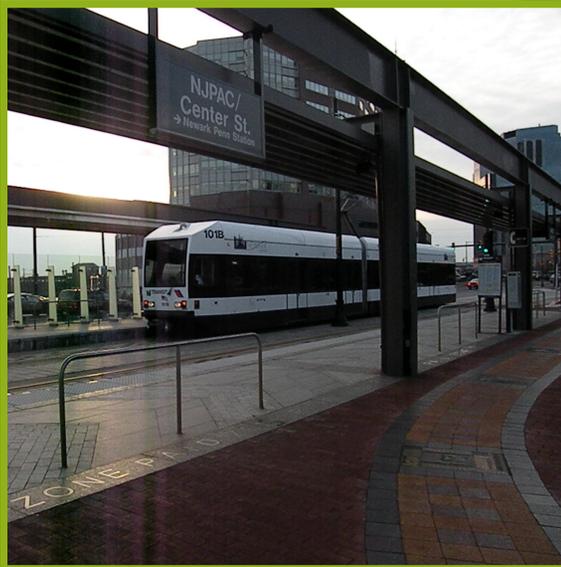


# Out and About: A Guide to Sustainable Local Circulation Planning



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# Preamble



We all use our circulation system to get around.

Inside buildings we use corridors, walkways, hallways and other passageways to circulate, including ramps, steps, staircases and elevators for vertical circulation.

Outside buildings we use sidewalks, trails, walkways, alleys, lanes, paths, bicycle lanes, streets, roads, drives, circles, ways, boulevards, allees, places, walks, avenues, parkways, turnpikes, expressways, thoroughfares and throughways.

Our rich vocabulary describes the varied nature of our circulation system, with which we are constantly in contact.

We all rely to some extent on our circulation systems to go about with our lives. How we

navigate these systems, how much time we spend using them and the types of experiences we have while using them can have profound implications in terms of our wellbeing and quality of life.

We experience it in many different ways, depending upon our means of circulation. Up close and personal, if we are walking; at a slightly faster speed if we are rolling or bicycling; and at a much faster pace if we are drivers or passengers on a motorized vehicle. Our experience – and how much of our surroundings we are able to take in -- depends heavily on how fast we are travelling and on what type of vehicle we are travelling in. As drivers we take less in; as passengers we take more in.

We have all been caught in traffic jams and frustrated at how slowly we are able to move. We have all wished we were the only travelers, unimpeded by others who slow us down. The

“others” have thought the same about us. We are constantly on the lookout for shortcuts – whether a new, shorter path between buildings; the express train between two locations; or a back way, on secondary roads, to get to where we want to go, faster. Our time is precious, and the time we spend travelling takes away from time available for other, more valued activities: family, work, sleep, leisure and civic commitments.

The reality is that we live in a crowded place in a crowded planet. If we have circulation troubles we need to get smarter about how we move around and we need to make accommodations. Traffic jams and traffic congestion are not going to go away. In many ways, these are signs of success. When many people want to access a particular location – whether to live, work, shop, attend a concert, participate in an athletic event, or join a political rally – this means that particular place and location is

highly desirable and many people want to get there. Rather than trying to discourage these activities or events, we need to figure out how to facilitate them with the least amount of disruption to everyone else. It is not all that difficult, but it does require some brainpower, technical know-how and creativity.

That is the purpose of circulation planning. How to get people to where they want to go, and goods where they need to go – in the most efficient, socially equitable, least disruptive to ourselves and to others and environmentally benign ways – that is the job of circulation planning. The purpose of circulation planning is not to minimize cut-through traffic in high-income neighborhoods. It is not to facilitate high volume vehicular traffic in and out of shopping malls, office parks or sports stadiums, regardless of the adverse impacts on the surrounding local and regional transportation system. The streets and other elements of our circulation system should contribute to stable or

increasing property values, not depress them. When property values are depressed as a result of proximity to a road or some other component of the circulation system, this is an indication of poor decisions in terms of both land use and transportation.

We are not going to become a housebound society where everyone works at home and trips are drastically limited. Our global economy requires global contacts and while electronic communications can handle routine contacts, humans will continue to require face-to-face interaction for things that really matter. We will continue to travel for errands, for business and for pleasure.

However, given the overall transportation sector's heavy contributions to greenhouse gas emissions and global warming, in addition to its deleterious impacts on both air and water quality, finding ways to reduce tail pipe emissions from non-stationary sources and impervi-

ous surfaces devoted to circulation should be a high priority for the entire community. While part of the answer lies in improved technologies and other factors that are beyond the abilities of local governments to influence, a big part of the solutions will depend on local decisions.

In addition, the nation faces a public health crisis manifested by alarming rates of childhood obesity, which the public health community has scientifically determined is positively correlated, among other factors, with the low density land use patterns and high levels of auto-dependency which became prevalent over the last century.

Local circulation planning can and should play a vital role in helping us meet these awesome challenges.

