist, Clarence Perry.

In developing the Neighborhood Unit scheme, Perry was greatly influenced by Forest Hills Gardens, an early application of Garden City principles to suburban development in the United States. Started in 1911 by the Russell Sage Foundation, Forest Hills was planned by the firm of Frederick Law Olmsted, Jr. Upon close analysis, Forest Hills Gardens shares much in common with the Neighborhood Unit concept. This may be explained, in part, by the fact that Forest Hills was the home of Perry for a number of years. The neighborhood unit represents the 'codification' of attributes in

the Forest Hills Garden plan that Perry found to be useful in creating desirable neighborhoods. The Pedestrian Pocket also resembles Forest Hills Gardens. As Forest Hills was constructed adjacent to a transit line, it demonstrates the kind of relationship between land use and transit that the Pedestrian Pocket seeks to achieve.

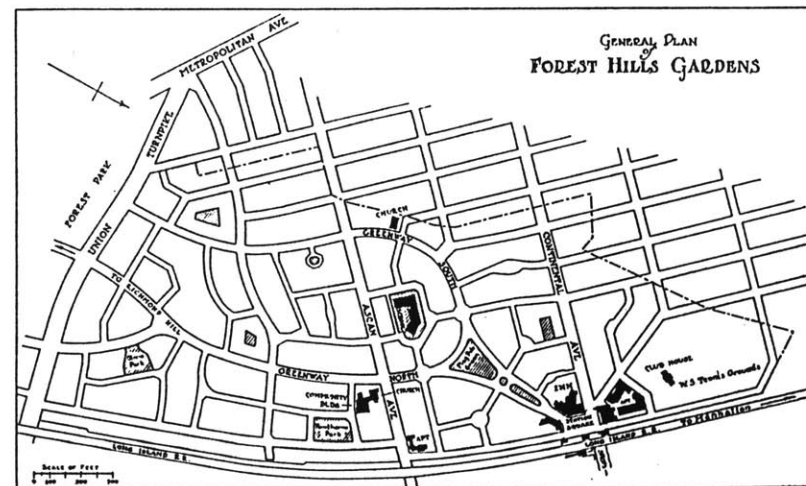


Figure 2.7: Forest Hills Gardens

Perry provides a summary of the Neighborhood Unit concept in A Regional Survey of New York and its Environs (1929).

[The neighborhood Unit can] be regarded as a somewhat elastic pattern for laying out unit districts in new or re-planned urban residential sections. Its desirable size may be defined, in general terms, as that populated area for which one elementary school should be provided. In sections where single-family-per-lot housing is the rule, this means an area of about 160 acres and a population of 5,000 or 6,000 people. It has school and institutional sites grouped around a community center, and shopping districts at the traffic intersections in its circumference. It is bounded and walled in by arterial highways and enjoys a special street system of its own which provides direct circulation within the unit but does not invite traffic through it. The interior is restricted entirely to residential use and ideally, 10 percent of its area, and more in apartment house units, is devoted to small parks and recreation spaces (Perry 1929:88).

Upon closer analysis the Neighborhood Unit and the Pedestrian Pocket concept share much in common. Both were devised in response to inadequacies noted in the development practices of their respective eras (1920s and 1980s). Both seek to guide and direct growth incrementally by applying site planning principles in a manner consistent with issues of

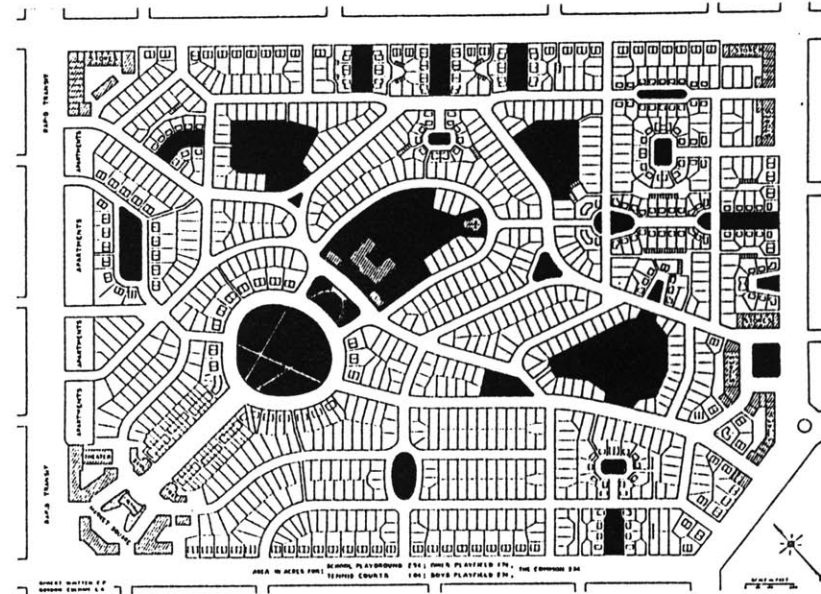


Figure 2.8: Neighborhood Unit (See p. 130 for larger plan)

regional concern. Both seek to create mixed use environments which contain retail, services, and community facilities. Both represent physical planning concepts put forth as new visions or paradigms for growth. Thus, the Neighborhood Unit may be described as a physical planning scheme devised to resolve problems associated with the industrial city and the motor age.

The Pedestrian Pocket, on the other hand, may be described as a reinterpretation of the Neighborhood Unit to deal with the circumstances of the present era. It has been formulated to address the problems of the suburb—problems brought about by new patterns of growth, overdependence on the automobile, and a degraded natural environment. The similarities between the Neighborhood Unit and the Pedestrian Pocket are confirmed by the creators of the pocket themselves, Van der Ryn and Calthorpe:

the Village Center [an early name for the Pedestrian Pocket] is a direct descendent of the "neighborhood school planning" dogma which dominated suburban planning a generation ago. Then, the key concept was to locate neighborhoods around a half mile walking radius of the elementary school. Today, education and other key consumer services may form the core for new pedestrian oriented energy efficient communities (Van der Ryn & Calthorpe 1986:105).

Van der Ryn and Calthorpe found the incremental development controls in the neighborhood concept to be useful in the design of energy efficient communities. Specifically,

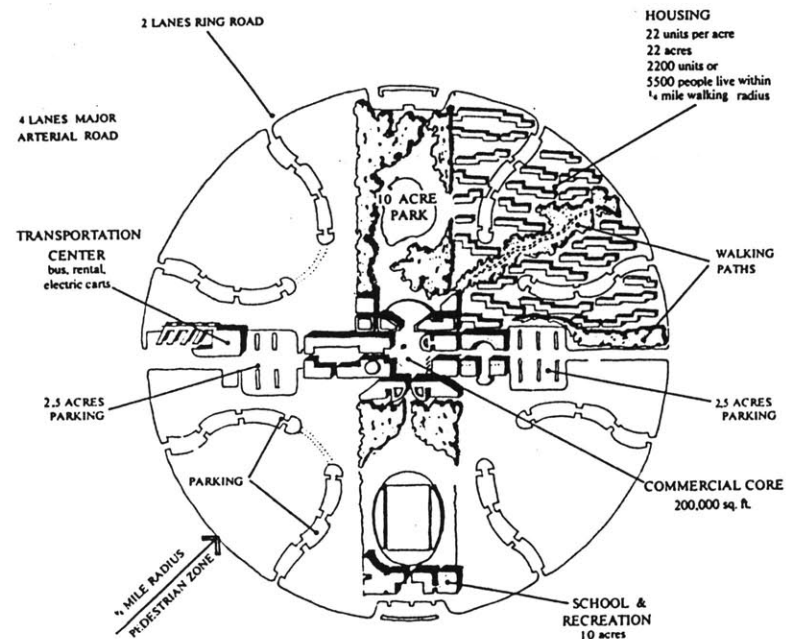
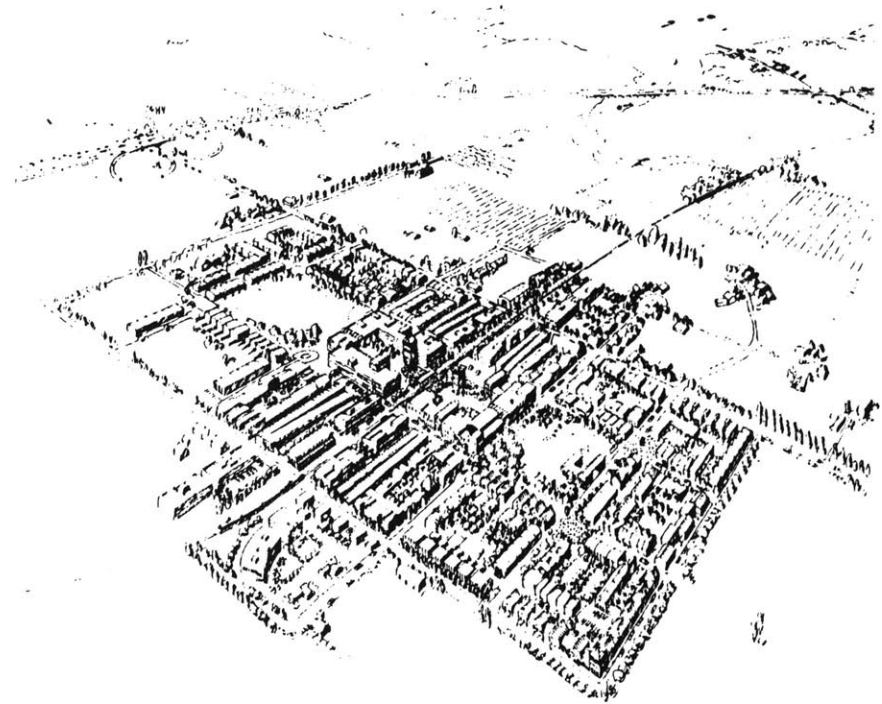


Figure 2.9: Early version of the Pedestrian Pocket

the concept proved to be compatible with their efforts to minimize the length and number of resident auto trips for local service, and to save land and energy. As they also sought to

facilitate pedestrian movement, many of the site planning principles of the Neighborhood Unit proved to be useful as well.

Since the firm of Van der Ryn and Calthorpe was dissolved in the mid 1980s, the Pedestrian Pocket concept has undergone several stages of refinement beginning with a study funded by the National Endowment for the Arts. Prepared by Calthorpe and architect Mark Mack for sites in Marin County this next version of the Pedestrian Pocket took on an idealized, almost utopian vision (Boles 1989). It was not until the concept was tested in a week long design charrette at the University of Washington that it began to receive recognition. Following the charrette, the concept was further developed with students at UC Berkeley by Calthorpe and Daniel Solomon and also by Doug Kelbaugh at the University of Washington. And with the publication of The Pedestrian Pocket book in 1989, a record of the Washington charrette and a description of the concept, it gained widespread recognition.



**Figure 2.10 Pedestrian Pocket—**from the Pedestrian Pocket Book. Shown here in the "Garden City" phase surrounded by agricultural land and linked to adjacent pockets by light rail.

Peter Calthorpe has further refined the concept for application to the problems experienced by communities in California. In its refined state, the Pedestrian Pocket became Transit Oriented Development (TOD). Although essentially the same concept as that utilized in the 1988 charrette, the TOD is a more quantitative version, providing detailed information about densities, spatial arrangements, retail type, and square footage, open spaces etc. This latest version differs in that each Pocket or TOD is intended to be less autonomous and more responsive to existing urban patterns. Thus, Pedestrian Pockets are no longer depicted as independent settlements surrounded by greenbelts.

The refined concept is now being applied to the suburban context in the form of Transit-Oriented Design Guidelines. Completed by Calthorpe Associates for the County of Sacramento, California, the TOD Guidelines are intended to coordinate land use and transportation planning around the

light rail system now in operation in the County. Thus, the intent of the concept has changed to address the existing urban pattern and the requirements of a urban transit network. The underlying goal of these guidelines is "to establish policies which reduce automobile dependence and support alternative modes of transportation while minimizing the impacts on existing community character" (Calthorpe Associates 1990).

In the TOD concept devised for Sacramento County, many of the physical design principles appear to have been borrowed directly from the Neighborhood Unit.

Both concepts call for a maximum total area of about 160 acres, the area contained within a 1/2 square mile. This is considered by both concepts to be the maximum one should have to walk to reach the community, retail and institutional facilities of development.

Both concepts call for similar housing densities—an average of 11 dwelling units per acre in the Neighborhood Unit opposed to an average of 12 in the TOD. A variety of housing types is possible in each concept.

Both concepts call for a minimum of 10 percent open and park space.

Both concepts call for populations of approximately 5000. In the Neighborhood Unit however, the number of people per acre is higher due to changes in household size.

Both concepts call for a mixed use environment that provides the daily goods, services and institutional facilities required by a neighborhood. They differ in that these facilities are concentrated around the transit station in the Pedestrian Pocket. The Neighborhood Unit calls for retail to be placed at each corner of the unit.

Both concepts restrict through traffic to arterials placed on the edge or boundary of the development.

Both concepts seek to provide circulation systems that facilitate movement to facilities within the development.

Both concepts seek to address regional issues incrementally.

Both concepts were intended to be applied to developing areas or to revitalization / redevelopment sites.

## **CHAPTER III:**

### ***Implementation of the Pedestrian Pocket Concept***

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Sacramento County, California has in recent years become a virtual testing ground for the Pedestrian Pocket concept. Since 1990, the first development designed according to the concept's inherent principles—Laguna West—has been under construction. Further, the County Planning Department, impressed by Laguna West, initiated an amendment to its general plan to incorporate the Pedestrian Pocket concept as way of coordinating land use and transportation planning within its jurisdiction. As applied in Sacramento, the concept has been refined by Calthorpe Associates to become the Transit-Oriented Development (TOD) concept, reflecting its role in the County's General Plan.

### Laguna West

Laguna West is slowly emerging as a prototype for the TOD concept. When completed sometime within the next five-to-ten years, Laguna West is expected to have a population of approximately 5000 residents and 700 workers. The

development will occupy a 1000-acre site, of which 200 acres are zoned for industrial and commercial uses (a large portion of the industrial area is now occupied by the Apple Computer Distribution Center). Of the 5000 residents, approximately 2000 will be housed within a 100-acre TOD or "Town Center". The remaining 3000 residents will occupy 2100 single-family homes in surrounding lower-density residential neighborhoods known as "Secondary Areas".

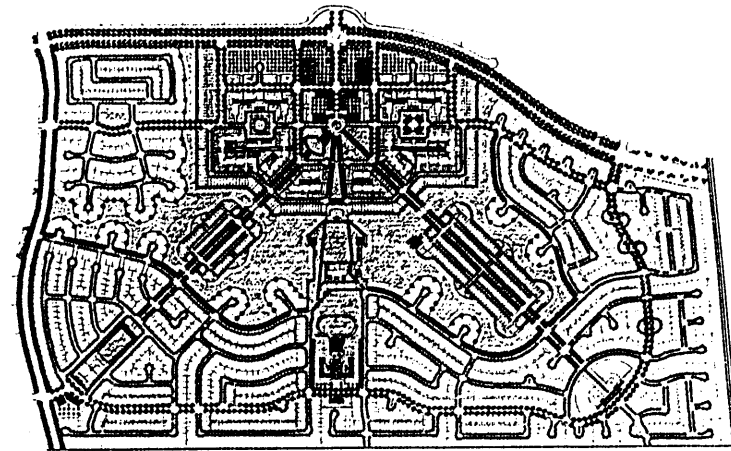


Figure 3.1: Laguna West, Sacramento, California  
(See page 131 for larger plan)

The "Town Center" is to contain 1200 multifamily units, 90,000 square feet of retail, 150,000 square feet of office space. The TOD concept seeks to combine these elements in a pedestrian scaled and coherent environment in order to encourage transit use and to decrease auto-dependence. Amenities in the Town Center include a town hall and transit center both of which are sited adjacent to a "village green". Surrounding the village green will be shops, a library, day care center, and an 1800-seat amphitheater. In terms of design, the Town Center is intended to offer an alternative to the conventional strip commercial center and suburban office park. By reorienting and combining the elements of these prototypes, the Town Center at Laguna West will incorporate auto-oriented retail, such as the supermarket, with pedestrian scaled shops and office buildings placed along a traditional Main Street. The character of the Town Center is intended to evoke images of small town life which is the theme of developer's marketing scheme.

The "Secondary Areas" at Laguna West are separated from the Town Center by a 73-acre man-made lake containing two "islands" designated for townhouses. The lake will provide five miles of shoreline, 70 percent of which will be public. It will feature five beaches for swimming and launching areas for sailing. The Secondary Areas, although unique among suburban developments, maintain many elements common to the traditional pattern such as cul-de-sacs and long curving streets. Unlike typical developments, Laguna West will contain 38 acres of parkland; a more coherent street pattern; pedestrian paths with specific destinations, i.e. the TOD or "Town Center"; commercial activities relevant to daily life; and several transportation options. Secondary Areas are directed connected to the Town Center via a radial street system. In order to encourage walking and cycling, all homes within the Secondary Areas are to be a maximum of one mile from the Town Center.

Laguna West will contain a variety of housing types including, garden apartments, townhouses, small-lot single-family homes, conventional single-family homes, and custom-built homes. The housing guidelines specify that each house is to have a front porch and that garages be placed five feet behind the front façade or to the rear of the house. In an attempt to increase the overall density of the development, ancillary units are encouraged over garages. Densities could eventually be as high as 12 units per acre depending on the number of ancillary units built and if they are in fact utilized as permanent residences. All designs are subject to a review process devised by Calthorpe Associates. According to representatives of River West, the builders are responding favorably to the review process and the changes required in housing design.

Laguna West is considered by its developer, River West Developments, to be "transit adaptable", anticipating the day

when the County extends its light rail system to the area via two railroad corridors adjacent to the site. River West set aside land to serve as a station site for either of the potential lines. However, this site is not located in the "village green", but rather, in a remote location on the periphery of the site. Until the transit line is extended, the regional transit authority has committed to providing express bus service to Sacramento's city center from a bus stop located at the Town Hall.

The decision to utilize the Pedestrian Pocket concept at Laguna West may be traced to Phil Angelides, head of River West Development. Angelides became interested in Calthorpe's ideas in the late 1980s out of concerns he had in completing more environmentally responsive development. Despite having already gained approval for a conventional site plan at Laguna West, Angelides decided to seek the advice of Calthorpe. Following their collaboration, a new concept and plan reflecting Angelides' environmental concerns were

developed for Laguna West. These concerns combined with several qualitative issues form the basis of the development goal for Laguna West.

The goal of the new community is to create an environment where homes, schools, work, civic uses and shops are all within easy walking distance. In addition to providing convenient alternatives to the automobile and improving air quality, it has been designed to make the streets and common areas more comfortable and inviting to the pedestrian. (River West)

Although Laguna West may be considered a "typical" example of the Pedestrian Pocket concept, the development compromises some of its inherent principles. Rather than focussing the site plan on the future rail access, Laguna West focuses on the adjacent arterial. While understandable from a logistical point of view—especially that of the developer—it limits the development's link with the future light rail station. This issue illustrates how the concept may be compromised in locations where transit is not yet available. Additionally, the lake surrounding the TOD occupies a great deal of the land

within one-half mile of the town center. This would seem to inhibit the type of pedestrian links the concept seeks to establish. River West contends that the lake is an amenity commonly found in subdivisions in Sacramento. Thus, the lake was constructed to improve the marketability of the development. However, it would seem that other motives may have influenced this decision—primarily the perceived need to provide distance between the TOD and the single-family homes in the Secondary Areas. In that sense the lake acts as a moat between the "unknown elements" of multi-family housing in the TOD and the "stability" of the Secondary Areas.

### *The TOD Concept as Applied in Sacramento*

Sacramento like other regions of California is struggling with the consequences of the expansive and rapid growth that occurred in the 1980s. As air quality has worsened and the number of vehicle miles traveled has steadily increased, the County's planning agency has been under increasing pressure to address these problems in new and innovative ways—especially since the passage of the 1988 California Clean Air Act. According to the air quality standards of the 1988 Act, the Sacramento Region is classified as having "severe" air pollution and is thus required to achieve an annual five percent reduction in total emissions. Additionally, the Act increased the power of the Sacramento Metropolitan Air Quality Management District (SMAQMD) giving it the legislative authority to review and mitigate indirect sources. Auto emissions are the primary indirect source of critical air pollutants in the Sacramento Region.

In response, the transportation planning process of the County is currently being coordinated with SMAQMD's responsibilities to reduce air pollutant emissions. Several strategies have been identified for achieving air quality goals:

- reduced per capita trip generation;
- increased transit options;
- employment of new technologies like telecommunications to reduce trips;
- implementation of mitigation programs or offset fee receipts from indirect sources such as housing developments, shopping centers, and major employment centers;
- new land use patterns.

Auto-intensive land use patterns are considered to be a major factor in the County's worsening air quality. Changes in land development practices are seen as the most significant contribution the Planning Department could make toward the long-term goal of improving air quality. (County of Sacramento 1990a). To address this goal, the County Planning Department is looking to the Pedestrian Pocket concept as a method for coordinating land use and transportation planning. Specifically, the County has adopted the concept as a means of

guiding and encouraging development along major transit routes in the metropolitan area.

The Pedestrian Pocket, now known as Transit-Oriented Development (TOD), is currently awaiting approval for incorporation into the Land Use Element and Circulation Element of the County's General Plan. Along with several other land use strategies—including growth accommodation and management, reuse and infill; redevelopment, and congestion management—the TOD concept is intended to assist the Region in achieving the air quality goals mandated by the 1988 California Clean Air Act.

The County's justification for incorporating the TOD concept for this purpose is expanded to include other issues as well:

The development of Sacramento's expanding metropolitan area, in a manner consistent with the Transit-Oriented Development concept, accomplishes several of the County's

most important goals. TODs establish a link between ...transit and land use, and also assist in providing affordable housing. TOD communities are beneficial because they efficiently use the County's limited land resource. By increasing transit use they reduce traffic congestion and air pollution. They are affordable for the diverse households moving to Sacramento because a variety of housing types and densities are encouraged in convenient locations. TODs are affordable to businesses seeking to relocate in Sacramento because their workforce can be freed of the gridlock and high housing cost typical in other California regions. And TODs are affordable to the public taxpayer because TOD infrastructure is used efficiently (County of Sacramento 1990a:25).

The TOD concept is to be utilized to guide and direct new growth on the periphery of the city in areas where public transit exists or is planned. Similarly the concept is to be used as a means of encouraging and directing infill development at identified locations along existing transit lines and planned future routes (County of Sacramento 1990a). Ultimately, the County seeks to guide new growth such that a compact urban form develops. The County contends that a compact form will "conserve natural resources, retain valuable agricultural lands, minimize travel distances, reduce air pollutant emissions, and

enhance the ability to provide and finance urban infrastructure and services" (County of Sacramento 1990b:49). To ensure that this form is achieved, the County has established an Urban Policy Boundary. The Boundary is intended to limit "urbanization, and in doing so, identifies where it is anticipated that public infrastructure and services will be provided. It will prevent urban development of remote sites, and is intended to lead to infill and orderly development of a compact and efficient metropolitan form" (County of Sacramento 1990b:51).

Accordingly, several physical settings have been identified as appropriate locations for TODs:

- Infill Areas - Vacant parcels within existing urbanized communities surrounded by urban development;
- Revitalization Areas - Reinvestment of private funds into urbanized areas where the quality of development has deteriorated or the land is significantly underutilized;

- Reuse Areas - Reuse of large, planned but not developed industrial parks throughout the County and reuse of large areas of excess parking near commercial centers;

- Urban Growth Areas - Undeveloped areas within the Urban Policy Boundary.

The TOD concept as applied in Sacramento may be described as a land use strategy designed to address the problems associated with the existing pattern of suburban / urban development. These problems are identified as: traffic congestion, jobs / housing imbalance, consumption of open space, urban sprawl, and air pollution. In response, the TOD concept is designed to redirect "urban growth to patterns which reduce automobile dependence and support alternative modes of transportation" (Calthorpe 1990:1). The strategy utilized to accomplish this goal coordinates transit facilities with moderate and high density housing, public amenities, jobs, retail and services in mixed-use developments. The mixed-use component is designed to address and encourage

transit and pedestrian travel. The concept also accommodates lower density housing and auto-oriented uses by creating "Secondary Areas", or areas which surround the mixed-use TOD.

By linking land use and transportation, the TOD seeks to establish an efficient land use pattern that addresses the needs of pedestrians and facilitates the use of transit. In other words, it seeks to guide development in such a way that transit may be efficiently operated and utilized. Special emphasis is placed on designing an environment that addresses pedestrian circulation, both as a form of transportation itself as well as a way to access public transit. Yet in the attempt to facilitate walking and public transit, the concept acknowledges that the majority of household and work related trips will continue to be by automobile. In response, it attempts to reduce congestion on arterials and thoroughfares by providing an alternative or internal street network for local trips.

Furthermore the mixed use component of the TOD is intended to provide daily services in close proximity to residential areas.

Although the TOD concept does incorporate and address regional goals at the site planning level, it must be coordinated with a comprehensive regional planning effort in order to truly achieve full success. To ensure that TOD concept is consistent with regional objectives outlined by the County of Sacramento, Calthorpe Associates has identified those objectives that the land use strategies are intended to address. The following is a list of those objectives and a brief discussion of each. A more detailed discussion will be carried out in the analysis of the land use strategies in the next chapter. Rather than focussing on the social and economic objectives, the analysis in the next chapter and the thesis itself will focus primarily on the regional objectives that the TOD concept seeks to address.



### **1) Limitation of sprawl**

Sprawl is considered to result from development practices that allow new growth to occur outside the contiguous area of a city rather than adjacent to it. The limitation of urban sprawl is seen to be desirable in that it results in an urban pattern which facilitates and supports walking and transit use. Such patterns are considered to be efficient in terms of providing public transit and infrastructure. It is proposed that urban sprawl be limited by developing mixed use areas (TODs) adjacent to existing urban development rather than in distant subdivisions. Furthermore, redevelopment of underutilized areas of the existing urban area is seen as a means to increase the densities necessary to support transit, efficiently utilize existing infrastructure, and prevent further expansion of the urban area.

### **2) Relation of land use and transit**

The concept seeks to facilitate public transit use by intensifying existing urban patterns and by limiting urban sprawl as described above. Intensification of existing urban patterns according to the guidelines can be achieved through mixed-use infill development. Mixed use development along transit routes is considered essential for establishing the densities necessary to economically support the system. In employment areas, mixed use developments are considered essential for encouraging people to utilize transit opportunities. If people are not able to access restaurants, retail and services during the work day, their use of transit is thought to be limited.

### **3) Reduction of vehicle miles traveled**

This is to be achieved by encouraging people to walk, cycle, and utilize public transit through the creation of mixed-use environments in close proximity to both residential and

employment areas. In residential areas, the concept seeks to reduce vehicle miles traveled by providing the essential daily services within walking or cycling distances of each household. Even if households choose to drive to near-by mixed-use centers, they do not drive as far. Additionally, they may potentially accomplish more errands on the same trip-end, thus reducing the total miles driven.

### **4) Protection of the natural environment.**

The natural environment, it is claimed, will be protected by encouraging cluster development in mixed-use nodes thereby conserving land for agriculture and recreation. Additionally, by reducing the total number of vehicle miles traveled, as noted above, air quality could be improved.

### **5) Creation of a jobs/housing balance.**

This is to be achieved by matching housing types to the incomes provided by locally available jobs. For example, in an area in which lower, middle, and upper income jobs co-exist, this mix would be reflected in the availability of apartments, condominiums and small-lot single family homes. Additionally, a variety of household types are claimed to be accommodated within the scheme, i.e. single-parent families, the elderly, and singles.

### Land use strategies

Pedestrian Pockets or TODs are defined in the Sacramento guidelines as mixed-use neighborhoods, ranging in size from 20 to 160 acres, which lie within 1/4 mile of a transit station. Inside this 1/4 mile radius, a commercial core or mixed use development with a variety of housing types, retail, office, open space, and public facilities is located in a "pedestrian-friendly" environment. Surrounding the high-density concentration of uses within the TOD is a zone known as the "Secondary Area". Comprised of lower density housing, schools, parks and commercial / employment facilities, the secondary area is located within one mile of the transit station. The total population of a Pedestrian Pocket is intended to reach approximately 5,000 people.

TODs are described as taking two different forms depending on the context and market conditions required for their success. The two forms are Urban TODs and Neighborhood

TODs. These forms incorporate secondary areas and core commercial areas.

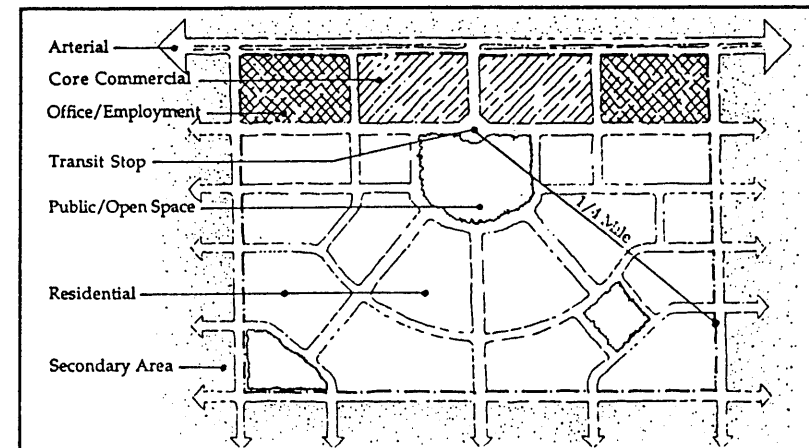


Figure 3.2: TOD Components

Urban TODs are mixed use developments which are to be located at major points along a primary transit line whether it be light rail, subway or express bus. Due to their prime location in relation to the regional transportation network, Urban TODs are reserved for higher commercial intensities and residential densities. They are to be locations for job-generating and high intensity uses such as offices, large-scale

shopping centers, and high density housing. These "intense" uses are described in the guidelines as being necessary to justify the substantial investment in a transit system as well as to maintain the population densities to support that system.

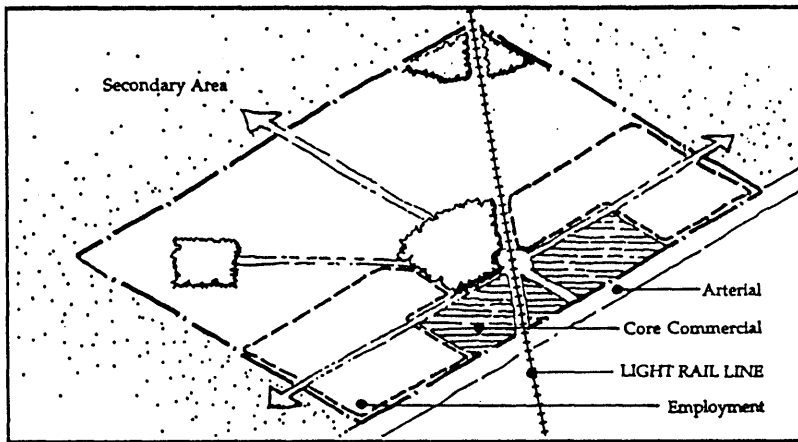


Figure 3.3: Urban TOD

Neighborhood TODs are mixed use developments situated within a 10 minute bus ride (approximately 2 to 3 miles) from a major transit line or on a major line itself. They focus primarily on residential uses and the retail, commercial, and

public amenities required thereof. Neighborhood TODs are key to the concept's objective of achieving a regional jobs/housing balance and providing housing in a variety of price categories. They are intended to contain a variety of

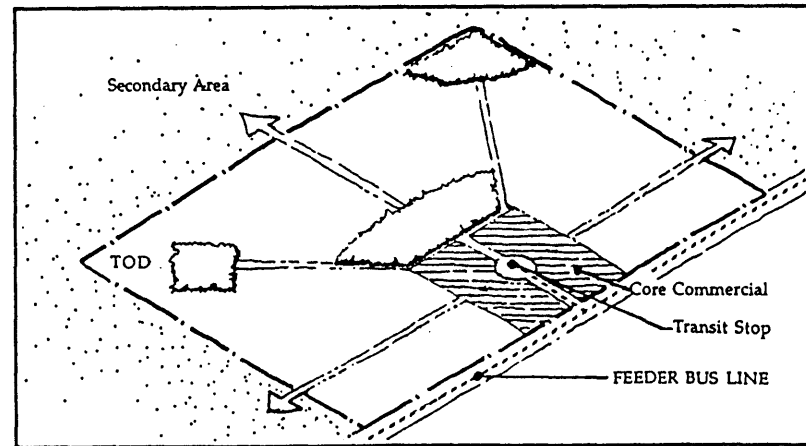


Figure 3.4: Neighborhood TOD

housing types such as townhouses, apartment buildings and small lot single-family homes. This variety of housing types in close proximity to retail, services, public amenities and employment opportunities is intended to address the needs of

lower-income people, reduce the total number of vehicle miles driven by decreasing driving distances to essential goods and services, and encourage walking, cycling and the use of public transport.

Secondary Areas are described as lower-density more auto-oriented areas surrounding both Urban and Neighborhood TODs. They are intended to link standard single-family residential zones to the services, amenities and transportation choices available within the TOD, and are not to be in excess of one mile from the transit station. This proximity is viewed as a way in which to encourage cycling and walking. Land uses within secondary areas may include schools, parks and commercial / employment opportunities designed to serve both the TOD and the secondary area. Employment generating uses with intensities supporting transit are allowed within one mile of the TOD core provided they are linked to the transit system via shuttle service. Circulation between the TOD core and

Secondary areas is to be direct and should not require the use of an arterial. The Sacramento Guidelines specify an 8 to 1 ratio of single-family secondary land area to TOD land area. Although it is an auto-oriented zone, overly dependent auto land uses, such as motels and service stations, are not allowed within secondary areas. They may however contain park and ride lots if connecting shuttle service to the TOD is provided.

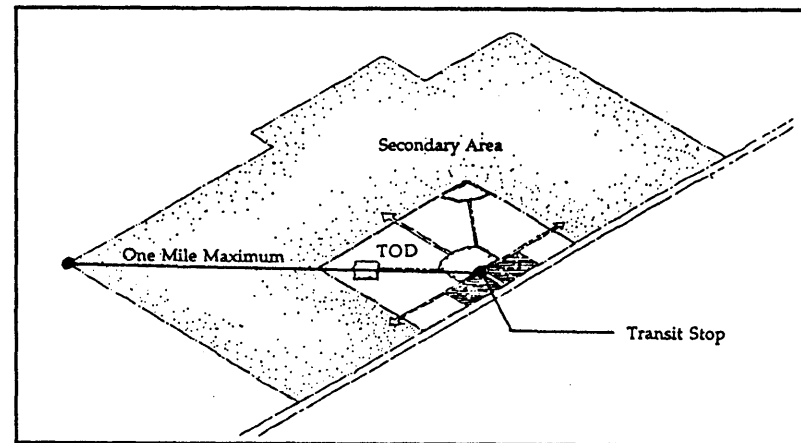


Figure 3.5: Secondary Area

The Core Commercial Area in each TOD—Urban or Neighborhood—is a mixed-use area that includes convenience shopping, offices, restaurants, services, housing and most importantly the transit station. The Core is intended to serve as a draw for mass transit line or bus route as well as to provide the densities necessary to support it. It is envisioned as the center of community life for the TOD and surrounding secondary area. The Core is to be located on the edge of the TOD itself, adjacent to a major arterial or transit corridor.

### Location and Site Criteria

TODs in Sacramento County are to be located along existing or designated Light Rail Lines or Feeder Bus Lines. All land within 2000 feet of designated transit corridors is subject to the TOD Guidelines.

To ensure that future development occurs in patterns that support Sacramento's planned regional light-rail network, the

County has designated a zone in which all TODs must lie. Known as the Urban Policy Area, this zone was established to encourage the clustering of development in and around transit lines within the contiguous urban area. Such measures in turn are expected to assist the county in controlling sprawl by creating a compact urban form.