## **Chapter One: Introduction to Transportation and Land Use**

Transportation and land use are inextricably linked. How the two are combined defines the physical world we live in. Traditional ways of approaching land use and transportation emphasized transit systems and compact development patterns. The 20th century created vast landscapes devoted to individual mobility.

We now understand that these are ultimately unsustainable. To meet current and future challenges, the 21st century must emphasize sustainability and find new, more environmentally benign solutions.

# Chapter One: Introduction to Transportation and Land Use<sup>1</sup>

I

n New Jersey today, there is an increasing demand for walkable, bikeable and transit-friendly communities.

This is in part due to a growing sensitivity to the high levels of pollution to our air, water bodies and land caused by an auto-dependent land use pattern and an auto-dominated transportation system, as well as the very high energy and land consumption rates they entail.

But there are a number of other reasons which make auto-dominance and auto-dependency very problematic public policy issues.

One is a demographic imperative: the aging of the Baby Boom generation, a bulging cohort that has changed policy and the face of communities at every stage of their lives. From 2026, when the first Boomers reach the age of 80, there will be a growing number of seniors whose driving skills may be impaired and who in turn will increasingly become captives in their communities, even at a stage in life where active living offers tangible benefits in slowing the aging process.

Another source of demand for places that are less dependent on the automobile is coming from those now entering the workforce, including both younger cohorts -- who favor vibrant streetscapes in the places where they live and work -- and more urban-oriented immigrants, who rely more heavily on public transit and are less likely to drive a car than native-born residents. Both groups want places to socialize, such as cafes and restaurants; opportunities to shop; access to cultural events, sports and entertainment venues; and active and passive recreation within easy walking distance of almost any place they are likely to be.

As a result of changes in demographics, lifestyle preferences, and disposable income there is also a rapidly shrinking market for low density, single-use development -- and in particular of large-lot, single-family detached housing -- and a significant “overhang” (unsold inventory) on the market looking for buyers.

And finally, another compelling reason for change is that there is less and less land available to continue constructing the type of low-density, single-use development that has brought about the auto-dependency in the first

place. This is especially true in New Jersey, the state closest to build-out<sup>2</sup>. Even if we wanted to and could afford it there is simply no more room to continue the land use and transportation practices that were prevalent in the last century.

## The Historical Relationship Between Land Use and Transportation

Throughout history, land use patterns have been shaped by the then dominant modes of transportation. In pre-industrial times, when New Jersey’s traditional communities were laid out, settlements emerged on the coasts and on rivers and at the crossroads of cart and coach routes. The design of these settlements still reflects the fact that most people walked most everywhere they needed to go, while longer trips were taken on horseback, in horse drawn coaches or by boat. Most streets were relatively narrow and buildings were clustered close together. Mixed-use buildings and neighborhoods were the norm in the most densely populated centers. Larger land holdings, usually in active agricultural use, were located in the outskirts of these centers.

<sup>1</sup>Land use The type and pattern of urbanized versus open lands: whether it is residential, commercial, or other; whether it is in separate or mixed-use zones; its density, scale and layout; and its relationship to transportation, parks, natural resources and open areas.

<sup>2</sup>Build-out A condition where all land is either already urbanized or protected from further development by regulation, conservation measures or public ownership.

In the 19th century, with the advent of trains and streetcars, the need for settlements to be near navigable waters diminished. But the pattern *within* new settlements did not change much, although the widespread use of the street grid provided much greater regularity and discipline to the built form. Walking was still the primary mode of transportation. An extensive and now largely forgotten network of trolleys and streetcars extended the geographic reach of the population, while longer trips were taken by passenger rail and steamer. The footprint of human activities was quite compact. Agriculture was still a viable land use and consumed much of the rest of inhabited rural landscape.

In the 20th century, however, as the automobile came into widespread use, it greatly influenced how land use patterns would evolve: it reduced the need for settlements to be near water or rail lines, and it reduced the need for buildings to

be close together. In fact, tightly clustered buildings did not suit the automobile. It needed wider streets and parking spaces, which took up more land and pushed buildings and activities apart. The increase in distances between homes and almost any place people needed to go meant that walking as a means of getting anywhere became difficult and increasingly irrelevant.

In the first half of the 20th century, local land use regulations also became widely used. To prevent noxious factories from encroaching on residential areas, zoning encouraged the separation of uses<sup>3</sup>, and zoning, subdivision and land development regulations became increasingly popular. To avoid the squalor of the 19th century urban tenements, and to minimize the risks to property and life from large-scale fires, zoning required lower densities<sup>4</sup> to allow more air and light. Both measures increased the distances between buildings, places, uses and



*At the beginning of the 20th century, most cities and towns in New Jersey were connected by trolleys known as inter-urbans, such as this one run by the Pennsylvania Traction Company.*

activities and accelerated the conversion of open land to suburban uses. But there would never have been a widespread market for such development without such large numbers of households owning a car and government incentives for home ownership and subsidies for highway construction.