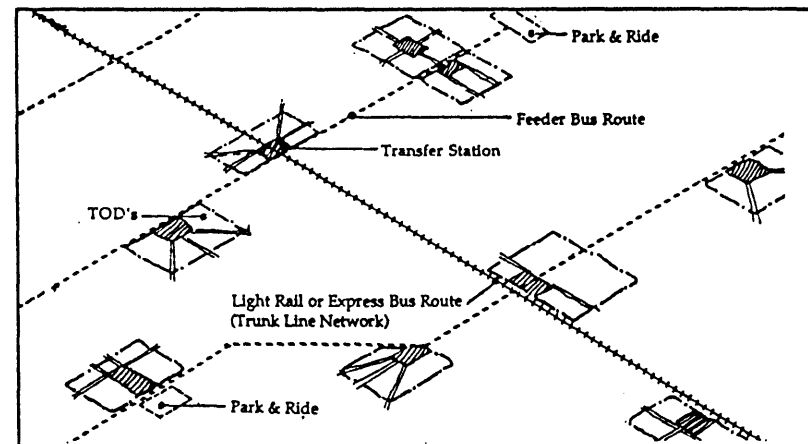


Figure 3.6: Relation to Transit

TODs are also intended to be utilized in conjunction with efforts to revitalize or intensify use and densities in existing areas. According to the guidelines, implementation of the TOD concept on infill sites would provide the opportunity to alter auto dependent suburban development patterns and convert them to higher-density mixed-use centers. Sites for such conversion however would require sensitive analysis for their appropriateness and compatibility with existing development and for any impacts on traffic and infrastructure that might occur. Additionally, TOD sites would need to have appropriate access to transit. Redevelopment of underutilized or faltering commercial uses would be encouraged by placing new construction on existing surface parking areas and by placing parking into structures.

TOD sites are required by the guidelines to be underutilized, undeveloped. Underutilized sites are defined as developed or partially developed parcels where the ratio of the value of

improvements to the land value is less than 1:1. The guidelines call for 80 percent of the minimum sized sites (20 acres) to be underutilized or undeveloped.

TOD sites in Urban Growth Areas are required to be a minimum of 40 acres and no more than 160 acres (equivalent to 1/4 mile radius) and are to be complemented by secondary areas. Forty (40) acres is considered the minimum area necessary to develop a TOD that can function as a mixed-use transit-oriented destination.

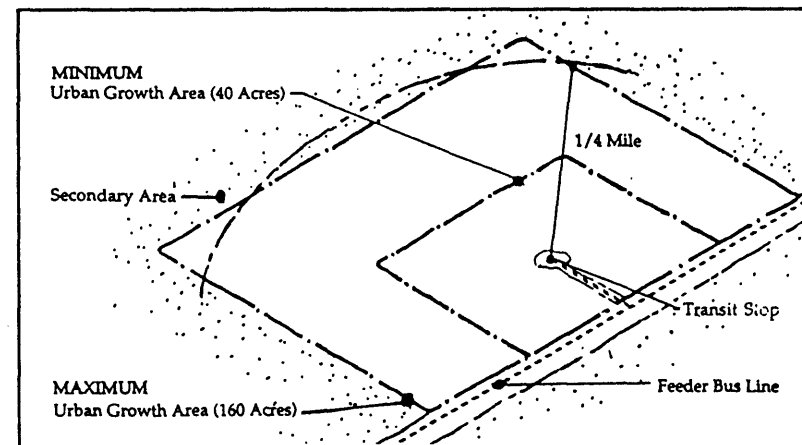


Figure 3.7: Urban Growth Areas

Infill sites are required to be a minimum of 20 acres and no more than 160 acres. The minimum sized site of 20 acres is to have at least 80 percent of its area either vacant or developable. It is claimed that a 20-acre site could function as a TOD if existing and compatible uses such as multi-family housing are adjacent to the site. Connections and coordination of adjacent development is considered essential for the success of new infill.

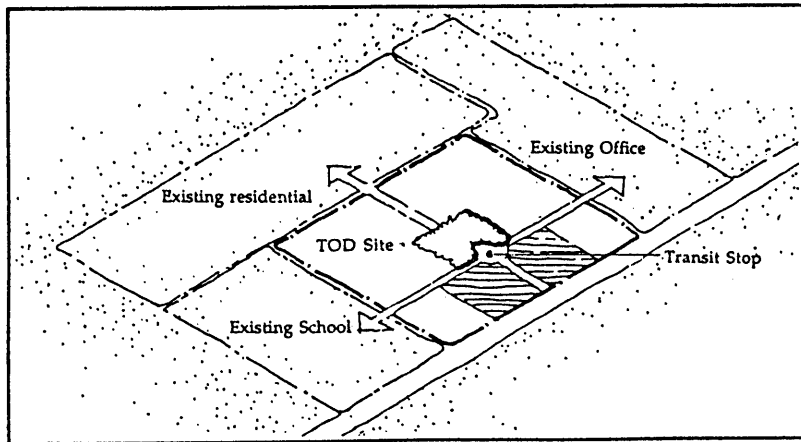


Figure 3.8: Infill and Revitalization Sites

Mix of Uses

By definition TODs are mixed use developments. Thus, "a certain minimum proportion of uses are required to stimulate pedestrian activity and to provide economic incentive for developing mixed-use patterns (Calthorpe Associates 1990). In response, the guidelines call for the following gross land use areas within a TOD.

Use	Neighborhood TOD	Urban TOD
Public	10% min.	10% min
Core	10-15%	10-30%
Housing	40-80%	20-60%
Office	0-40%	20-60%

[Source: Calthorpe Associates, 1990]

Each TOD is required to have a mixed-use core area with ground floor retail and commercial space occupying at least 10 percent of the total land within the TOD. The minimum amount of retail space is specified as 10,000 S.F. The core is required to be located adjacent to a transit station so that activities of the area may reinforce one another. This measure is considered essential to creating the desired link between land use and transportation.

The Sacramento plan identifies the following types of possible TOD retail centers:

- Convenience shopping and services (10,000 to 15,000 S.F.)
- Neighborhood Centers with a supermarket, drugstore and supporting services (60,000 to 100,000 S.F.)
- Specialty retail centers (60,000 - 100,000 S.F.)
- Community centers with convenience shopping and small department stores

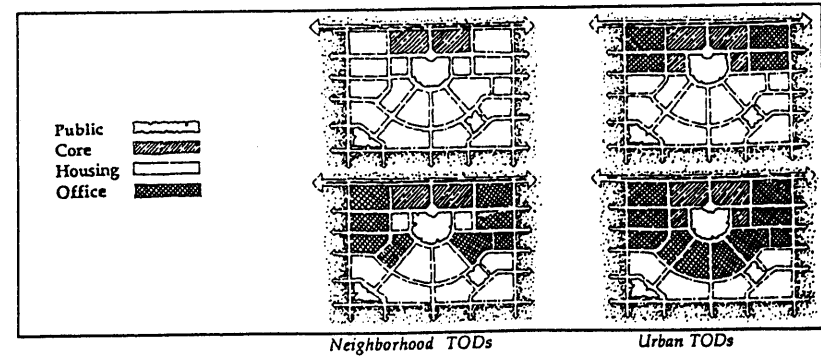
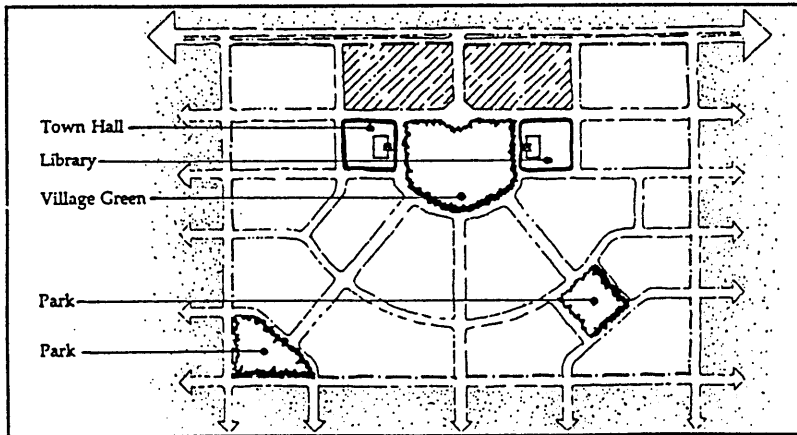


Figure 3.9: Proportion of Uses

The housing as envisioned in the TOD guidelines would provide a variety of densities, ownership patterns, price ranges, and types. This mix is intended to address the diverse housing needs now prevalent in Sacramento. The TOD guidelines seek to provide such diversity by allowing ancillary or "granny" units behind single family homes in addition to the moderate-to-high density apartments and townhouses to be located immediately adjacent to the commercial core and transit stations.





**Figure 3.10: Public Uses**

TODs are to include parks, public plazas, daycare centers, and community buildings. Developers are required to set aside sites for such uses although they are not required to construct buildings. Instead, public agencies are to be encouraged to construct new facilities on the sites provided by the developer. The purpose of this measure is to encourage a "sense of community" within the neighborhood and create an environment which encourages pedestrian travel.

### Residential Density and Commercial Intensity

In order to encourage and support transit, Neighborhood TOD sites are required to have a minimum of 7 units per residential gross acre, an average of at least 12 units per residential acre, and a maximum of 30 units per residential gross acre. Urban TODs are to required to have a minimum of 7 units per residential acre, an average of at least 15 units per residential gross acre, and a maximum of 50 units per residential gross acre. The minimum average residential density within the Secondary area is to be 6 units per gross acre. In order to increase densities in secondary areas, the construction of duplexes and ancillary units is encouraged. A minimum residential density of 12 units per acre is desired in order that efficient transit may be provided.

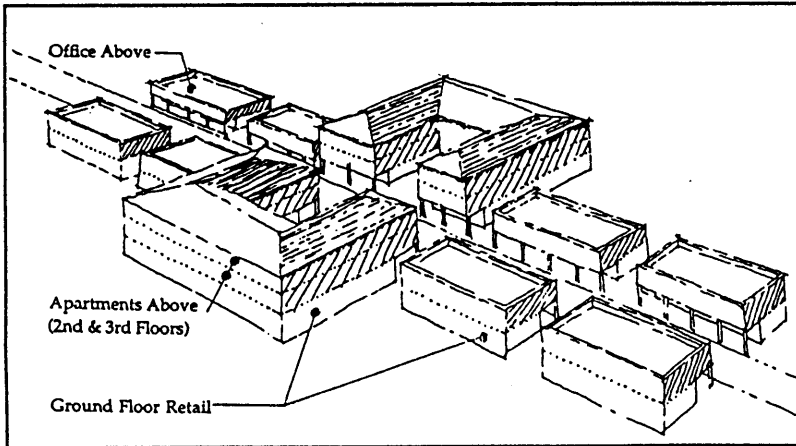
To ensure the efficient utilization of land near transit stops, adjacent offices are required to be multi-story (not to exceed 4-1/2 stories in Urban TODs or 3-1/2 in Neighborhood TODs)

and surface parking is strongly discouraged. "Office intensities without structured parking are to have a minimum 0.35 FAR and are not to exceed 0.60 FAR [note: 0.45 is about the highest FAR possible without structured parking]. In Neighborhood TODs, offices are allowed to develop to a maximum of 1.00 FAR with structured parking. Urban TOD office developments are allowed to develop to a maximum FAR of 1.70, if structured parking is provided" (Calthorpe 1990).

The core area in most contexts is intended to provide convenient neighborhood-scale shopping. A minimum FAR of 0.25 is required—not including second floor uses. Enclosed shopping malls surrounded by parking lots are not allowed in the Sacramento guidelines. In order to support retail and the objectives of the core, residential and office space is allowed on the floors above the retail. In the Sacramento case, up to two floors of residential uses may be added for every

floor of retail, or up to one floor of office for every ground floor of retail.

The goal of the core is to strike a balance between pedestrian and auto accessibility. Retail in the TOD is required to have two faces. Major anchor stores are to face an arterial and parking while smaller shops are to face a pedestrian Main Street. Anchors are however encouraged to provide entrances and window displays along the pedestrian street. Buildings are required to maintain a consistent edge at the sidewalk line and are to provide display windows for each of the shops. The idea is to provide a true separation between pedestrian and auto uses within the TOD and thereby reinforce the goal of creating an active and pleasant pedestrian environment.



**Figure 3.11: Core Commercial Area**

### *Streets, Circulation and Parking*

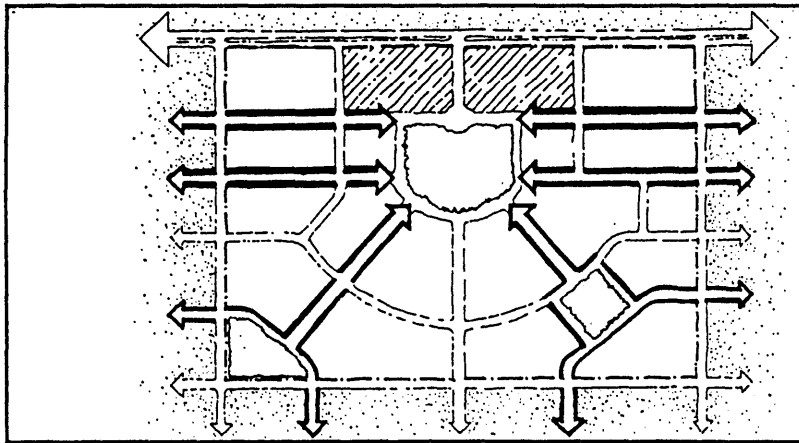
Arterials and thoroughfares are not allowed to pass through TOD sites, rather they are to be located along the periphery. They may, however, be located between a TOD and adjacent Secondary Area provided that convenient and safe crossings are designated for pedestrians and cyclists. Street patterns are to be "formalized", clear, and imagable, linking the periphery of the TOD to the transit stop and commercial center. To enhance the imageability of the TOD streets, public buildings,

parks and natural features are to be utilized as focal points and terminations of major axes.

Multiple routes are encouraged to the transit stop and commercial area so as not to force traffic onto an arterial to access destinations within the TOD. On-street parking is called for on all TOD streets except for arterials. This measure is intended to "civilize" the street and minimize the area needed for large parking lots. Minimum street widths are also specified to slow traffic, reduce paving costs, and enhance the pedestrian environment.

The Guidelines advocate the use of alleys in residential and commercial areas so that relief may be provided to the street system as well as to allow cars to be placed behind buildings. Placing cars to the rear is intended eliminate garage doors from the façades of small-lot single family houses. This would allow porches and the windows of the house's major rooms to

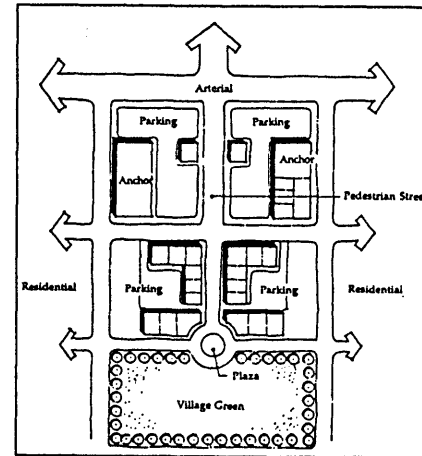
face the street. It is claimed that this will result in a safer environment as more "eyes are on the street".



**Figure 3.12 Street Patterns**

Parking lots are not permitted to occupy more than 33 percent of the frontage of pedestrian-oriented streets or interrupt pedestrian routes; instead they are to be located behind buildings or on interior blocks. They are also not allowed to exceed 2.5 acres, which is claimed to be the appropriate size for anchor grocery and drug stores. They may, however,

exceed 2.5 acres if divided by a street. Joint parking is strongly encouraged for appropriate adjacent uses such as



**Figure 3.13 Parking Configuration**

office, entertainment and some types of housing. Standard parking requirements for offices are to be reduced by 15 percent, in order to discourage commuting. But in doing so, restrictions are also placed on parking in residential areas.

## Summary

From the discussion above, the land use strategies utilized in the Sacramento TOD concept may be summarized as follows.

Each of these will be discussed and analyzed in greater detail in the Chapter IV.

- Sprawl can be checked by utilizing the TOD concept in conjunction with urban containment and infill development policies.

- Housing sited within a one mile radius of pedestrian scale mixed-use developments containing retail, services, employment, entertainment public spaces and amenities and transit connections will:

  - allow residents to choose a variety of transit alternatives to the automobile such as walking, cycling and convenient public transit;

  - decrease the total number of vehicle miles driven and the associated air pollution and gasoline consumption (will not necessarily decrease the number of trips, only the distance traveled, see site planning below);

  - decrease traffic congestion by transferring some auto trips to transit and non-motorized modes.

- High density mixed-use employment clusters (Urban TODs) containing retail, services, housing, entertainment, public spaces and amenities and transit connections will:

  - increase the number of trip ends at transit stations by creating destination nodes along transit routes (increases the viability of transit by capturing more work trips;

  - concentrate the critical population mass—residential, employment, and transient—necessary to attract transit trips and to provide the foot traffic necessary to support the retail and services provided;

  - encourage/allow more people take transit to work;

  - provide an environment in which jobs and housing may be linked;

  - accommodate modern retail and office development more sensitively.

- Moderate-to-high densities are required in residential areas to provide the 'capture rates' necessary to economically sustain a transit system.

- High employee densities are required to sustain Urban TODs as destination nodes on the transit route.

- Higher density environments are required to create the spatial proximities necessary for pedestrian environments.

- Moderate-to-high densities can play an important role in making housing more affordable thereby facilitating a better link between housing and jobs.

- Pedestrian friendly site designs, linking residential areas with mixed-use commercial, service and employment centers will encourage people to walk.

- Streets that provide multiple and direct circulation routes from residential to nearby mixed-use centers containing the goods and services needed daily by households will result in a reduction in the total number of vehicle miles traveled and traffic congestion.

## **CHAPTER IV:**

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### ***Air quality, Mobility, and the TOD Concept***

### The TOD concept and Air quality

Since the first federal Clean Air Act was passed in 1970, pollution control devices have been successful in reducing point source pollution and improving vehicle efficiency. While impressive, these technical improvements may soon be overwhelmed by the growth in total number of vehicle miles traveled (VMT). With most US cities reporting a growth in VMT between 3.5 and 6 percent annually, even the new emissions standards of the 1990 Clean Air Act amendments will be negated by VMT growth within 10 to 20 years. (Epstein 1992).

The 1990 Clean Air Act seeks to address this prospect by encouraging the coordination of land use and transportation planning by utilizing strategies similar to those in the 1988 California Clean Air Act. The Act includes several Transportation Control Measures (TCMs) including: expanded public transit; high occupancy vehicle lanes; trip reduction

ordinances; pedestrian only zones; exclusive bike lanes; and land use strategies.