At the same time, we witnessed the dismantling of what had been a vast network of public transportation covering both larger metropolitan areas and smaller rural centers. Tram and trolley companies were purchased by the

<sup>3</sup>**Separation of uses** Residential, industrial, commercial and retail development put into separate zones, an innovation of zoning replacing the mix of uses in traditional downtowns, where homes, shops and work places were clustered in downtowns.

<sup>4</sup>**Low density** Definitions vary considerably from place to place, but usually refer to the number of single-family homes allowed per acre (4 to the acre in some areas is considered low density; in others it may be 1 house on 10 acres). In commercial zones, low-density zoning restricts both the building's height and its footprint on the ground. A criticism of suburban development is that conventional low-density zoning is not low enough to conserve natural resources or farmland and not high enough to support public transportation or produce affordable housing.

emerging auto and oil industries and closed down or replaced by buses. Transit services were discontinued in all but the largest cities. In a short period of time, the private automobile became not a luxury, but a necessity.

After World War II, as the decades wore on, the Boomer-influenced market changed, moving from “starter” homes to more expensive housing. Zoning and other land use regulations also changed, requiring increasingly lower densities, new features such as off-street parking and new environmental regulations, such as requiring each project to take care of its stormwater on site. The average building lot, house size and distance to shops and employment all increased considerably as a result. People became dependent on the automobile for almost every trip.

It can be noted that in Europe and other places during this same time period, auto ownership and driving also increased significantly, just like in North America. But in these places, land patterns did not suburbanize nearly as much, transit systems were not dismantled and people continued to have the option to use many different modes of travel.

Households in Europe can choose their mode of travel depending on the type of trip – walk-

ing for small errands, biking for short commutes and recreation, public transportation for commuting and longer solo trips, and automobiles for families and groups traveling together. As a result, mode split – the percentage of trips made using different forms of transportation – is dramatically different. In these places, a single car is enough for most households. Zero-car households are possible because of car-sharing programs and other low cost alternatives and because there is still a range of viable transportation options almost everywhere that people live, work and shop.

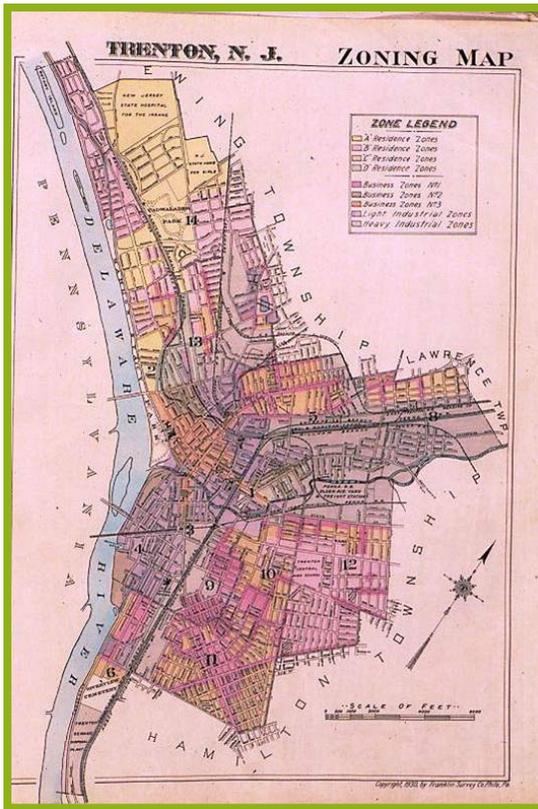
The following table summarizes in general terms the differences between the traditional, compact development land use / circulation patterns found in historic communities in the

US and throughout the world, and those found in communities largely created by single-use zoning (“sprawl communities”, for lack of a better term) in the second half of the 20th century.

### The Land Use Challenge in New Jersey

Research suggests that New Jersey may be the state closest to reaching “build-out” in the nation. As open land disappears, the need to find other ways to grow becomes increasingly urgent. In fact, it leaves New Jersey with only one viable way to grow: redevelopment. Building permit data for the last decade of the 20th century indicates a substantial increase in the number of building permits issued in NJ’s older communities, precisely those that might be considered “built-out” under conventional

Traditional Communities	Sprawl Communities
Small blocks (between 200 and 400 feet)	Superblocks (often 1,000 feet or longer)
Mixed-use and mixed building typologies	Single-use and single building typologies
Interconnected street network	Hierarchical street network
Relatively narrow streets	Significantly wider streets
Relatively slow design	Significantly higher design speeds
Limited use of cul-de-sacs	Heavy use of cul-de-sacs
Shallow building setbacks from streets	Deep building setbacks from streets; reverse frontages
Parking in rear; on-street parking	Parking in front; off-street parking
Pedestrian and transit friendly	Car friendly



*The City of Trenton's original zoning framework from 1930 is a model of simplicity, using only 8 zoning districts to regulate a diverse, richly textured urban environment. Contemporary zoning for considerably less complex suburban communities routinely relies on 25 or 30 zoning designations.*

assumptions. In fact, a considerable share of development growth in NJ took place in these communities, many of which had not seen any visible development activity in decades. This can be explained as a result of several, complementary factors: shifts in market preferences by households and employers; increasingly tight and expensive suburban markets; state and local fiscal and other incentives; an increasingly tight regulatory environment in the suburbs; a more adventurous and enlightened development industry; greater appreciation for proximity to transit; and adoption by the state of the rehabilitation sub-code of the construction code.

But redevelopment is often more complex, more difficult, and frequently more expensive than development on a “greenfield” site (i.e., open land). Constructing a mixed-use project, which is often the goal of many

<sup>5</sup>**Urban and Community Forest** Street trees; trees in public or private open space; trees in non-urbanized parcels located in developed areas or connecting urbanized areas.

<sup>6</sup>**Green Infrastructure** Using natural resources to replace conventional engineering infrastructure: wetlands that serve as flood control and pollution filters; street trees that reduce stormwater runoff and the urban “heat island” effect of roads and parking lots; or bio-swales (planted areas designed to channel and clean stormwater) instead gutters, etc.

## Definitions

**Redevelopment** means re-using or finding new ways to use abandoned buildings. It also means tearing down existing buildings to build something new, from a single new building to an entire neighborhood.

**Infill** means building on vacant lots located in an otherwise urbanized area. Lots may be vacant because previous buildings burned down, as a result of a title dispute or for various other reasons.

**Revitalization** means that the community being redeveloped shows sign of distress: a poor economic base, weak markets, unsafe neighborhoods, failing schools or other problems. Revitalization often requires finding new uses for empty or partially empty buildings and bringing new life into distressed areas.

**Retrofitting** is a form of redevelopment. It means that the community being redeveloped has land use patterns that are inefficient or no longer desirable. Suburban areas, which may have traditionally had a strong market but is now showing signs of decline, are often seen to need retrofitting to create vibrant streetscapes in a new transit-oriented and pedestrian-friendly center or downtown.

**Regeneration** is also associated with redevelopment. It is used primarily to reflect the need to restore degraded natural resources -- either in developed areas or not -- but can also be applied to restoring impaired human ecologies and local economies. Regenerative interventions applied to natural systems include actions such as “day-lighting” streams that have been forced into culverts and paved over; restoring riverbanks and streambeds that have been channelized or degraded, expanding the urban and community forest<sup>5</sup> and using “green infrastructure”<sup>6</sup> within and between communities. Regeneration is often made possible through redevelopment.



*In the early 20th century, bicycling was popular with both men and women and there were numerous bicycle clubs in the major cities. This group belonged to a bicycle club in Newark.*

redevelopment projects, adds even more complexity. Most developers today have experience in only one type of development, whereas a mixed-use project requires knowledge of commercial, retail and housing regulations, construction, markets and financing.

In almost every type of redevelopment, the cost to the developer is higher than building on clean, open land. Redevelopment often requires the expensive cleanup of contamination from previous users, the demolition costs of tearing down or gutting existing buildings, the cost of securing the site from surrounding buildings and passers-by, and meeting the cost of parking and landscaping requirements as well as many state and federal regulations designed for suburban conditions.

Redevelopment also adds traffic to areas that often already have congestion. In New Jersey,

that often means adding transportation impact fees to cover the costs of improvements to roads and intersections.

To meet these added costs, redevelopers often need higher densities – and public subsidies -- in order to make the project financially viable. But higher densities also increase costs, which, in weak market areas, may exceed any increases in revenue that can be expected. For example, steel and concrete construction costs more than wood frame construction. Greater building height requires costly elevators, fire protection and possibly structured parking. Structured parking alone may cost ten times that of surface parking – sometimes more. When these costs exceed the revenue likely to be generated by the rents or sale prices in that market, the redeveloper may want to keep costs down by building at lower densities, thus undermining the feasibility of some types of public transportation service.

### **The Transportation Challenge in New Jersey**

Different land use/transportation patterns are not just a question of preference or aesthetics. There are profound consequences involved with these choices, including dramatically different transportation, economic and environmental outcomes.

Low-density environments generate significantly higher numbers of motor vehicle trips. The need for multiple vehicles in every household means transportation-related costs take up an increasingly larger share of household budgets. The need to accommodate an ever-increasing number of private motor vehicles means a larger share of public budgets goes towards building and maintaining the circulation system, potentially at the expense of other public needs, such as education or health. Larger roads and parking lots increase stormwater run-off, which, in turn, requires larger and larger systems to convey and treat the stormwater.

But higher densities associated with redevelopment also impact the transportation system in a number of ways, not always positive. For example, if auto-dependency remains after redevelopment because no public transit services are available in the area, it will add more congestion. And this congestion is unlikely to be addressed by adding more highway capacity. Only reducing car trips and increasing the number of trips that people take by walking, biking and taking public transportation will manage congestion in higher density areas.