As the 1990 CAA links federal funding of transportation projects to compliance with the emission reduction targets and schedules of the Act, land use in the US could be greatly impacted. Development in the future may be tied to air pollution measures requiring developers to address air quality issues before approvals are granted. The outcome of the Act is ultimately predicted to lead to *urban planning that emphasizes compact development and mass transit* (Bookout 1992). That being the case, the TOD concept could prove to be useful to communities nationwide as they seek to reduce annual automobile emissions within their jurisdictions. Additionally, the power of local planning authorities to accomplish other social and economic objectives could be integrated with air quality legislation. The TOD concept provides a good example of how other objectives could be coordinated with air quality



legislation. However, the question remains: What can the TOD concept actually contribute toward improving air quality? To answer this question it is necessary to examine the supporting objectives of this primary goal.

The objective of reducing auto emissions is directly related to reducing the overall reliance on the automobile. In Sacramento this is to be addressed in three ways: by reducing the distance driven to reach essential daily services, entertainment, and employment facilities; by encouraging the use of alternative modes of transportation such as public transit, walking, and cycling; and by establishing a balance between jobs, income, and housing. While it is claimed that vehicle miles traveled can be reduced, little evidence exists to support this notion and will not until Sacramento's Laguna West, the first development to utilize the TOD concept, is completed. Moreover, until a large portion of the Sacramento area is

developed and redeveloped utilizing TOD land use strategies, the overall impact of the concept will not be known.

### *Reducing Vehicle Miles Traveled*

The urgency of reducing the total number of vehicle miles traveled (VMT) is reflected in the U.S. Department of Transportation's *Nationwide Personal Transportation Study* (NPTS). This recently published (1990) study noted a 41 percent nationwide increase in VMT between 1983 and 1990 despite only a 6 percent increase in the total population. This unprecedented growth in travel can be attributed to an increase in the total number of vehicle trips as well as the distances traveled on those trips. In fact, fully two-thirds of this traffic growth can be attributed to increases in the number of trips and trip distances (Bookout 1992).

The data collected for the NPTS study indicate that nationwide people are driving more and traveling alone more

often. This is in part due to an increasing reliance on the automobile for daily activities—a reliance that accounts for 25 percent of the total growth in travel. Despite a slight increase in the number of household person trips, vehicle trips increased approximately three times as fast even though the number of persons per household dropped (Bookout 1992). The number of vehicles per household has increased and is thus impacting the number of non-work trips now made in suburban areas. Richardson and Gordon (1989:6) note the following facts about non-work trips that are often ignored in transportation planning: "three of every four weekday trips are nonwork trips; the number of of non work trips is growing rapidly, especially outside central cities, while the number of work trips is constrained by the growth of employment; and that the majority of peak-period trips are nonwork trips". This growth may be explained by the opportunities created for nonwork travel as a result of the decentralization that occurred in the 1980s. This is especially true in larger metropolitan

areas where the most dramatic changes in land use patterns have occurred. Instead of delaying trips to distant shopping and entertainment areas, decentralization has allowed these trips to occur more frequently. Lifestyle changes also played a part, as more people participated in recreational activities and other entertainment options (Richardson & Gordon 1989).

The increase in VMT is also related to an increase in the total number of licensed drivers (Ducca 1989). Currently the population of licensed drivers is increasing faster than the population as a whole, attributable mainly to demographic changes. The aging of the population, the movement of women into the work force (according to Richardson et al. 1989, the number of women entering the work force has leveled off), a steady increase in personal income and shrinking household sizes, have all contributed to an increase in the sheer number of cars on the road (Ducca 1989). Middle age people statistically drive more in response to both their

own and their children's mobility needs, thus, the baby-boom generation is at present responsible for a significant increase in the number of vehicle miles traveled (Ducca 1989).

These increases are surprising because, in theory, the decentralization of the population, jobs, services, and entertainment has been predicted to result in a reduction of commuting distances, times and congestion (Richardson & Gordon 1989; Owens 1986). However, this was clearly not the case with the suburbanization of the 1980s when commuting distances increased 25 percent (Bookout 1992). Attributed to a lack of variety in housing types near employment centers, fiscal zoning, and an increase in the number of dual wage households (which must spatially maximize two jobs), the increases in commuting distances indicate that the probability of people residing near their place of employment has been greatly reduced (Cervero 1989b). It should be noted, however, that it is not necessarily

decentralization or even growth that complicates matters, but rather, the pattern that this growth assumes.

These findings suggest that any strategy intended to reduce VMT should not only target the work trip but the increasing number of nonwork trips as well. Land use patterns which establish close spatial proximities between housing and work places may not be enough to guarantee a reduction in VMT. It is essential that a balance exist between the jobs, income, housing type and price, commercial facilities and the entertainment options found within a particular geographic area. Furthermore, changes in the demographic composition of households must be addressed as well, specifically, the needs of emerging household types, i.e. single-parent families. This implies that a variety of housing types must be included in close proximity to mixed-use employment and retail areas. Moreover, it implies the need for mixed-income communities.

### *Creating a Jobs / Housing Balance*

Calthorpe claims that the importance of the TOD concept is that it provides "balanced growth in jobs, housing and services while creating a mass transit alternative for the existing community" (Calthorpe in Kelbaugh 1989). In Sacramento, a balance is to be achieved by using three land use strategies: concentrating employment and residential opportunities at key locations along planned and future transit corridors; supporting housing and job infill proposals at transit stations along established transit routes; and requiring a phasing plan in the preparation of TOD projects, which addresses the timing between construction of employment and residential uses so that one use does not lag too far behind the other (County of Sacramento 1990a).

A jobs / housing balance is considered important because imbalances have been identified as a major factor in traffic congestion and air pollution. Many planners claim that longer

commutes are contributing to these interrelated problems. However, the growth in peak-hour nonwork trips may be contributing more to the problems of congestion and air pollution. Although about three-fifths of work trips occur during peak hours compared to less than one-third of nonwork trips, nonwork trips still predominate during the peaks. In some areas, peak nonwork trips account for up to 26 percent of all weekday trips. Nonwork travel now accounts for up to 70 to 75 percent of all weekday trips in metropolitan areas (Richardson & Gordon 1989). These facts suggest that policies or land use strategies which seek to reduce nonwork trips, or at least price peak-hour travel accordingly, might produce better results than striving exclusively for a jobs / housing balance.

Residents of many metropolitan areas are finding it difficult, if not impossible, to live near their place of employment; or else they are choosing not to take advantage of the

opportunities that do exist. This is evidenced by the 25 percent increase in commuting distances between 1983 and 1990 (Bookout 1992). Several reasons are cited for the imbalance but none seem to fully explain the phenomena. The reasons range from large-lot and exclusionary zoning to the problem of spatially maximizing two-income households. Other reasons include that residents are choosing distant locations as a matter of preference or because the housing they desire and can afford is only available at distant locations (Cervero 1991a).

Although the causes of imbalances may be unclear, it is clear that a jobs / housing balance would accomplish several things. It would help rationalize commuting patterns by reducing distances, consequently relieving congestion. Although the closer spatial proximities that result in balanced settings could encourage more people to drive to work, the distances traveled would be shorter. "Environmentally, all of these transportation

benefits would translate into lower tailpipe emissions and energy consumption" (Cervero 1991a:11).

A jobs / housing balance could also be a part of an effort to match income, jobs and housing around major employment centers. During the 1980s, rapid development of suburban employment centers escalated land values in areas that traditionally had cheap land available for housing. As a result, it became economically unfeasible to provide housing at a variety of prices in many suburban areas. In turn, many communities experienced labor shortages as low-skilled workers could not afford to live near the newly created suburban jobs centers.

A jobs / housing balance involves more than providing one housing unit for each job within a specific geographic area. The increasing number of two-worker households indicates that for a true balance to exist, the number of jobs must exceed

the number of housing units. A 1983 study by Gruen Gruen + Associates for Placer County California suggests that 1.6 jobs for each unit of housing is an appropriate ratio. However, for a true balance to exist, the housing provided must match the housing requirements of jobholders and their wages (Bookout 1990). Jobs / housing ratios, however, do not guarantee balance, they only indicate the potential for it to exist. Cervero (1991a:12) contends that "the degree to which that potential is realized is a matter of the share of jobs in an area actually filled by residents, or conversely, the share of an area's jobholders who also live in the area."

To achieve a balance between jobs and housing would require that households place a greater value on reducing commuting time and distances. Little evidence exists to suggest that this would be possible. In a 1989 Builder magazine survey of homeowners, it was found the 62 percent of those looking for a home stated they would commute for one hour to live in a

single-family home as opposed to commuting 25-35 minutes to live in a townhouse (Builder 11/89). Thus, locational decisions involve a range of qualitative issues such as lifestyle preferences, neighborhood quality, schools, commuting costs versus housing costs. All evidence suggests that commuting is not a primary consideration in choosing housing.

Thus, the creation of a jobs housing / balance is as much a qualitative issue as it is a quantitative issue. If a balance is to be established, then the status quo must be coordinated with larger social, economic and environmental objectives. For example, any attempt to achieve a balance in the US would require that the single-family home, at various price ranges, be provided near employment centers. If not, it is fairly certain that a majority of individuals would be willing to drive great distances to find the type of housing they desired—provided that commuting costs and times were not excessive. Additionally, achieving a balance would also require that a

variety of multi-family units be provided. The spatial proximities suggested here imply that mixed-income communities would be essential in achieving a balance. Perhaps most important, these new communities would need to provide an attractive alternative to the current vision of desirable housing. Once again it should be cautioned that nonwork trips predominate during peak hours, suggesting that they should be addressed as well.

#### Facilitating the provision and use of transit

In their detailed and often cited study of transit in the New York Region, Pushkarev and Zupan (1977) found that three factors determine the use of transit in a particular area: auto ownership; density of the downtown or employment/commercial clusters; and the quality of transit service. In combination these three factors were found to determine the proportion of transit trips between residential areas and employment or commercial clusters along a transit route.

However, the absolute number of trips (to which this proportion is applied) was found to be more a function of the distance between clusters—the greater the distance from a particular residential area, the fewer the number of transit trips originating in that area.

Transit use is a function of the number of cars owned by households, therefore many of the factors of increasing transit use are directly related to car ownership.

- The number of cars per household. Auto ownership is a function of density, the quality of transit service (distance to stations and frequency), household income and the number of residents 16 years and older.
- Higher residential densities affect auto ownership and use as a result of the associated higher costs, congestion, inconvenience and better transit service. Considering households of the same size and income, a tenfold increase in residential density was found to result in a reduction of .4 autos per household. At densities above 7 dwelling units per acre, transit use increases dramatically.
- Density of transit destinations also affects auto ownership. Higher density employment and commercial centers decrease auto ownership and use among people who travel to such centers daily.

- Household income affects the total number of auto trips. The relation between auto use and rising densities is the highest in middle income households and least in the lowest income households (auto ownership is lower).
- The presence of rail transit decreases the number of autos per household. For example, the presence of a rapid transit station was found to have an effect equivalent to more than a tenfold increase in residential density. Similarly, commuter rail in low density, high income areas also affected auto ownership but to a much lesser degree.

Thus, to increase transit use, the following conditions must exist in an urban area:

- High density downtown or other clusters of high density nonresidential activity;
- residential neighborhoods in close proximity to employment centers;
- high quality of transit service—proximity and frequency of transit service;
- moderate-to-high density neighborhoods.

Of all these factors, the density of the employment cluster was found to be the most important because: it reduced auto ownership among those who traveled there daily; it restricted auto use by those who traveled there daily and owned cars; it resulted in a compact land use pattern. By contrast high

residential densities alone had a minimal effect on encouraging transit use. If greater transit use is the goal, then it is more important to put housing close to a downtown or other employment cluster than it is to increase residential density.

Based on these findings Pushkarev and Zupan recommend the following land use policies:

- Employment and commercial centers should be clustered.
- Increasing employment cluster density is more important than increasing residential density.
- The highest residential densities should exist closest to high density employment clusters.
- High density residential should be clustered around transit stations.

While the above land use recommendations apply to the overall urban form, less is known about the impact of the localized site design on encouraging people to utilize transit.

However, several guiding principles can be offered:

- Suburban office developments should have well-defined, centralized core that serves as a focus for the surrounding development. The core should contain restaurants shops and



banks and walking distances between buildings should be kept to a minimum by decreasing setbacks.

- The site planning strategies to support transit should create a link between pedestrian traffic flow and the transit system itself. Such linkages lend flexibility to the transit system thereby increasing its door-to-door competitiveness in terms of convenience and appeal (Bowden, Campbell, and Newman 1980). It is the convenience and time element that make cars attractive over transit (Gordon et al. 1989).

- Buildings should maintain the street edge. Direct building entrances and walkways to the street should be provided (Metro 1987).

- A distance of 500-1000 feet is the most people can be expected to walk to a bus stop. This distance should be measured along the actual pedestrian route (Miller 1976).

- The "sphere of influence" for heavy rail transit encompasses a radius of 2000 feet (3 - 4 city blocks) or more. Light rail's sphere of influence is somewhat less— 2 or 3 city blocks (Tennyson 1982).

The potential of transit to induce compact development (supportive of the downtown) and the associated benefits of energy conservation and improvements in air quality, are factors central to Sacramento's decision to develop a Light Rail Transit (LRT) network (one line of which is in operation). To

ensure that land use patterns are supportive of the system, the TOD concept is being utilized to direct development along the existing LRT line as well as mainline bus routes.

Light Rail Transit (LRT) functions best where high densities are linearly arranged along corridors and where major office and residential destinations anchor both ends of the line. If ridership is to be adequate to economically sustain the system, concentrations of both residential and employment land uses are essential (Cervero 1984). The overall urban pattern is also important to the success of a light rail system. Pushkarev and Zupan (1977; 1980) have estimated the minimum land use requirements to support light rail using national data on capital and operating costs, average fare levels, and land use trip generation rates. Although their recommendations are based on highly aggregated data gathered in the mid-1970s, they are often cited in LRT feasibility studies and are considered to be industry standards (Cervero 1984). Their findings suggest

that the size of the downtown and residential densities are the most important factors for LRT. To provide an LRT operating with five-minute headways in rush hour, the following minimum thresholds are suggested:

- A downtown or other cluster of nonresidential activity of 25 million to 50 million square feet; and
- Residential densities averaging at least nine dwelling units per residential acre in a corridor of 25 to 100 square miles.

Although these thresholds are often cited, they have in recent years been challenged. Based on surveys of several recently completed LRT lines, Cervero (1984) found successful systems which did not meet this criteria. He concluded that "the degree of LRT usage might be affected less by current density characteristics and more by such factors as local land use incentives, LRT operating features, and perhaps the existence of various automobile control programs [such as parking restrictions]" (Cervero 1984:137). Parking restrictions have been shown to increase transit ridership more than lower transit fares and more frequent headways (Altshuler 1979).

However, parking controls often meet with political resistance because commuters and shoppers are often inconvenienced. Such policies sometimes lead businesses to relocate to suburban areas. This suggests that parking restrictions might work only in very large and congested cities.

While the factors noted above were found to have a more direct influence on ridership, the size of the downtown and the overall population density were found to be important factors in the success of LRT as well. In comparing ridership of existing LRT systems with the floorspace and residential densities of their respective cities, Cervero found that LRT ridership increased with the size of the Central Business District and the city's overall population density. Thus, he further concludes that the success of LRT in areas with low intensity downtown activities requires careful coordination of land use and transportation planning.

In Sacramento, planners seek to alter the present auto-intensive land use pattern to one more supportive of transit. However, a light rail system alone cannot bring about land use changes or stimulate private investment. If Light rail is to impact urban form, local policies must encourage this process with development incentives (TOD concept offers density bonuses and greater flexibility in terms of land use) and a strong public commitment to concentrated urban growth (Cervero 1984).

Few studies exist that explore the relationship between LRT and development. However, evidence from the heavy rail systems opened in the 1970s offer insight. The market will not necessarily produce the changes desired around transit stations unless encouraged by land use incentives (Knight 1980). Studies of the BART system in San Francisco and the METRO system in Washington conclude that three conditions must exist before the market will support new development around

transit stations: the rail system must improve transportation service or accessibility; the urban area must be experiencing growth; and zoning must be supportive of such development. (Gomez-Ibanez 1985). Local taxation, and joint development incentives must be utilized. Additionally, several other conditions must exist before the market will support development around transit stations. These conditions include: developable land of sufficient acreage; a positive setting in terms of pedestrian access and safety; and automobile deterrents such as parking restrictions and limits on road construction.

#### *Land use Strategies*

To address air quality objective noted above, the TOD concept relies heavily on mixed use developments coordinated with transit. Two forms of mixed use developments are described in the concept, Urban TODs and Neighborhood TODs (including their associated Secondary Areas).

## TOD Land use Strategy

### *Urban TODs*

Research on mixed-use employment centers has revealed many facts that support the land use strategies utilized in the TOD concept—particularly Urban TODs. Robert Cervero (199b 1989a), in his analysis of mobility problems at suburban activity centers, found that coordinating land use and transportation planning can be an effective way of addressing several mobility issues, i.e. traffic congestion, transit and collective transport use. As much of the TOD concept centers on decreasing auto dependence, traffic congestion, and altering the land use pattern that results therefrom, Cervero's analysis seems particularly relevant for examining the TOD land use strategies. It should be noted that despite the emphasis Cervero places on the coordination of land use and transportation planning, he warns that this strategy ranks second to pricing policies (fuel taxes and "low-density taxes") as an effective method of encouraging change in the land-use

pattern. As such policies are politically and socially unpopular, Cervero concludes that coordinated land use and transportation planning is the best approach available.

Cervero identified four land use strategies useful for reducing traffic congestion and providing transit alternatives in suburban *work places*: densification, mixed-use development, jobs/housing balance, and pedestrian friendly site designs—each of which are inherent to the TOD concept.