Technology offers some mobility substitutes, in the form of tele-commuting and on-line shopping. However these options can only account

for a limited number of trips and will not resolve current or future transportation challenges, which can only be accomplished by shifting a substantial number of trips to more benign modes, such as walking, bicycling or transit.

Shifting trips to modes of travel other than the automobile requires smarter and more informed planning, a better understanding of what makes transit and non-motorized modes viable, a better integration between transportation, infrastructure and land use planning and a much better understanding of the realities that govern how different modes of transportation operate, and what actually motivates people when they make decisions about which mode to use for a particular trip.

Transit requirements, in particular, are poorly understood by many in the planning field. For example, rail requires land use patterns that are somewhat different from bus. Conventional bus service, with its more frequent stops and lower speeds, requires a relatively even distribution of density along corridors; while rail service, with less frequent stops, is best served by high density in stations areas, separated by a distance that reflects whether it is local or express, commuter or inter-city service. Both can

co-exist and compliment each other, if land use planning can get it right. And the increasingly popular Bus Rapid Transit (BRT) is a hybrid transit technology that seeks to offer a rail equivalent transit option without the rail infrastructure.

Similarly, if we want to encourage walking as a means of getting from A to B, it is not enough to add basic pedestrian amenities, such as sidewalks, street trees and street furniture (benches, pedestrian-scale lighting) to the existing road network, although that should be done as well. Walkers are discouraged when places seem unsafe or unfriendly, meaning that their paths cross wind swept parking lots, run adjacent to blank walls, take them through places where other people are unlikely to be or where speeding traffic is only inches from their feet.

More direct connections are needed to encourage walking. The “goat paths” worn into grass shoulders along the side of roads without sidewalks or showing where people don’t follow the sidewalk in order to cut corners and reduce travel distance indicate that pedestrians have a keen interest in more direct connections. Walkers need a circulation system that works with, but is sometimes independent of, the circulation system dedicated for automobiles.



*The Newark Light Rail functions as a circulator linking University Heights and neighborhoods to the north with the Downtown.*

Research has conclusively shown that the distance people are willing to walk varies with the characteristics of the physical environment they are walking through, with the quality of the pedestrian infrastructure as well as with the nature of (reason for) the trip. Discretionary walking trips in particular – those that can just as easily be taken by walking or by driving – depend on complex assessments people undertake when deciding how to make the trip, and assessing trade-offs between many factors such as quality of life, cost, time, convenience, collateral benefits such as physical exercise and so forth.

Bikers also need direct routes, and need the road network to accommodate them safely and efficiently. In many places in Europe, bicyclists not only have more direct paths, including dedicated bicycle-only rights-of-way, but

have their own traffic signals coordinated with traffic signals for motor vehicles. There is some debate among bike advocates in the US as to whether we should invest preferentially in on-road bike lanes or off-road facilities: on the one hand the efficiencies of maintaining a shared roadbed clear of debris and snow versus the added safety of having a barrier between bikes and motor vehicles. Ultimately this is a false dichotomy, because both options are acceptable and should be used where appropriate.

Changing land use and transportation planning practices requires broader knowledge of what makes the “other” modes of transportation viable; re-ranking priorities; and new ways for different agencies of government to coordinate their actions to create multi-modal transportation systems that work.

### **The Circulation System – Some Metrics**

There are over 8.5 million lane miles of roads in the lower 48 states -- the equivalent of 17,600 square miles of pavement -- accommodating 8 billion vehicle miles of travel daily. Americans travel over 4.6 trillion miles annually by personal motor vehicle, an average of over 15,000 miles per person. Public transportation accounts for less than 4% of total miles traveled.



*This 19th century view of the Atlantic Highlands – a popular beach resort at the time -- shows the train meeting the ferry from New York.*

Of all the trips made annually in the US, a little less than 90% are made by motor vehicle; almost 9% are by walking; about 1% are by bicycle; and 1.6% are made by transit. In terms of trips to work, 92% are by personal motor vehicle, 5% are by transit, 2.8% are on foot and only 0.5% are by bicycle. In contrast, some European countries have dramatically different mode splits: in Germany, 12% of trips are by bicycle, with 28% in the Netherlands and 20% in Denmark. The portion of trips captured by transit is also substantially higher, often over 40%. Perhaps surprisingly, some New Jersey communities, such as Jersey City and Hoboken, have mode splits comparable to European cities, which suggest that individual travel behavior is more responsive to external conditions than to cultural factors or idiosyncrasies.

New Jersey has 13,500 lane miles of state and federal highways and over 65,000 miles of local roads (municipal and county). That is

almost 300 square miles of pavement. The Federal Highway Administration (FHWA) rates NJ roads and bridges as the worst in the country, with 49% considered in “poor or mediocre condition”.

New Jersey has about 5.8 million registered drivers and 6.2 million registered motor vehicles. It has been estimated that there might be up to 10 parking spaces for every motor vehicle, which suggests that there might be close to 90 square miles dedicated to parking in New Jersey.

There is no comprehensive statewide inventory of sidewalks. We do know that along the 13,200 miles of county roads, there are only 3,700 miles of sidewalks, which means that about ? of county roads have no sidewalks. And while 90% of county road miles in Hudson County have sidewalks, in Sussex County only 2% have sidewalks.

### **Fatalities**

Travelling by car is not without a cost. In 2008, over 37,200 people were killed on the nation's highways. Another 2.3 million were injured. Motor vehicle accidents are the leading cause of death for Americans ages 1 to 34, accounting for one out of every four deaths in this age group. There are around 43,000 injuries and 700

deaths involving bicycles in the US every year. On New Jersey roads, around 600 motorists, pedestrians and bicyclists are killed in traffic crashes annually. Pedestrians account for about 20% of these deaths, about double the national average. About 5% are cyclists.

### VMT

Vehicle miles traveled (VMT) is a measure of the total amount of travel on roads. It is a critical indicator of how intensely the circulation system is used. It is also used to allocate large amounts of federal transportation funding. Nationally, VMT increased consistently from 1956 to 2004, but has leveled out since then. It is estimated that NJ had 144 million VMT in 1985, 208 million in 2007 and only 200 million in 2009. NJ residents drive 13,000 miles annually, on average, less than the national average of almost 15,000 miles, a reflection of NJ's more compact development pattern and availability of public transit. Still, each New Jersey motorist drives almost 1,800 more miles annually today than in 1997, amounting to a staggering total of 72.5 billion miles annually.

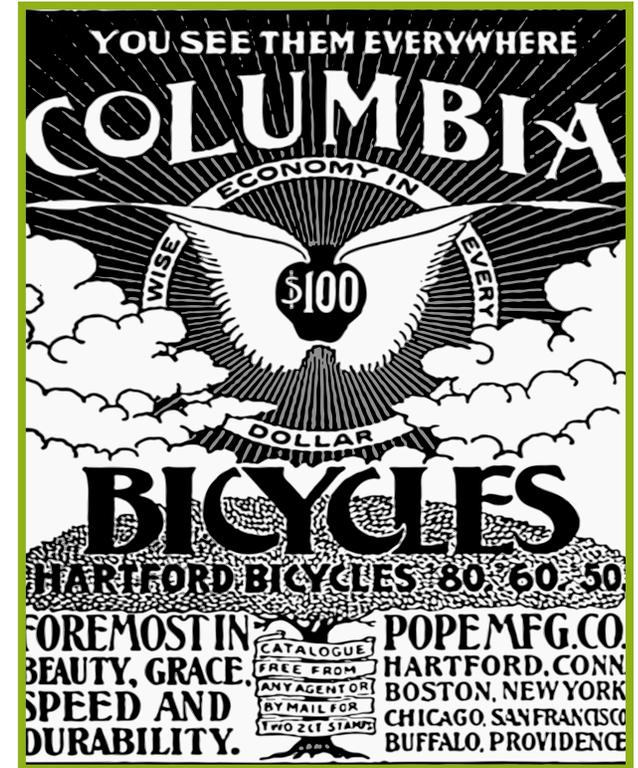
### Mode Share

In 2010, NJ Transit provided passengers with 161 million trips by bus, 80 million by commuter rail and 22 million by light rail. About 75% of New Jersey residents live within 5

miles of a NJ Transit rail station, and between rail, bus and ferries they increasingly rely on transit to get around. The share of work trips taken by transit in New Jersey – over 10% -- is one of the highest in the nation. That notwithstanding, driving continues to be the dominant mode of transportation in the state, accounting for 95% of all passenger miles traveled.

NJ Transit buses account for 2/3 of all transit riders in the state. Riders on NJ Transit buses travel almost 1,000 million miles yearly. However, passenger miles traveled by NJ Transit commuter rail is growing almost six times faster than bus ridership. Commuter rail carries around 30% of transit riders, with light rail and ferries carrying the rest. Light rail ridership has grown more than sevenfold since 1997, as a result of the opening of several new lines.

Transit use in NJ has been increasing faster than driving. Per person transit miles have been growing three times faster than driver miles. Total annual passenger miles on transit increased 45% between 1997 and 2007. The number of passenger miles traveled on rail nearly doubled to 2.3 billion. All told, in 2007, New Jersey residents travelled over 500 miles on average by transit. But travel by automobile and truck was 16 times greater.



Over 3% of New Jersey residents walk to work. As might be expected, walking to work is most prevalent in the denser parts of the state. But the journey to work only comprises about 20% of all trips. Overall, it is estimated that walking accounts for about 11% of all trips in NJ. Bicycling accounts for about 1% of total trips.