The density of employment centers has been found to be the most important factor in supporting transit—more so than the average residential density of the areas serviced by transit (Pushkarev & Zupan 1977). Similarly, Cervero concluded that the density of employment centers is the single most important land use factor affecting transportation mode choice in suburban areas (Cervero 1989a). In order for moderate levels of transit (15 minute headways) to be provided, it is

essential that workplace densities be at a minimum fifty workers per acre or more. Such densities allow modal splits in the 15-20 percent range and have been found normally to correspond to FARs in excess of 2 and above (Cervero 1988, 1991b). FARs less than 2.0 have been found to be too low to support intensive transit services (Cervero 1988). In the Urban TOD, which conceptually corresponds to the type of facilities Cervero analyzed, office uses are allowed to reach a maximum FAR of 1.70. When considered in conjunction with the retail and services to be provided, the total development within an Urban TOD could easily exceed an FAR of 2. Thus, Urban TODs would most likely support both public and other types of collective transit—carpool and van pool—if developed at the higher FAR. It seems unlikely that the lower FARs would result in high modal splits unless the surrounding uses could be coordinated with those intended in the TOD. The minimum density allowed in Urban TODs, .35 FAR,

would not provide the density and synergy necessary to support transit.

To illustrate the potential of increasing workplace densities, consider Bellevue, Washington and Uptown, Texas (part of the Galleria / Post Oak area)—the two densest suburban workplaces in the country. Bellevue with an FAR of 7.5 has 27 percent of its workers arriving by bus, carpool or vanpool (Cervero 1989a, Hooper 1989). Uptown, six miles west of downtown Houston, averages an FAR of 5.0 and has 22 percent of its workers arriving van pool and carpool (Cervero 1991). King County, Washington has observed that as the densities of mixed use employment centers increased from 25 to 60 employees per acre, the transit mode split increased from 1 percent to the 6 - 11 percent range (Metro 1987).

A key factor in increasing collective and public transit journeys to suburban employment centers involves the provision of retail and services. Unless retail and other personal services are provided within walking distances of office buildings and other employment locations, people are more likely to need their cars for midday errands and business. A recent survey of suburban employment centers found that approximately one-half of the workers needed their cars in order to complete errands or personal business (Hooper 1989). Thus, MXDs help reduce dependence on the automobile by internalizing midday trips and allowing workers to utilize alternative transit opportunities. A study of MXDs in Denver estimated that a reduction of up to 25 percent in trip generation rates for individual uses is possible in a well balanced development (ITE 1987; Cervero 1988). Some studies indicate that for every 20 percent increase in the amount of floorspace devoted to retail and commercial services, a 4.5 percent increase in public and collective transit

can be expected (Cervero 1989a). Thus, by reducing the need to travel for midday errands, Urban TODs could possibly play a role in reducing the total number of nonwork trips.

In addition to making transit more feasible, mixed use developments can also help reduce the overall congestion of suburban areas by distributing more of the auto trips generated over the entire day. If an employment center contains only office space, the traffic it generates occurs in relatively small time slots during peak hours. However, if a number of uses are included, traffic is more likely to be dispersed because of the varying schedules of the various uses.

Mixed use developments also allow shared use of parking facilities, therefore fewer parking spaces are required. Some studies indicate that parking reductions of up to 20 percent are possible, thus allowing more compact, pedestrian-scaled site plans (Barton Aschman Inc 1983; Cervero 1989a).

Additionally, reduced parking could assist in increasing transit trips. A number of studies indicate that the commuting mode is far more sensitive to parking supply and costs than other incentives such as lower fares or improved connections (Meyer and Gomez-Ibanez 1981; Cervero 1988). The Sacramento Guidelines respond to this conclusion by lowering the overall parking requirements in Urban TODs by 15 percent.

The provision of high density housing in Urban TODs could also increase the number of people walking to work and using transit as well as help establish a jobs / housing balance. In support of the transit objectives related to a jobs / housing balance, Cervero (1988) found the share of walking trips made to work increased in MXDs that had multifamily housing within a three mile radius—suggesting that people may be choosing to live closer to where they work based on price. The TOD concept is in agreement with this conclusion as

Neighborhood TODs are intended to provide multifamily housing within a three mile radius of an Urban TOD. Furthermore, clustering high density housing around transit was found to increase transit use by up to 34 percent in contrast to scattering it over a one-mile area (Pushkarev & Zupan 1977). Urban TODs are to include high density housing.

The goal of providing employment opportunities within the proximity of housing is one of the more interesting aspects of the TOD concept. Calthorpe, in developing his ideas on this issue, examined the employment patterns in Vällingby, Sweden. Although much larger and more intense in its land uses, this satellite city of Stockholm exhibits many of the land use and transportation linkages Calthorpe envisions for the TOD concept. Housing areas are all within an acceptable walking distance of a town center and transit line.

By 1965, some 14 years into the development of this new town, jobs were locally available for 54 percent of the town's employed residents. However, at that time only 24 percent of Vällingby's employed residents worked locally (Popenoe 1977). In theory, it may be possible to recreate similar balances in Urban TODs but it seems important to consider the differences between Vällingby and the TOD concept as well as differences between American and Swedish society and urban planning.

Home ownership patterns in the TOD concept are to be much higher than those of in Vällingby where 92 percent of the housing is multifamily. Thus, in Vällingby, people may be more likely to base their decision to live there on job opportunities as to do so does not involve a major investment in housing. And according to Popenoe there are fewer pressures in Swedish society to "get ahead" in the American sense—making job mobility less common. He therefore

concludes that the workplace and home are more likely to be in closer proximity to one another as a result of the types of housing available and the nature of Swedish society. It does seem however that the TOD concept could at the very least provide more employment opportunities in close proximity to housing than has previously been the case in the American suburb. Establishing a relationship between jobs and housing seems to apply most to those households that rent rather than own. It is more difficult for a homeowner to respond to changes in work location due to the investment made in housing. Thus, it may be concluded that renters are more likely to contribute to a jobs / housing balance than are homeowners.

#### TOD Land use Strategy *Neighborhood TODs and Secondary Areas*

The efficient and effective provision of transit in residential areas is also a function of density. Residential density is, however, a less important indicator of transit use than is the



density of major destinations and the location of the residential clusters within the urban area. Pushkarev and Zupan (1977; 1980) found that as distance increased between residential areas and employment / commercial centers, transit capture rates decreased. This could indicate that the notion of linking Neighborhood TODs to Urban TODs may not result in the degree of transit use envisioned. Neighborhood TODs are to be within 3 miles of an Urban TOD (approximately a 10 minute bus ride) yet, the number of transit trips to destinations at that distance has been observed to drop considerably (Pushkarev & Zupan 1977).

In terms of the densities required to support transit, a minimum of seven dwelling units per acre is necessary to economically support local bus service with 30 minute service. Light rail service requires densities of at least 9 dwelling units per acre in a corridor of 25 to 100 square miles (Pushkarev & Zupan 1977). The Sacramento Guidelines exceed this

minimum requirement by requiring an average density of at least 12 units per residential (net) acre.

A recently released study from the University of Wisconsin-Milwaukee concludes that in a general sense concepts like the TOD are supportive of transit. The study involved an analysis of the transit potential of 10 proposed new suburban projects—only one of which has been built and only four of which included transit—incorporating concentrated development and mixed land use, including a variety of housing types. Eight of the communities incorporated neighborhood retail within a quarter mile of residential areas. The study concludes that the "critical principles underlying most of these proposals, whether they included transit or not, are based on a village or neighborhood in contrast to suburban sprawl, and this concept is indeed transit friendly. Higher densities, concentrated locations, pedestrian orientation and

mix of uses make them largely transit compatible." (USDOT 1991 in Bookout 1992).

While it is presently difficult to determine if the site planning principles—1/4 mile walk to transit, etc.—will encourage transit use in TODs, it is possible to gain insight from similar existing situations. For example, a recent survey of transit users in suburban Washington, D.C. found that 25 percent of those working in office buildings within 2000 feet of the Silver Spring Metrorail station arrived at work by transit. Those residing near a suburban rail station and working near a different rail station were particularly inclined to take transit. Over 60 percent of those who lived within 1000 feet of a station and worked near another took the train to work. This was true even where income and rates of auto ownership were high (JHK 1989). Neighborhood TODs as envisioned in Sacramento will rely on express bus or LRT. These transit modes have lower capture rates and "spheres of influence"

suggesting that similar conditions in a TOD would result in lower capture rates.

If a Neighborhood TOD is to play a significant role in reducing the number of Vehicle Miles Traveled, then it is essential that the goods and services provided internally address the needs of the community to the fullest degree possible. Calthorpe (1990:24) states:

The mixed-use core commercial area is the driving force behind successfully linking transit and land use. The TOD must have a minimum amount of retail and commercial space to form a useful neighborhood shopping center and provide opportunities for workers to run errands at lunch time or on the way from work. Without shopping opportunities within convenient walking distance, residents will use their cars for a greater number of trips and workers will lose an incentive to use transit as an alternative travel mode.

Assuming that Laguna West is a typical example of the TOD concept, then a population of approximately 5,000 people is to be within one mile of a large neighborhood shopping center. Laguna West has been programmed for 90,000 square feet of

retail and 150,000 square feet of office space. According to the Urban Land Institute, a development of this size would be classified as a neighborhood center. It would provide "for the sale of convenience goods (food, drugs, and sundries) and personal services (those that meet the daily needs of an immediate neighborhood trade area)." The trade area population is normally assumed to be 3,000 - 40,000 people within a 5 to 10 minute drive (Casazza 1985:4). Supermarkets are the principal tenant of a neighborhood center as are a drugstore and a small variety store. Considering that consumer shopping patterns indicate that geographical convenience is the most important factor in choice of supermarkets (ULI 1985), then it is safe to assume that the market provided will capture a majority of the daily convenience shopping trips at Laguna West. It may be concluded, however, that commercial intensities of Laguna West are not sufficient to capture numerous other shopping, social and entertainment related

journeys. Nor is the population sufficient to support the retail to be provided.

To illustrate, consider the information in Table I compiled by Van der Ryn, Calthorpe Associates in their early work on the Pedestrian Pocket concept. Assuming that the activities highlighted are provided in a Neighborhood TOD and that residents choose to take advantage of these nearby activities, about 30 percent of household trips would be captured. This is a very optimistic figure, leaving a wide range of other activities unaccounted for. Additionally, as a population of 5000 people would not support the retail activities highlighted—especially the supermarket. Retail in a Neighborhood TOD would necessarily need a market area that extended beyond the boundaries of the TOD and the associated secondary area.

**Table I: Trips per Household**

Activity / Trip Attraction	Percent of all Household Trips.
<b>Possible Neighborhood Trips</b>	
Small Markets	6.8%
Small Cafe	2.1
Refreshments	1.5
Beauty Shop	2.3
Liquor Store	.9
Supermarket	3.4
Drug Store	2.2
Barber shop	1.2
Bakery/Butcher	2.8
Cleaners/Laundry	1.4
Variety	.4
School	4.3
<b>Total Neighborhood Trips</b>	<b>29.3%</b>
Large Restaurant	1.0
Bars	1.6
Apparel, Women's	.6
Women's Acces'y	.1
Apparel Men's	.3
Auto Services	2.9
Gas Station	2.9
Hardware/Garden	.5
Furniture/Apl.	.2
Stationary/Book	1.6
Gifts/Novelty	.3
Radio/TV/Photo.	.4
Bank	1.2
Savings/Loan	1.1
Insur./R.E./Tax Off.	1.8
Civic Buildings	1.8
Recreation Center	2.6
Movie/Entertainment	2.5
Dental/Medical	1.4
Church/Temple	1.0
Sporting Goods	.3
Department Store	.1

[Source: Van der Ryn & Calthorpe, 1986:103]

In light of the increased dependence on the automobile, it remains to be seen if the trip reduction claims of the TOD concept can indeed reduce the total number of vehicle miles traveled. However, the *NPTS* data discussed in the objectives section of this chapter suggest that the trip reduction principles of the TOD concept may in fact be useful. By integrating employment, residential and commercial activities, rethinking circulation patterns, and focusing on pedestrian friendly environments, the concept may contribute to a reduction in the lengths of a few select trips. However, as noted above, the potential of the concept is greatly dependent on the mix of uses included.

A 1990 American Society of Civil Engineers (ASCE) Study of the Traditional Neighborhood Development (TND) and the TOD concept suggests that the multiple connections between residential areas and the mixed use cores inherent to these concepts could produce a 57 percent reduction in the number

of internal VMT (compared to a Planned Urban Development [PUD] of the same size). The study also found that local streets would have up to a 400 percent increase in traffic while internal trips on arterials would drop significantly. Although the circulation systems in the TOD concept and the TND concept differ in that the latter is based on a grid pattern, they are similar in that they both seek to establish more direct and multiple routes to destinations within the boundaries of the development. Additionally, they both seek to transfer trips to non-motorized forms of transit (Bookout 1992).

Based on a hypothetical 700-acre development, the model used in the NTPS study compared a TND with a grid street pattern and mixed land uses with a similar PUD style project replete with curving streets and diverse but segregated land uses. The ASCE study, however, did not analyze trips originating or terminating outside the TND nor did it address whether or not the concept would produce fewer household

automobile trips than a comparable PUD (Bookout 1992). Measuring the number of trips is an uncertainty as it remains unclear if people will actually shift from the automobile to other modes of transit, especially walking and cycling.

The following Table summarizes the findings of the study:

**Table II.**  
**Vehicular Capacity in Prototype Conventional and TND/TOD Communities**

	Conventional Suburban Dev. (CSD)	TND/TOD	Difference
VMT	10,990	6,260	TND-57% of CSD
Arterials	4,340	850	TND-25% of CSD
Collectors	5,400	810	TND-15% of CSD
Local Streets	1,250	4,600	TND- is 4 x CSD
<b>Volume/Capacity Ratio</b>			
Arterials	0.92	0.83	TND is lower
Collectors	0.94	0.87	TND is lower
Local Streets	0.21	0.22	Nearly Identical
<b>Level of Service</b>			
Arterials	D	B	TND higher
Collectors	D	D	Same
Local Streets	A	A	Same

[Source: Traditional Neighborhood Development—Will the Traffic Work? (American Society of Civil Engineers, 1990 in Bookout 1992)]

The conclusions of this study are questionable and certainly support the advocates position. Although conducted by the ASCE, there is fierce debate within the organization about the conclusion of this study and about the TND and TOD concept. A more detailed report is forthcoming from the organization. The degree to which the concept is able to assist in the reduction of VMT both within and outside the TOD depends greatly on the behavior of the general population. Use of the automobile is determined by the inclination to travel, cost of travel versus income, ownership of the automobile, attitudes, and public investment in infrastructure (Hanson 1992). If Neighborhood TODs or nearby Urban TODs don't provide the variety of goods, services and entertainment facilities demanded by the population, then some of the concept's potential for reducing travel may be negated. It should be noted that the widespread application of the concept is not intended to result in isolated pockets from which its residents do not venture. Rather, the idea is more one that brings the

essential goods and services of daily life within walking and cycling distance of the home and to decrease the travel distances to larger nodes containing those services not provided within the Neighborhood TOD.

## **CHAPTER V:**

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### ***Urban Form and the TOD Concept***

Implementation of the TOD concept is ultimately intended to produce an urban form characterized by a series of moderate-to-high density decentralized clusters linked to one another by a regional transit system and surrounded by lower density development. It is in the urban form produced by the regional application of the TOD concept that most of its potential to address air quality and other regional issues would be realized. TODs in isolation offer little if any benefit to the regional objectives that the concept seeks to address. Thus to truly understand what the concept may contribute toward regional concerns it is necessary to examine the regional pattern that would result from its widespread application.

*The TOD concept and Urban Form*

Although the efficiency of the transport energy requirements associated with a particular land-use pattern depend on many factors, it is possible to identify characteristics of the built

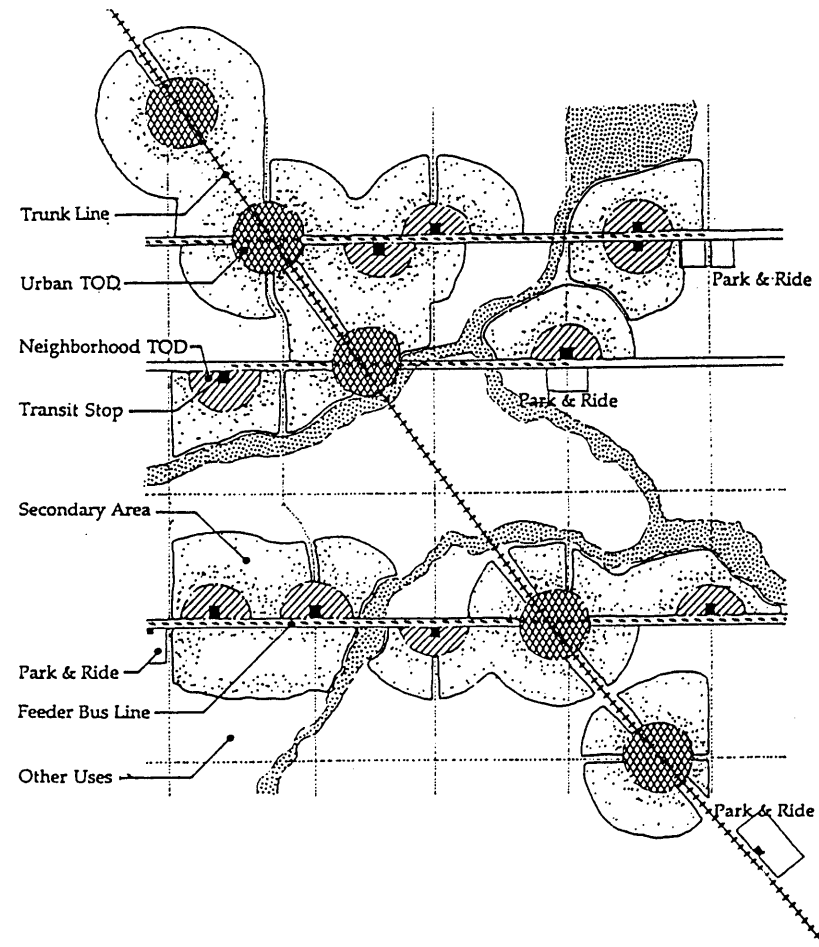


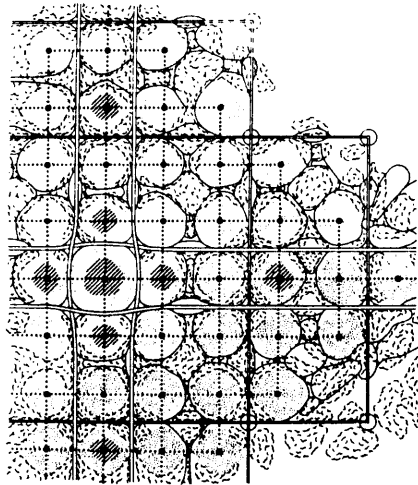
Figure 5.1: The TOD and Urban Form



environment that will potentially reduce energy demand. Research has shown that the single most important characteristic in the relationship between urban form and transport energy requirements is the physical separation of activities, determined in part by density and in part by the integration of a different land-uses, i.e. housing, retail, businesses, services (Owens, 1986). From theoretical work, two basic physical patterns of relating density and the interspersions of land-uses have been identified: mono-centric settlement forms such as the pre-automobile city; or a pattern of decentralized development clusters (polynucleated) containing jobs, services surrounded by residential uses (Owens, 1986). While these patterns tend to represent "ideal" forms, many of the underlying principles could be applied to incremental change in the existing urban structure. The TOD concept encourages such changes by seeking to create a pattern of decentralized clusters.

Theoretical work on decentralized cluster patterns has primarily focussed on the redistribution of centralized jobs and services to locations within closer proximity of residential areas, i.e. the suburbs. Decentralization has, in theory, been demonstrated to establish smaller geographic relationships between land-uses, thereby creating the opportunity for more efficient spatial relationships in terms of travel distances and energy use (Odell, 1975). The model discussed here is conceptually similar in pattern to that which would result from utilizing the TOD concept—a series of compact nucleated urban subunits with a scale based on walkable distances. Known as the "archipelago" pattern (Mathieu, 1978), this model resembles both the Neighborhood Unit scheme and the TOD concept in that it seeks to concentrate "everyday" facilities in relatively autonomous units and reduce unnecessary travel. The subunits inherent to the archipelago pattern could reduce unnecessary travel "but would almost certainly involve more compact development, more

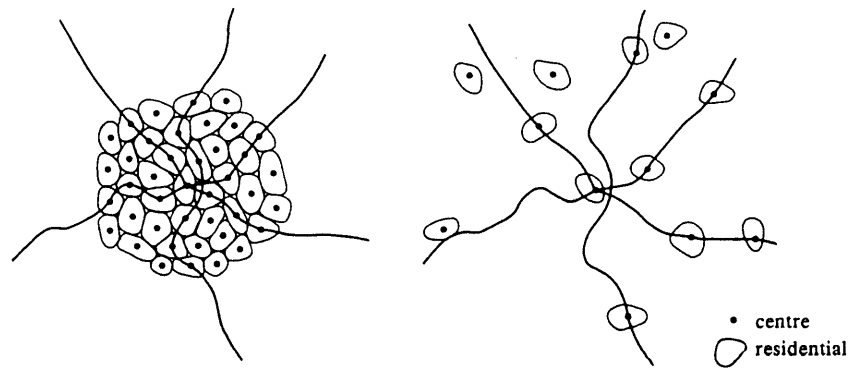
decentralization of employment and services, and greater autonomy of function" (Owens 1986:64). The compact form resulting from this pattern of development does not necessarily need to be urban in character but could be developed at moderate densities like those suggested in the TOD concept.



**Figure 5.2: The "Archipelago" Pattern—Polynucleated subunits.**

The subunits or pockets in the "archipelago" model are intended to be relatively autonomous in terms of the goods, services, amenities and even employment opportunities provided so that the travel requirements of the overall urban area may be reduced. Populations are intended to be large enough to provide the economic base necessary for the high degree of autonomy desired. However, the appropriate population is considered to be difficult to determine primarily because the minimum thresholds necessary to sustain the goods and services envisioned change over time in response to travel costs. Historically, the minimum thresholds have increased as travel costs have declined and greater economies of scale have been sought. The populations of the pedestrian clusters considered in the model range between 10,000 and 30,000 people, and are several hundred acres in size (Mathieu 1978).

The overall urban pattern possible utilizing the model assumes two forms: contiguous subunits or "pockets"; or subunits separated by open space in a manner similar to Howard's garden city principles. The efficiency of the overall pattern would of course be affected by the travel distances between units. Greater separations would result in increased travel and energy consumption.



**Figure 5.3: Urban Subunits: (a) contiguous, (b) noncontiguous**

In theoretical analysis, the "archipelago" pattern has been found to be energy efficient—provided that mobility is somewhat constrained by price or distance and people are willing and able to utilize the employment and service options in their immediate area. The pattern may be limited by the preferences and choices of individuals as well as transport costs. In cluster development of this type, the degree to which nearby job opportunities and services are utilized is a function of how well they meet the needs of surrounding residents *versus* the cost of commuting to other areas (Owens 1986). Research has shown that when rising energy costs or policies restrict mobility, decentralization may be more efficient as people will be more likely to consider location in the decisions they make about housing, work and shopping. If however, travel costs pose a minimal deterrent, this pattern could prove to be more energy-intensive as a result of increased auto use (Owens 1991). Nonetheless, the decentralization of employment and services "has often been found to be more

efficient in terms of energy travel requirements than has concentration in a single centre" (Hemmens 1967; Schneider and Beck 1973; Stone 1973 in Owens, 1986:64).

The actual efficiency of a decentralized pattern of development may be hindered by mobility constraints. Road network geometry may not connect trip origins and destinations in a direct and efficient manner. Unless infrastructure is designed to accommodate the multi-directional travel that this pattern creates, congestion is likely to overwhelm any gains in energy efficiency it might facilitate (Cervero 1991b). Despite such qualifications, the decentralized pattern is considered to be a worthy goal in that it would result in an appropriate urban form if mobility were to ever become constrained. Some researchers contend that existing development might be reshaped by market forces to resemble this pattern if mobility restrictions became severe enough (Owens 1986). The TOD concept seeks to establish such a pattern for the future when

mobility constraints or air quality legislation place limits on current land development practices. In the meantime, vehicle fuel efficiency and emissions control are more likely to produce the desired results.

It may be concluded that reducing the physical separation of activities is not "a sufficient condition for the reduction of transport energy requirements; it must be accompanied by a decreased inclination to travel longer distances and a willingness to take advantage of the opportunities offered for collective transit and non-motorized transport" (Owens 1986). Moreover, the physical environment must facilitate transport alternatives and concentrate the types of activities, services, and amenities necessary to discourage travel.

*Public Transit efficiency and urban form*

Discussion thus far has focussed primarily on reducing the need to travel through land-use planning. It is also clear that land-use could play an important role in facilitating the economic and efficient operation of public transport—a notion central to the objectives of the TOD concept

In terms of spatial structure, public transit is most economical and efficient in moderate-to-high density areas because it improves access and clusters trip-ends. The actual efficiency of public transport depends on load factors or the number of passengers, thus, in low-density areas such as residential suburbs, it proves to be less efficient. This does not necessarily mean that efficient transit would not work in the suburbs. In low density areas, the pattern of development has a significant effect on efficiency (Owens 1986) For example, forms that cluster major facilities in moderate-to-high densities surrounded by lower density areas could support and facilitate

the use of transit—provided that urban design patterns allow for convenient and safe pedestrian access. In the U.S., densities necessary to support a viable transit system vary according to the type of service intended. For example, 2-10 units per acre is necessary for local bus service; 9-12 units for light rail; and for express bus, 15 units per acre over a two square mile area. Such densities are possible by mixing single-family homes, garden apartments and two-to-six story apartment buildings (Pushkarev & Zupan 1977).

Thus in terms of establishing land use patterns which support transit, Owens (1986) concludes:

Planners should encourage higher residential densities and concentration rather than dispersal of facilities.....Relevant planning policies might therefore include discouragement of dispersed low-density suburbs, some degree of clustering (though not necessarily centralisation) of facilities, siting new development near transport routes, and the maintenance of moderately high densities along these routes. (Owens 1986:38)

As is true for the reduction of travel needs, spatial patterns are not enough to guarantee efficient transit service. Many factors determine the success of transit including car ownership, socioeconomic characteristics and attitudes of the population, investment in infrastructure and public transport policy. Currently transit is unable to compete with the private car because motorists do not pay the full costs of operating their vehicles (Owens 1986; Hanson 1992). Thus, some restriction or cost accounting on auto use would be necessary to encourage the increased use of public transit.

As demonstrated, theoretical work on transport energy efficient urban patterns indicates that decentralized clustering could be an effective way of organizing both new and existing suburban areas—provided that other supporting measures are utilized. Sensitive design of the physical environment is particularly important for the success of this pattern. The environment must skillfully combine the following land-use

initiatives: densities sufficient enough to support collective transit; an appropriate mix of uses and opportunities (including employment) to discourage travel to other areas; and pleasant pedestrian and cycling circulation to decrease auto travel within the cluster. Furthermore, the success of the concept is dependent on pricing policies, such as higher fuel prices and parking fees, which discourage use of the automobile.

#### *Fuel Efficiency and Urban Form*

The exploration of the relationship between urban form and fuel efficiency has recently been supplemented by an international assessment relating fuel consumption to various factors of price, vehicle efficiency and urban form (Newman and Kenworthy 1989). This discussion is based on the work of Australian researchers Peter Newman and Jeffrey Kenworthy (NK).

The NK study primarily evaluates the relationship between physical planning and policies for conserving transportation energy in urban areas by comparing gasoline consumption in 32 cities around the world. The conclusion of the five year study was that "urban structure within a city is fundamental to its gasoline consumption—more so than vehicle efficiency" (1989:25). In fact their work using international data indicates that approximately half of the variation in gasoline consumption among world cities can be attributed to fuel price, income, and vehicle efficiency with the urban form of these cities explaining the other half. While life style and travel behavior may explain some of these differences, urban form is certainly a significant factor in the consumption equation. Consider that per capita gasoline consumption in U.S. cities is four times that of many European cities and ten times that of Asian cities such as Tokyo, Hong Kong and Singapore. It is doubtful that travel behavior and lifestyle fully

explain these differences. After all travel behavior and lifestyles are impacted by the land use patterns.

The NK study found population and job density to be the major land use parameters strongly correlated to gasoline consumption. The relative intensity of land use in U.S. cities was found to be correlated to gasoline consumption—higher inner city population densities were associated with less gasoline consumption. Intense land use patterns were found to result in shorter trip distances, greater transit viability, more walking and cycling, an increase in the number of occupants per vehicle and less of a need for a car.

Based on their research Newman and Kenworthy conclude that the ideal transportation efficient city would be one with a high population density, a strong center and "intensively used suburbs"—suburbs that could support a transit system and facilitate more walking and cycling trips. They advocate the

provision of rail transit to the suburbs claiming that by increasing the intensity of the urban center and providing transit, substantial energy savings could be realized. Thus, Newman and Kenworthy conclude: "the clear relationships between gasoline use and a range of physical planning and transportation variables confirm that the model of a gasoline-conserving urban structure....is compact, with a strong city center, combined with a commitment to transit (especially rail) and other nonautomobile modes, and to restraint in the provision of automobile infrastructure" (1989).

The findings of Newman and Kenworthy contradict many econometric models of gasoline consumption. Such models have usually suggested that only minimal savings would be possible from land use or transit changes. Small (1980) suggests that increasing residential densities to 15 units per acre from the US average of 5 would reduce work related auto use approximately 1.4 percent over a 6 year period. Newman

and Kenworthy, however, criticize such studies because they do not take into consideration the full pattern of changes that occur with increased urban activity and lower automobile dependence. In particular, the major fuel savings made possible as densities increase from the 4-6 people per acre to the 12-14 people per acre as a result of the exponential relationship between gasoline use and density.

According to Newman and Kenworthy "the problem with using econometric models to attempt to explain variations in urban gasoline consumption is that these models assume urban spatial variations, and modal split patterns can be accounted for solely by gasoline price and income variations." Such models tend to suggest that little can be done to decrease gasoline consumption other than taxing gasoline and vehicles or increasing fuel efficiency. While pricing policies and efficiency requirements can be useful, these measures will not be adequate without "direction in land use and a rethinking of



transportation resource allocation" (Newman and Kenworthy 1989).

Conversely, they contend that physical planning could conserve fuel:

- by increasing urban density;
- by strengthening the city center;
- by extending the proportion of the city that has inner-area land use;
- by providing a good transit option; and
- by restraining the provision of automobile infrastructure.

From their data analysis they conclude that two physical planning policies in particular could be pursued to conserve fuel in the long run: reurbanization and reorientation of transportation priorities. These policies are in agreement with the objectives and principles of the the TOD concept as applied in Sacramento.

The process of reurbanization involves bringing jobs and population back to the city and an intensification of the

suburbs through infill mixed-use development—not unlike the TOD concept. The ultimate objective of this process is to return to the pre-automobile pattern of development or the compact city. However, the NK argument does not fully consider the decentralization that has occurred in the United States. Considering the lifestyles that have evolved as a result of decentralization Gordon and Richardson (1989) contend that planning for a stronger downtown and limiting suburbanization would increase consumption by making people travel further to reach urban amenities. Considering the amount of decentralized development on the ground, it seems logical to create several centers rather than one single center.

Newman and Kenworthy also argue that land use patterns can be altered to some degree by the mode of transit given the most emphasis. The following are suggestions they have for reorienting the US transportation system:

- Upgraded and extended transit

They suggest that by focussing on light rail systems and encouraging appropriate land use, the US transport system could be altered. Furthermore they suggest that the systems could be paid for by entrepreneurial activity on the lands surrounding stations. Correctly, Gordon et al. criticize the notion that public-private land development could help pay for the systems as there are few success stories. Knight (1980) concluded "on the basis of the available evidence we cannot clearly establish a causal relationship between rail transit and changes in land use and development . At best, such changes would seem to occur only in the presence of other favorable factors."

- Increased pedestrianization and bicyclization

They advocate these modes as efficient forms of transit and as a way to improve linkages to transit and add flexibility to transit routes which will increase the door-to-door competitiveness of transit (Bowden, Campbell, and Newman 1980).

- Planned congestion

They suggest that limits should be placed on automobile movement and parking.

Gordon and Richardson in their critique of Newman and Kentworthy contend that their argument is misguided in several ways. First, if reducing fuel efficiency is truly a societal goal, then introducing a fuel tax would be "much simpler, faster, more effective, and cheaper than rearranging metropolitan areas and/or major investment in transit. "This reply ignores the dependence suburban residents now have on the automobile and the regressive nature of taxes. Furthermore, this singleminded notion ignores several other social, economic and environmental problems associated with current land use patterns. To allow market forces to reshape the environment does not necessarily guarantee that desirable urban forms would result both in terms of providing transit or creating desirable alternatives.

Would higher gasoline prices, as Gordon and Richardson contend, serve as an effective method of reducing energy consumption and ultimately change the urban form? The

answer is not as straightforward as it may seem. For example, despite a 60 percent increase in U.S. fuel prices (corrected for inflation) from 1973- 1980, auto travel decreased only 5 percent per capita. (Reid in Van der Ryn & Calthorpe 1986). As this indicates, a drastic increase in the real price of fuel will not necessarily result in the dramatic decrease in consumption, which might be expected. If demand for travel is considered inelastic, as may be the case for the journey to work or shopping, consumption of another commodity may be given up instead (Owens 1986). Evidence from the 1973 energy crisis suggests that people are more likely to continue travelling to all the activities they can afford, with any changes in travel habits occurring in trip distances and frequencies, rather than elimination. (Reid in Van der Ryn & Calthorpe 1986). Such persistent driving habits clearly illustrate the extent to which suburban residents are dependent on the automobile to carry out many of their daily activities. Thus, it may be concluded that decreases in fuel consumption as a

result of increased prices may in the long run be limited by land-use patterns that necessitate driving. This is not to suggest that price increases could not be useful in reducing consumption, rather, they must be coordinated with land-use initiatives that decrease dependence on the automobile.

In terms of spatial changes that could occur as a result of price increases, theoretical research has not yet produced enough conclusive evidence to predict if changes in land use patterns would result therefrom. In the short to medium term, the general consensus among researchers is that people will respond to energy constraints, such as price increases, in ways that reduce energy consumption, having little impact on locational decisions (Owens 1986). The response to sudden and drastic increases in price, as was the case during the 1970s, proved this to be the case. Some researchers hypothesize that a gradual increase in fuel prices would ultimately affect the locational decisions people make about

where to live in relation to work and other activities although no substantive evidence exists to support this notion (Owens, 1986). It is interesting to note that surveys conducted in the U.S. following the 1974 oil crisis suggest that the periodic nonavailability of energy for inelastic trips is more likely to affect locational decisions than is price (Corsi and Harvey, 1977).

A recent study on transportation and urban form concluded that increasing travel cost exerts little effect on urban patterns but increasing or decreasing travel time has a significant effect. The effect of changing travel times by 20 percent is greater than the effect of doubling the price of gasoline. This conclusion is reinforced by the fact that all of the models tested ignored the possibility of drivers buying more fuel-efficient cars. At the local level this study indicates that growth restrictions, trip management ordinances and other measures to

curb traffic may have either no effect or undesired effects such as pushing growth outward (Webster et al. in Ducca 1990).

While it may be debated, urban form is significant factor in transport energy consumption and therefore auto emissions. Strategies to reorganize the urban structure in a more efficient manner are controversial. Nonetheless, it may be concluded that an urban form that limits the need to travel is a key issue in decreasing auto emissions. Of the two urban forms presented, the polycentric concept seems most applicable to reorganizing the existing land use pattern due to the decentralization that has already occurred. Newman and Kenworthy's argument clearly is out of touch with what has occurred in the US; however, their strategies for reorganization are consistent with the Sacramento Guidelines, i.e. reurbanization and reorganization of the transit system.

*The Sacramento Plan:*

*Urban—Form, Policies and Strategies*

In terms of the overall urban form, the Sacramento TOD Guidelines seek to limit sprawl and facilitate the development of a contiguous polynucleated urban pattern. Although a polynucleated pattern is encouraged, the County wishes to direct as much growth as possible to downtown. The compact pattern of development is assumed to be efficient in terms of transport, fuel efficiency, travel needs and is therefore assumed to result in lower auto emissions.

Underlying this notion of contained urban growth is the highly debated assumption that sprawl is unattractive, fiscally inefficient, and environmentally unsound (Real Estate Research Corporation 1974). Conversely, the containment of growth within existing boundaries or adjacent to those boundaries is assumed to facilitate the efficient provision of urban services and infrastructure, and increase the overall

densities necessary to support public transit as well as conserve energy and protect the natural environment (Popenoe 1979). While popular among environmentalists and many planners, the concept of containing growth in a compact urban form has not gone without criticism.