New Jersey ranks 34th among the states in terms of the percentage of people who cycle to work, and 18th in terms of those who walk to work. But New Jersey ranks 46th in terms of per capita state transportation funding spent on bicycle and pedestrian facilities: a scant 0.6% of the state's capital budget for transportation. This does not reflect well on NJDOT's capital spending priorities.

### **Energy Consumption**

New Jersey residents consume almost 1,000 trillion BTUs for transportation. The transportation sector accounts for almost 40% of total energy consumption in the state. New Jersey residents consume far more energy for transportation than for residential, commercial or industrial uses.

### **Environmental Impacts**

Roads have significant environmental impacts, both during construction and later when in use. They change chemical soil conditions, water flow and water quality, and lead to deleterious changes to natural habitats, increased wildlife mortality, changes in animal migration patterns and dispersal of nonnative pest species, both plants and animals. Vehicle use causes air and water quality degradation. Emissions from vehicles cause local air pollution, through increases in VOCs, NOX, carbon dioxide, particulate matter and ground-level ozone. The negative impacts of these pollutants on humans and other species have been well documented. Roads (and other impervious surfaces) also change local climate conditions, primarily through the “urban heat island” effect and increased rainfall.

The transportation sector accounts for 1/3 of total US CO2 emissions, the single largest con-



*This view of Bahnhofstrasse in Zurich shows early streetcars circulating in streets still uncluttered by private motor vehicles.*

tributor. Of that, 82% comes from cars, sport utility vehicles, freight and light trucks. CO2 emissions are directly correlated with VMT. It is estimated that the transportation sector is responsible for 54% of New Jersey's total CO2 emissions, compared to 28% nationwide. CO2 is a major greenhouse gas. New Jersey motorists emit close to 85 billion pounds of CO2, slightly under 10,000 per resident per year.

In terms of GhG emissions by mode, the US transportation sector breaks down as follows: 36% passenger cars, 19% light trucks, 16% heavy trucks, 10% aircraft, 5% maritime, 2% rail, 1% bus and 11% other (US EPA 2000).

This notwithstanding, US EPA data also indicate a steep decline over time in air pollutant emissions from cars and trucks as a result of changes in the fleet towards newer, more effi-

cient cars and better emission controls. CO, NOX and VOC emissions from cars and trucks have dropped by about 1/3 since 1997, and emissions of fine particulate matter from diesel have dropped more than 50% as a result of tighter regulations and cleaner fuel. As a result, air quality in those NJ cities that are monitored has improved markedly in the last 15 years.

### **What is a Sustainable, Multimodal Circulation Plan?**

Circulation affects people, goods and a variety of vehicles, as well as the infrastructure that makes it possible for people, goods and vehicles to move around: streets and sidewalks; tunnels and overpasses; canals and water bodies; rails, stairs and elevators and so forth.

A circulation plan is a statement of how a jurisdiction seeks to facilitate (or in some cases restrict) circulation, mobility and access in the future.

A circulation plan contains a set of goals and objectives describing what it is seeking to achieve; an inventory and description of all the relevant components of the circulation system, both public and private; a clear-headed assessment of what is working and what is not working, or is not likely to work, in the future; a set of realistic strategies for achieving the desired

goals and objectives and solving or mitigating the problems or shortcomings identified; a comprehensive list of projects; and a lucid strategy to fund them.

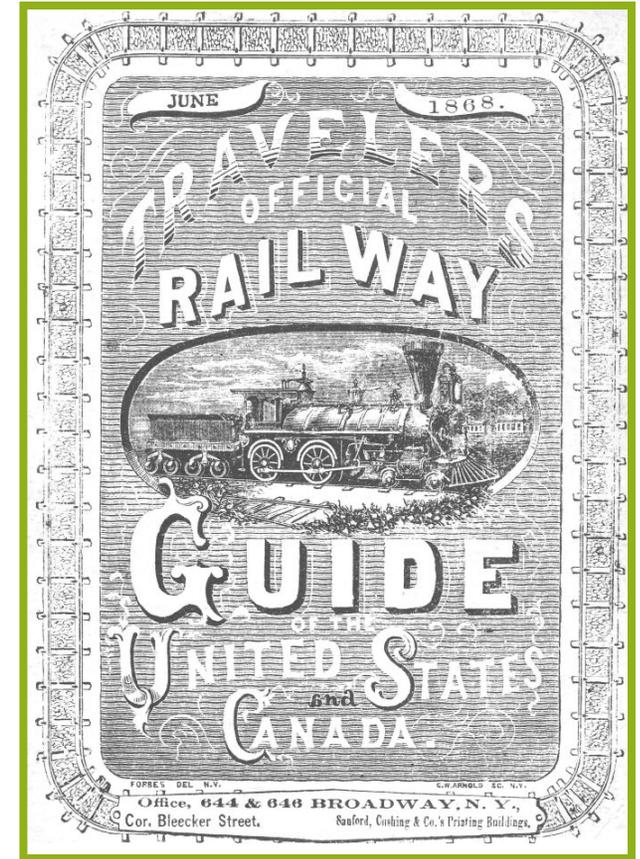
Conventional circulation plans are heavily biased towards vehicular travel. Many are little more than an inventory of local roads classified according to a functional hierarchy and a list of proposed physical “improvements”, such as road widenings, proposed new signalized intersections, proposed new dedicated turning lanes and so forth. Other forms of transportation are often ignored or given short shrift.