Critics claim that compact urban forms do not address preferences for low density lifestyles and that insufficient evidence exists to support the claims of the economic and fiscal benefits. In terms of the environmental advantages of the form, it may oversimplify environmental problems and may actually exacerbate them in certain developed areas. Audirac et al. (1990: 478) claim that many city governments "in their quest for the most public-cost-effective urban form have endorsed an often nostalgic imagery of the good life in "compactness", with little evidence that such urban form is

indeed more economically efficient and more livable for all occupants."

Justification of growth management is often based on the claim that the public good is best served when sprawl is minimized. This claim is substantiated by the often quoted conclusion of the "The Costs of Sprawl". This comprehensive study of the topic concluded that in theory "planned high-density development had lower fiscal, energy, and environmental costs than low density sprawl." In other words, higher overall costs result from urban sprawl than would be the case in planned high-density communities contiguous to existing development (Real Estate Research Corporation 1974). However, the assumptions and methodology of this report have been repeatedly criticized leaving its conclusions subject to question (Altshuler 1977; Windsor 1979; Peiser 1984). Much of the criticism has been centered on the report's failure to isolate and identify the

effects of density and planning from other variables of development costs (Windsor 1979). The connection between discontinuous development and density is thought to be important "because uniformly low-density urban development is inefficient. It increases transportation costs, consumes excessive amounts of land, and adds to the cost of providing and operating public utilities and public services" (Peiser 1989:193).

Peiser (1989) states that the pattern of sprawl is undesirable but at the same time the process of discontinuous development may be more efficient than continuous development under certain conditions of market imperfection. Discontinuous development results from market imperfections and from the land development process itself. Land that is skipped over during the initial development process increases in value as it is surrounded. In the long run its price may increase as a result of the "value" created by adjacent development. Higher

land prices inherently encourage higher densities to occur. This process of discontinuous development is dependant on higher density development of infill areas; thus, "land use controls that restrict discontinuous development may reduce efficiency in the land market and lead to lower rather than higher overall densities" (Peiser 1989).

In the case of Sacramento County, the TOD concept is to be implemented in conjunction with an urban growth boundary. But, if it ultimately seeks to increase the overall density of an urban area, is the use of an urban growth boundary an appropriate way in which to accomplish that end?

Peiser (1989) concludes that public policies such as urban growth boundaries, which seek to limit sprawl by supporting contiguous development, may be unintentionally increasing the overall amount of low density development. To illustrate, if growth boundaries are placed so tightly that they do not allow

adequate land for expansion of the urban area, then land prices may increase while. As discussed above, higher land prices may lead to higher densities provided regulation does not prevent the market from following its natural course. To ensure that the overall density of the urban area increases, it is essential that growth boundaries be drawn such that markets are allowed to function freely and that the density of infill development not be limited to levels below the average of the surrounding area. Peiser (1989) concludes: "In cities which allow higher than average density on infill sites, overall densities may be expected to be higher than would have been the case if policies limit the density of infill."

While strategically placed urban growth boundaries may in some cases be useful for encouraging infill development and preserving agricultural land, the policy may have unintended results (Knapp 1985). Critics claim that growth boundaries may negatively impact housing affordability (Audirac et al.

1990) and may even generate more sprawl as growth is shifted to remote unregulated areas (Fishcel 1989). In Oregon, where growth boundaries have been in place for some time, land prices and densities have increased (Wallis 1991). However, housing prices have not been driven up as high as was expected primarily because the growth boundary was placed in such a way that the land supply was not restricted. However, there is a fear that the market's ability to continue producing affordable housing may be limited by opposition to the urban character produced by higher density projects. Even though higher densities are encouraged, many developers find that their projects are received more favorably if they have densities lower than that permitted. In the long run such practices could lead to a lower than expected overall density and ultimately increase housing prices (Nelson 1990).

Infill development is encouraged in the Sacramento TOD Guidelines for several reasons. It is seen as a way to revitalize

or redevelop existing neighborhoods; as a way to introduce the densities needed to support transit in the existing urban fabric; as a way to utilize existing infrastructure more efficiently; and finally, as a way to halt sprawl and conserve land.

By utilizing land that is already serviced, the Sacramento Guidelines seek to encourage the use of underutilized infrastructure in a more efficient manner and reduce government capital expenditures. However, the efficiency of such reuse and intensification (due to higher densities) depends on the condition of the infrastructure and whether or not it meets current standards (RERC 1982). A 1989 study of infill efficiency, sponsored by the state of Florida (using Orlando as hypothetical case) concluded that infill development may be successful in utilizing some latent capacity. However, the cost of providing or upgrading that capacity in existing areas may be more expensive than providing new infrastructure on the urban periphery. "In short, encouraging



infill may achieve some select, but not universal economic advantages" (Wallis 1991:17).

High land prices on infill sites are often a major deterrent to the financial feasibility of utilizing such sites. As discussed above, development of infill sites is dependent on allowing higher densities that necessarily entail the construction of multi-family housing. It is on this point that infill development has encountered the most opposition, especially in middle-to-upper income areas. In Sacramento County, where infill development has been successfully encouraged since 1973, resistance to multifamily infill development now threatens to undermine the effort to increase densities (Johnson et al. 1984). Planners in Sacramento have found that encouraging contiguous growth through phasing policies has been easier to accomplish than infill development. This is especially true where multifamily housing projects are perceived to threaten the property values of single-family homeowners as well as

where such projects are considered to be a threat to neighborhood character. Similarly, efforts in San Diego to increase densities to levels supportive of transit have encountered considerable opposition from neighborhood groups in congested areas who fear density will only intensify problems (Porter 1989).

Although infill development has the potential to revitalize existing inner city and suburban neighborhoods, it is often viewed as being unadvantageous by the residents (RERC 1982). Infill is often viewed as gentrification and displacement. In fact, infill development in Portland, Oregon has been found to displace households from their neighborhoods and has resulted in violent confrontations ranging from the destruction of construction equipment to arson (Nelson 1990). Such behavior deters not only the effective creation of a compact urban form but the interests of developers. Developers often claim that neighborhood

opposition is one of the major problems encountered on infill projects (RERC 1982).

The 1982 study of infill development conducted by the Real Estate Research Corporation (hereafter RERC) identified several factors that affect the infill potential of a city:

<b>Factors</b>	<b>Highest Potential</b>
Growth	Rapidly growing population; extensive demand for new housing.
Employment Centers	Strong CBD and local employment nodes; long commuting distances form the urban fringe.
Building Conditions	Extensive investment (public and private) in neighborhood preservation and upgrading.
Resident Incomes	Infill land located in a variety of neighborhoods serving many income groups.
Land Prices	Shallow land price gradient from urban fringe to inner city or significant density differences to balance steep gradient.
Growth Controls	Limits on outward spread of development operating regionwide
Availability and Costs of Services	Developers at the fringe pay costs of service extensions and assist with school and park requirements; limited preservicing

[Source: Infill Development Strategies, RERC 1982: 6]

The RERC study also found that for infill development to occur, it would be necessary for local government to encourage the process due to unfavorable market and regulatory conditions that hinder it. First, local governments would need to stimulate interest in infill sites by "advertising" their advantages within the context of the city and their relationship with future capital expenditure projects. Second, infill could be encouraged if government obstacles were removed or streamlined. For example, permitting processes and excessively high or inappropriate standards could be altered. Perhaps most important, zoning could be adjusted to allow higher densities and uses that maximized the financial return and minimized the risks of infill development, i.e. multi-family housing. Third, the local government could assist in fostering neighborhood support for infill development by including residents in the planning and development process. It should be noted, however, that in Sacramento County, neighborhood involvement in the planning process

has resulted in pressures to lower densities and exclude multi-family housing (Johnston et al. 1984). Fourth, in areas with market weaknesses or areas with a poor image, the local government would need to demonstrate commitment to improving the conditions of the area by providing incentives such as loan guarantees, "below-market" financing through mortgage revenue bonds or industrial bond programs, and improvement to public works. Finally, the local government could address site specific problems by waiving fees, forgiving delinquent back taxes etc.

In addition to the fiscal benefits of limiting sprawl by containing growth, the Sacramento TOD Guidelines also assume that environmental benefits accrue as well. This assumption is based on two arguments: containing growth converts less land to urban uses by accommodating it in denser patterns and by encouraging infill; and, containing growth

reduces transportation energy consumption and the associated pollution (Audirac et al. 1990; Owens 1986).

Critics contend that many of the environmental benefits claimed by advocates of growth containment policies oversimplify environmental problems. "Densifying development may exacerbate environmental problems (e.g., water and air pollution, traffic congestion, etc.) within urban containment areas and contribute to the deterioration of the quality of life" (Audirac et al. 1990:477). Concern centers primarily on whether or not the *concentrations* of pollution would increase in higher density environments. Evidence suggests that this may indeed be the case but not the case when the city is considered as a whole. Berry et al., (1974) in their detailed study of the U.S. support the notion of a compact urban form. They conclude that dispersion and auto dependent land use patterns produce urban forms associated with increases in environmental pollution.

Population growth alone presents serious challenges to the containment of growth. Audirac et al. (1990) argue that concentrating population growth within existing urban areas only temporarily prevents outward expansion. They claim that in areas of rapid population growth, it may be difficult if not impossible to accommodate new development in a timely manner within the confines of a containment area. This claim, however, directly contradicts the conclusions of the Real Estate Research Corporation (1982): infill development has the greatest potential in areas of rapid population growth and extensive housing demand. While infill certainly could not accommodate all the new growth in an urban area, it could accommodate certain types especially if the government incentives are utilized. Clearly, the degree to which population growth can be accommodated in a compact form will depend on how well the development strategy is outlined and guided. In response to similar criticism, the Sacramento TOD Guidelines attempts to guide growth on a piecemeal and

incremental basis while simultaneously addressing issues of regional concern such as the overall pattern or urban form.

Growth containment also can impose environmental costs. In his criticism of the European Community's *Green Paper on the Urban Environment*—which advocates growth containment—David Lock (1991:338) identifies additional environmental costs: "the environmental impact of transporting goods and raw materials into the urban area; the energy consumption of dense fabric in managing its heating and cooling systems; the quantity and quality of waste produced in urban concentrations; and the environmental and energy costs of collecting such waste for treatment or recycling." To illustrate, high density development could negatively impact water quality unless measures are taken to ensure that it is treated properly. Stormwater runoff is one of the most detrimental forms of nonpoint sources of pollution in lakes, rivers and estuaries (Livingston 1989). Higher densities and intensities

of use necessarily lead to higher concentrations of pollutants in urban runoff.

For these reasons and others, Audirac et al. contend that a more appropriate response to the environmental issues would be to follow Ian McHarg's (1971) organic conception of urban development. McHarg advocates that the natural balances of potential development areas ecosystems be studied so that new development may harmonize with that system. Environmentally sensitive areas should be mapped, such as hills and wetlands, and then should not be included in the development plan. (McHarg 1969). This concept bases the amount, type and location of development on what the environment can feasibly support. It should be noted that this concept is not necessarily at odds with the TOD. In fact, Calthorpe and Associates acknowledge that limits of the land must be considered in conjunction with the inherent principles of the TOD concept. Considering the TOD concept evolved

out of a desire to create strategies for sustainable redevelopment, McHarg's ideas are certainly compatible.

**CHAPTER VI:**  
*Conclusions*

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## Conclusions

This thesis has traced the development of the Pedestrian Pocket concept from its beginnings in the environmental movement of the 1970s to its realization in Laguna West and its pending incorporation into the General Plan of Sacramento County. The thesis set out to answer several questions about how and why the concept is being considered as a planning strategy in Sacramento County. Specifically, the questions addressed in the thesis are:

- What can the TOD concept actually contribute toward improving air quality?
- Will the land use strategies inherent to the TOD concept reduce the number of vehicle miles traveled, help create a jobs/housing balance, and facilitate the use and provision of public transit?
- Will the overall urban form created by the regional application of the TOD concept be efficient, both in terms of reducing auto emissions and providing transit?
- Will the strategies and policies utilized in conjunction with the TOD concept help establish the compact urban form envisioned?

## Air Quality

The extent to which the TOD concept could assist in improving air quality depends greatly on the regional application of the concept. A large portion of a metropolitan area would need to be developed and redeveloped according to the concept's inherent principles before any significant improvements would be realized. Thus, the TOD concept is a long-term strategy for altering land use and transportation patterns. By establishing land use patterns supportive of transit as well as a pattern that potentially reduces the total number of vehicle miles traveled, the TOD concept could in the long run have a significant impact on air quality, and for that matter, on the quality of life.

Land use strategies like the TOD concept could in the future be linked to air quality legislation such as the 1990 Federal Clean Air Act (CAA). As changes in land development practices are but one of several Transportation Control

Measures (TCMs) incorporated in the CCA, the TOD concept is well poised to address the mandated changes. However, it remains to be seen if the political will exists to enforce the Act's Transportation Control Measures. Most of the TCMs included in the 1990 CAA, were also part of the original 1970 Clean Air Act. However, they were never enforced due to public opposition and a lack of political will at the local, state, and federal level.

Provided that the will now exists, the TOD concept could make an important contribution to fulfilling the requirements of the Act. Moreover, other benefits in addition to air quality improvements could accrue from the application of the concept. As the concept seeks to address a variety of social, economic and environmental issues, it is possible that qualitative issues could be conveniently linked to air quality legislation.

Ultimately, however, the contribution that the TOD concept could make toward improving air quality is dependent on the to which the supporting objectives of this primary goal are addressed. These objective include: reducing vehicle miles traveled; establishing a jobs housing balance; and facilitating the use and provision of transit.

#### *Reducing Vehicle miles traveled (VMT)*

As mixed use developments, both the Urban TOD and the Neighborhood TOD have the potential to reduce the distance traveled on a few select trips—primarily those directed towards the uses within the development. By including a variety of retail and services within walking and cycling distances, both types of TODs are potentially able to capture some of the trips which would have otherwise been directed to facilities located at more distant locations.



The degree to which TODs are able to reduce travel distance is largely dependent on how well the mix of goods, services and opportunities (employment and otherwise) provided fit the needs or desires of their respective populations. Providing the appropriate mix of land uses becomes a balancing act between what resident populations can feasibly support and the economies of scale required by the various uses provided. As economies of scale have historically increased as travel costs have decreased, many retail and service activities today have come to depend on the automobile to deliver the critical mass necessary for their success. As a result the population required to support the commercial activities needed on a daily basis in residential areas, extends well beyond that which could be accommodated within walking or cycling distances. This is particularly true in residential areas that maintain the low-density patterns of single-family homes. Thus a conflict exists between the commercial activities that can be supported by the socially acceptable population densities and the activities

necessary to substantially reduce the travel to other areas. To substantially reduce the need to travel to other locations would require that retail be decentralized—something that seems unlikely considering the current trend toward greater centralization, i.e. hypermarkets, regional malls. Thus it may be concluded that the potential TODs have for reducing the need to travel is limited by the nature of modern retail and the culturally acceptable densities associated with the single-family home.

Even TODs such as Laguna West with 5000 people per square mile are too small to adequately support a shopping facility with the mix of goods and services necessary to internalize a substantial number of household trips. This suggests that densities within Neighborhood TODs, in particular, should be increased if the goal is to capture as many pedestrian and transit trips as possible. While this could be accomplished by increasing the number of multi-family units

or row houses, such actions may be unacceptable to many residents. Another way to increase the critical mass necessary to support commercial activity would involve linking several TODs in a synergistic way. For example, two or more TODs could be physically linked so as to support one central retail area. Linking TODs would, in effect, double the population within walking distance of the retail provided.

Urban TODs, on the other hand, have a greater potential to reduce the need to travel, particularly for trips made during the day by office employees. Provided that Urban TODs are developed at an FAR of 2 or more, commuting as well as midday trips could be significantly reduced. Reductions of travel distances in Urban TODs as in Neighborhood TODs depends greatly on the mix of goods and services provided within the development. The appropriate mix is in turn dependent on what the office and residential population of the TOD can support.

The potential of the TOD concept to reduce VMT is also dependent on the polycentric urban pattern that would result from the widespread application of the concept. The decentralized cluster has, in theory, been shown to be efficient in terms of travel requirements—provided that the inclination to travel to other nodes is kept to a minimum. The inclination to travel, as discussed above, is partly a function of how well the goods, services and opportunities within a particular geographic area meet the needs of nearby residents. However, it cannot be assumed that people will travel less just because of the spatial proximities created and mix of uses provided in such a pattern. Unless transit options are made more convenient or attractive to driving, then the potential of the concept to reduce VMT is diminished greatly. In addition, travel costs and mobility can impact the inclination to travel to other areas. If travel costs pose a minimal deterrent to travel, the decentralized cluster pattern could prove to be more energy intensive as auto use would increase. Nonetheless, the pattern

would most certainly be more efficient than the dispersed pattern of development that now exists in many suburban areas.

### *Jobs / Housing balance*

Implementation of the TOD concept on a regional basis could systematically establish a balance between jobs and housing. This is possible primarily because the concept offers the potential to establish a mixed community—mixed both in terms of housing variety and income level. The inclusion of multifamily units in particular, contributes to the jobs / housing balance. Residents of multifamily units are more likely than are homeowners to base housing location on job location. Furthermore, renters are better able to respond to a changes in job location than are homeowners.

The TOD concept seems particularly well suited for establishing a jobs / housing balances in existing low-density

areas. It offers a method of introducing either jobs or housing "pockets" where imbalances may exist. However, the concept faces several obstacles beyond what site planning and design can address. The potential of establishing a balance, especially in Neighborhood TODs, is severely limited by the prejudice against multifamily housing in suburban areas. Single-family homeowners often oppose multifamily housing on the basis that it "devalues" their investments. It has also been well documented that many suburban residents seek to isolate themselves based on social class and income. At Laguna West this fact is reconciled in the site plan by the provision of a 73-acre lake that separates the high-density TOD from the Secondary Areas.

The provision of multifamily housing in TODs also faces challenges from the market. For example, Real-estate interests in Sacramento have recently vied to bypass the TOD concept on the basis that it does not conform to what has traditionally

been marketable in the area. The California Building Industry Association (BIA) recently attacked the concept proclaiming that "the American Dream [is] vanishing in Sacramento County". Developers in Sacramento maintain that there is no market for the types of housing programmed for TODs. Thus, while TODs conceptually could be a useful method for incorporating "pockets" of housing diversity and employment into low-density single-use areas, they will face two obstacles: the market, and the values of suburban residents.

#### *Facilitating the provision and use of public transit*

The site planning principles inherent to the TOD concept are a textbook case of appropriate strategies for encouraging transit—pedestrian access is convenient and well thought-out; walking distances are minimized; mixed use developments are utilized to provide the necessary synergies; parking controls are utilized to limit auto use (reductions in parking spaces in Urban TODs); densities exceed recommended levels in

Neighborhood TODs; and, if programmed properly, can exceed them in Urban TODs.

In terms of the overall urban structure, however, the TOD concept could challenge the efficient provision of transit. Application of the TOD concept on a regional basis implies that employment, retail, and services be dispersed throughout a metropolitan area—primarily in an attempt to establish a balance between jobs and housing and decrease travel distances. While decentralization may, in theory, be useful for reducing travel energy demands, it may make it more difficult to provide transit efficiently. Transit works best when employment, residential and major commercial centers are clustered along transit lines. In that sense, the TOD concept provides the necessary spatial structure to support transit. However, it is conceivable that the widespread application of the concept could lead to the decentralization of employment to a degree such that TODs within a region would lack the

intensities necessary to serve as a major transit "magnets". As has been demonstrated, the intensity of employment centers is central to encouraging transit usage. To adequately support transit, Urban TODs must maintain moderate densities (FAR 2+) to ensure that enough trip ends are clustered to serve as a transit magnet. This suggests that Urban TODs should be limited in number and placed at appropriate locations along transit routes in a manner that best supports the system.

While some degree of decentralization is economically necessary, it should be cautioned that it can not be carried out to establish jobs / housing balance at the expense of conditions that efficiently support transit. This suggests that how the TOD concept is utilized should vary with the urban area in which it is to be applied. For example, in a newly developing and growing city which has experienced little decentralization, it may be better to use the TOD concept in support of the downtown, i.e. develop the mono-centric model

(this is the approach taken in Sacramento). This implies that Neighborhood TODs would be the best strategy. On the other hand, in a large metropolitan area which has experienced a high degree of decentralization, it may be better to use the concept to develop a polynucleated urban pattern. In a decentralized context, the concept offers a convenient method of providing the conditions necessary to support transit as well as the potential to establish a jobs/housing balance.

Based on the discussion above, it would seem that the TOD concept is particularly useful in low-density areas in which transit is to be provided. For example, on the west coast, many of the recently constructed transit systems seem to be as much about air quality as they are about mobility. Due to the low density land use patterns common on the west coast, often transit cannot be feasibly supported. Thus the TOD concept offers a way to provide the "market" for transit in areas which would otherwise lack the conditions necessary for its success.

In areas which lack the concentrations of employment and residential densities, this has been shown to be essential for providing transit, i.e. land use patterns become more important than the initial densities.

*The Concept as applied in Sacramento*

As it is being applied in Sacramento, the TOD concept is utilized as an infill strategy to focus development along major transit routes within the existing urban fabric. Given the circumstances necessary for infill development to occur, the TOD concept is an appropriate infill strategy in that it allows for higher-densities and coordinates public investment with private development. The policies utilized by the County to encourage infill should result in the type of development climate necessary to ensure that a compact urban form occurs. The compact form is consistent with objectives of providing transit and decreasing the need to travel.

As an infill strategy, the TOD concept provides a method for revitalizing and redeveloping the existing pattern of development. Rather than applying only to green-field sites, the TOD, like its forerunner the Neighborhood Unit, can be utilized to revitalize and redevelop existing areas. Considering the amount of existing development on the ground and the recent round of decentralization, it seems wise to redevelop rather than starting anew as has often been the case with visionary planning concepts, i.e. the Garden City. Thus in that sense, the TOD concept seems particularly well suited to address the dispersed and decentralized pattern of development common in many areas of the country.

If the concept is to adequately address regional objectives, it is essential that infill development occur. However, the success of infill development is dependent on several factors: the routes of transit lines in relation to other desirable areas or infrastructure; the presence of compatible land uses in the

immediate area; the size and configuration of available parcels; and public support. Thus it seems for the concept to be truly applicable in existing areas, local government would need to be heavily involved in the process. Otherwise infill development may ultimately be limited by public opposition to increased densities—especially in the form of multifamily housing.

### *Opportunities*

While this thesis has primarily focused on how the TOD concept is being utilized to address air quality, it is clear that the potential benefits of the concept lie beyond this narrow and controversial issue. The more convincing argument for using the the concept lies in its ability to create the types of environments which are an agreeable alternative to current development practices. By providing a variety of public amenities including parks, daycare, schools, and neighborhood retail, the site planning principles of the concept

imply that it may be possible provide a sense of community that has been long absent from residential developments.

In addition to the notion of community, the TOD concept offers an alternative to the lifestyles dictated by auto intensive land use patterns. It offers a greater level of freedom to those who do not have access to a car. Socially, the TOD concept could lead to more balanced communities, not only in terms of jobs and housing, but in terms of demographics as well. The elderly could remain a part of the community as opposed to being isolated in some geriatric enclave and single-parent families could find the types of services they need.

Although the TOD concept seeks to alter development practices it manages to protect what Anthony Downs has called the "pillars of the dominant vision" —the automobile and the single-family home. By accommodating these elements in a physical setting that offers an attractive alternative to

conventional residential development, the TOD concept could become a very marketable strategy for residential areas. Thus, if the concept is both marketable and linked to air quality legislation, it could have a tremendous impact on development practice. The fact that the concept seeks to include a variety of housing types at various price levels suggests that the concept could also become more than "good design" for the wealthy.

The appeal of the TOD concept is enhanced by the fact that it does not prohibit the existing elements of the suburbs. Rather, the concept seeks to rearrange the elements in a pattern that addresses a broader range of issues. Thus it could offer an alternative to policies which seek to change the suburban environment but do not offer attractive alternatives. With the TOD, changes to the current practices are directly linked to a vision of what the new environment could be. By linking the qualitative aspects of environmental design to quantitative

objectives such as reducing auto emissions, it may be easier to "sell" it as a strategy for addressing such issues.

### Shortcomings

Perhaps the greatest threat to the successful application of the TOD concept are the market constraints and the logistical requirements of transit development. The fact that the concept seeks to establish a variety of uses within one area suggests that it may take several years to fully develop a TOD to a level supportive of transit. The time delays and mandated uses could prove to be unrealistic in the market. Thus the synergies which the concept seeks to develop could be compromised. It is not difficult to imagine the areas designated for multifamily housing, retail, and office, lying vacant for several years. As has been the case in Sacramento, opposition to multifamily housing could also hamper the intended outcome as well. Similarly, according to Rick Williams of Calthorpe Associates, corporations seeking new office space have been reluctant to



accept TODs as an appropriate location for business. Rather than seeking mixed use locations the firm has found that many businesses favor the seclusion of corporate office parks where they can maintain greater security over their operations. Finally, the concept may be compromised somewhat by the logistics of providing transit. As transit follows development, TODs may not have transit service well into the development process—especially if the market won't support the high density uses intended.

The TOD concept, the provision of light rail, and the feasibility of infill development, are all highly dependent on the vigor of the regional economy. Obviously, the TOD concept would require a rather rigorous regional economy to ensure that all of the intended uses could be provided in a timely manner. Due to the problems associated with infill development, the TOD concept may work best in areas that have steadily growing regional economies, a strong need for

various housing types and a strong commitment to the concept of contained urban growth.

### *Closing*

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The TOD concept as applied in Sacramento could be helpful in reducing auto emissions but only after it has been applied regionally and consistently over time. The mix of uses provided within or near to residential areas must address the broadest range of activities possible if the need to travel is to be reduced. If the goal of reducing auto use is to be addressed to the fullest degree possible, a system of physically linking TODs should be devised so that the population densities needed to support neighborhood retail are provided. Urban TODs, as programmed, will most effectively support transit at the higher FARs allowed.

The policies being utilized to establish the desired urban form in Sacramento have been effective in containing growth in

places like Portland, Oregon and should be effective in Sacramento as well. Urban Growth boundaries and infill policies are consistent with the notion of creating a contiguous polynucleated pattern of development. As an infill strategy, the TOD concept is well suited because it allows for higher densities and more intense land uses. Furthermore, it helps coordinate public and private investment in the development / redevelopment process. The degree to which infill is capable of increasing the over all density of the urban area is dependent on many factors and variables. For this policy to work effectively, the County will need to offer incentives in addition to the density bonuses and mix of uses allowed in the TOD concept.

Before closing, the question embodied in the title of this thesis should be addressed: Is the Pedestrian Pocket a new suburban paradigm? Will it influence several generations of planners as did its precedents the Garden City and the

Neighborhood Unit? While it is impossible to answer these questions, it is possible to conclude that it has as good of a chance, or even better, than did its forerunners. If, in fact, the concept is linked to air quality legislation, it would gain the backing and the "teeth" required for longevity. Thus, it could be linked to a higher mandate to change urban form—a mandate many consider to be of great urgency and importance.

Its "appropriateness" as a new paradigm can also be tested against the criteria that Anthony Downs (1989) of the Brookings Institution has offered for "a New Vision of Future Metropolitan Area Development".

The criteria of the new ideal vision (as related to design) are as follows:

- The new vision must contain sizable areas of at least moderately high-density development, especially housing, but also of workplaces.
- The new vision must encourage people to live nearer to where they work.

•The new ideal vision should incorporate workplace designs that combine efficient interchange among individual

workplaces with big enough critical masses of jobs to create productive interchange possibilities.

•The new ideal vision should be internally consistent, in the dual sense that (1) the amount of travel it requires does not lead to the levels of traffic congestion or air pollution we are now encountering; and (2) that some homes in the vision are affordable to the low-and-moderate-income households needed to do much of the work [in society].

Downs asks: "Is it really possible to create an alternative ideal vision of future....development—a new paradigm—that meets all these criteria? Our society desperately needs to make an attempt to find out. We have overwhelming current evidence that the currently dominant ideal vision does not work effectively. But we cannot displace that vision unless we have some plausible, attractive, and persuasive alternative to offer" (Downs 1989:12).

Clearly, the TOD concept has the potential to address each of these criteria. Whether or not it is a new suburban paradigm to

be embraced with vigor is debatable—the jury is still out.

Certainly, the research conducted in this thesis would suggest there is no reason why we shouldn't give it a chance.

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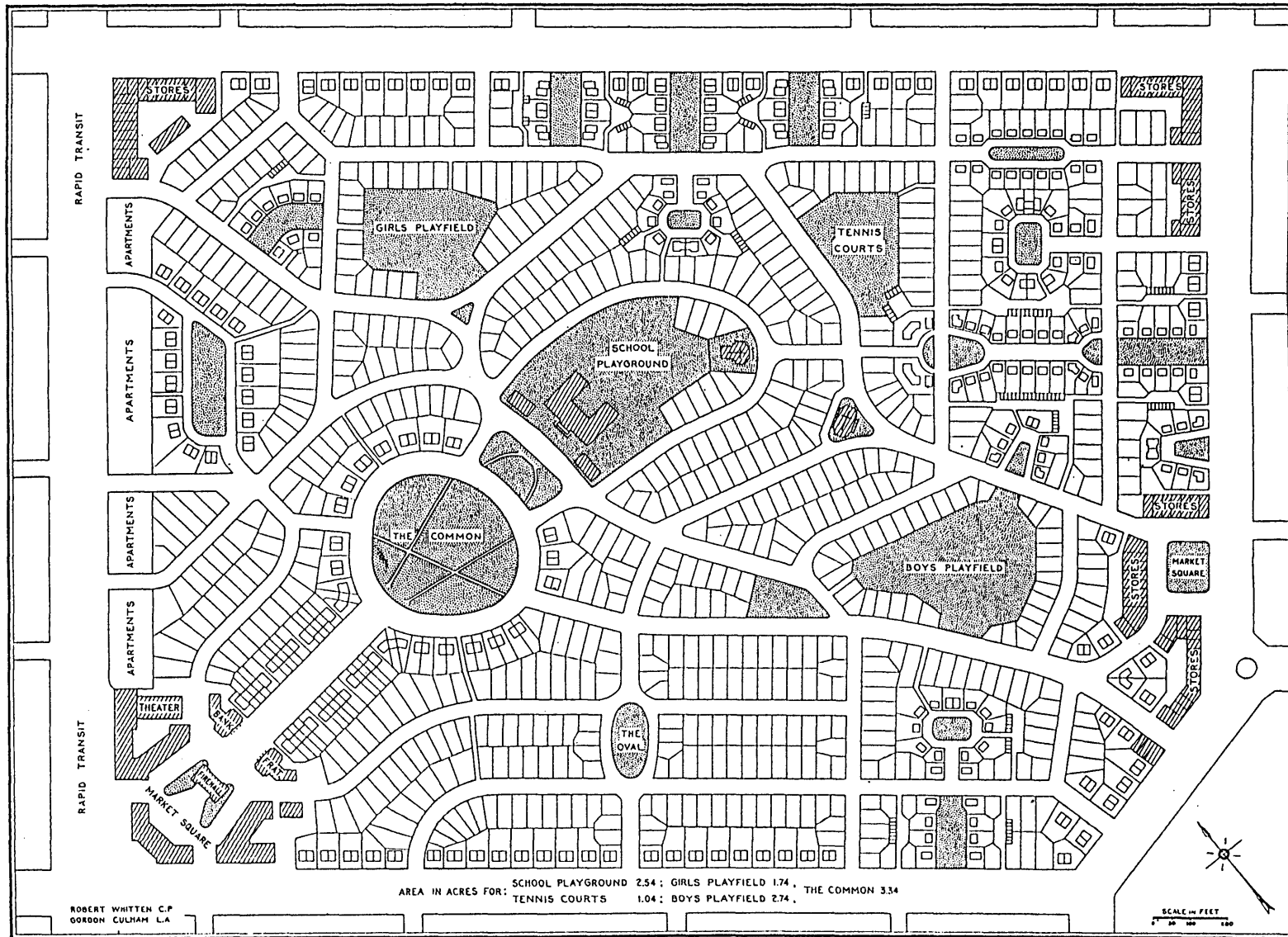


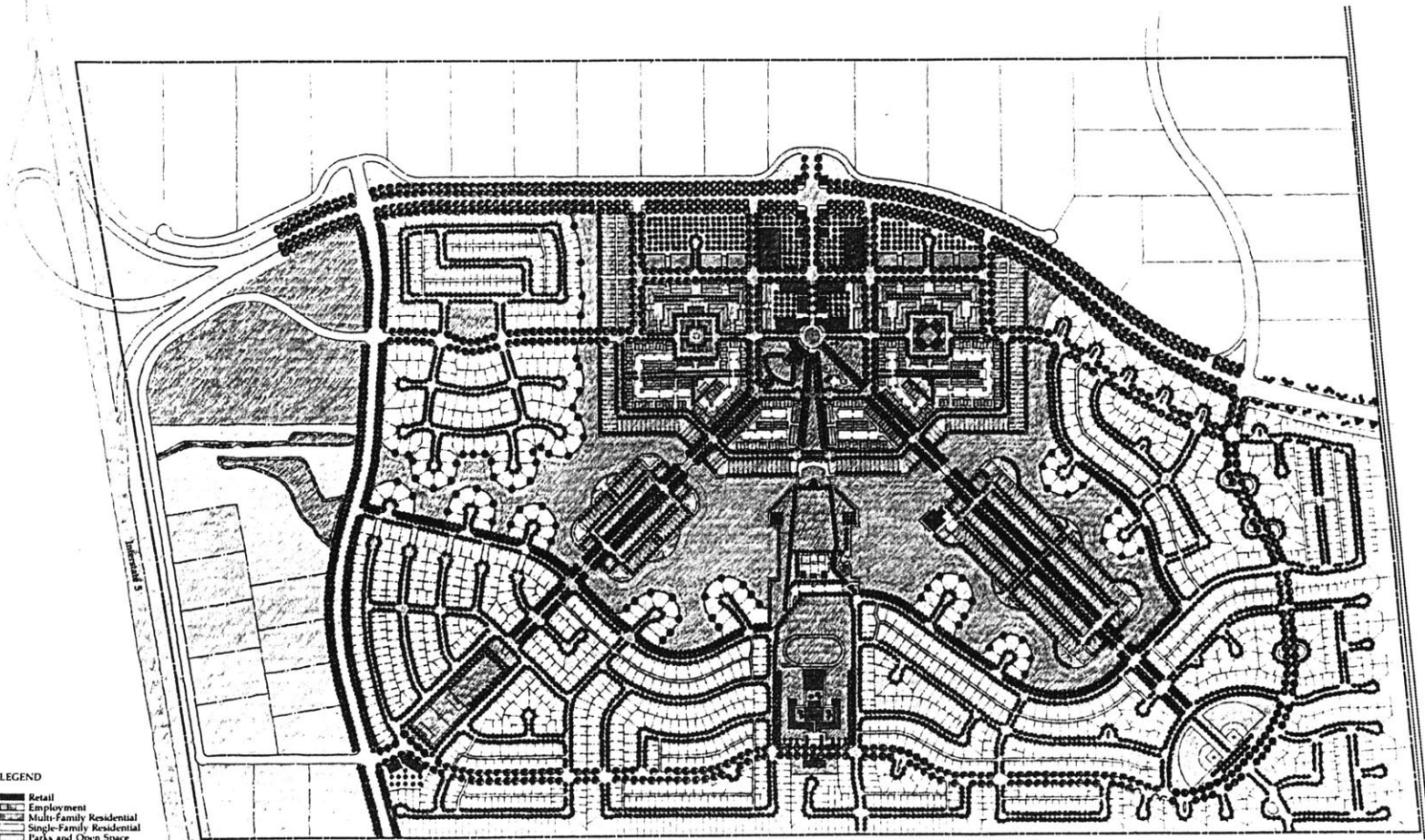
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*Plans*





LEGEND

- Retail
- ▣ Employment
- ▤ Multi-Family Residential
- ▥ Single-Family Residential
- Parks and Open Space



CONCEPTUAL  
SITE PLAN

LAGUNA WEST  
Sacramento, California

River West Developments  
Community Developer  
Sacramento, California

Calthorpe Associates  
Architecture and Planning  
San Francisco, California

Ken Kay Associates  
Landscape Architects  
San Francisco, California