The underlying assumption to the conventional approach to circulation planning is that vehicular traffic will continue to grow and that the planners’ job is to figure out what actions (improvements) need to be taken with respect to the circulation system to accommodate that growth in vehicle travel.

This fundamental assumption is seriously questioned today. We now realize that systematically facilitating private motor vehicle circulation above all other modes creates an auto-centric environment that both snuffs out other modes of transportation and ultimately results in inferior places and an overall poor quality of life.

We are trying to become smarter about how we manage the public right-of-way and stricter in disciplining the private motor vehicle. A sustainable, multi-modal circulation plan recognizes that people, goods and vehicles move around in many different ways and have different needs, and that it is an appropriate goal of public policy to encourage the maximum use of transit and non-motorized modes of transportation to the full extent possible. As such, a sustainable multimodal circulation plan will consider the needs of pedestrians, bicyclists, transit riders and goods movements, in addition to the needs of private motor vehicles and their drivers. In some, perhaps many cases, the needs of pedestrians, bicyclists and transit users will be deemed more important and will come first.

A multi-modal circulation plan seeks to level the playing field and assign an appropriate role to each mode of transportation. It does not seek to eliminate private motor vehicle travel, although it may discourage it in some cases, and possibly restrict it, in others. But mostly, a sustainable multimodal circulation plan seeks to give non-vehicular modes of transportation their due, and provide an appropriate, functional and just balance between modes of transportation.



## Key Players in Transportation and Circulation Planning

Land use decisions in New Jersey are largely made at the local level. There are a variety of state and regional regulatory programs – such as sewer service area determinations, threatened and endangered species, or proximity to protected stream corridors, along with many others – that strongly influence and condition local land use policies. Affordable housing requirements, local fiscal implications and other considerations influence local land use policies. But ultimately, in all but a handful of exceptional situations, local land use policies



*The entire city of Hoboken, with only a few exceptions, was platted using a 200 by 400 foot street grid.*

are a local decision.

Transportation, on the other hand, is a different story. More than any other issue addressed in a local master plan, transportation is covered by a large and powerful hierarchy of many different agencies of government. Indeed, the field of key players in circulation and transportation planning is a crowded one, and can be very confusing for the uninitiated. In this section we provide a brief overview of the key players. In chapter 2 we dwell in greater detail on the legal jurisdiction of some of these entities over transportation assets.

**The New Jersey Department of Transportation** (NJDOT) is the state agency with jurisdiction over the state's portion of the transportation system, including highways, bridges, overpasses and tunnels. NJDOT regulates access to this transportation infrastructure through its access management policies.

NJDOT also has regulatory jurisdiction over certain types of transportation decisions at the local level, including approval of signalized intersections and roundabouts. NJDOT is primarily concerned with the performance of the state transportation system, but may intervene in local projects if it perceives that these may bring benefits or detriments to the state system. NJDOT is also active at times in regional or sub-regional transportation planning initiatives.

**The New Jersey Transit Corporation** (NJ Transit) is the state agency with jurisdiction over the state's rail and bus transit assets. It was created in the late 1970's to manage the assets of the bankrupt private passenger railroad companies with operations in New Jersey. NJ Transit is the nation's third largest provider of bus, rail and light rail transit with a service area of 5,325 square miles. The agency operates a fleet of over 2,000 buses, 700 trains and 45 light rail vehicles servicing 236 bus routes and 11 rail lines and provides for over 220 million passenger trips each year. It also administers publicly funded programs for people with disabilities, the elderly and rural residents with no other means of transportation, and provides support and equipment to privately owned bus carriers.

NJ Transit is primarily interested in how local land use and circulation decisions may affect its rail and bus operations. NJ Transit's Transit *Friendly Planning Assistance* program has provided funding and technical assistance for over 10 years for local planning activities with a potential incidence on promoting transit-oriented development and increasing transit ridership.

NJDOT and NJ Transit have a joint long-range transportation plan: **Transportation Choices 2030**. The plan is both a federal and a state requirement. The plan indicates that NJ needs to spend \$8 billion over the next 10 years to repair the state's highways and bridges; that alleviating heavy traffic could cost an additional \$5.5 billion; and that NJ Transit should spend \$12 billion to repair its infrastructure and increase capacity. NJDOT and NJ Transit also have capital plans, which describe the agencies' intentions regarding future capital projects. The capital needs identified in the long-range plan are not currently contemplated in the state's capital plan.

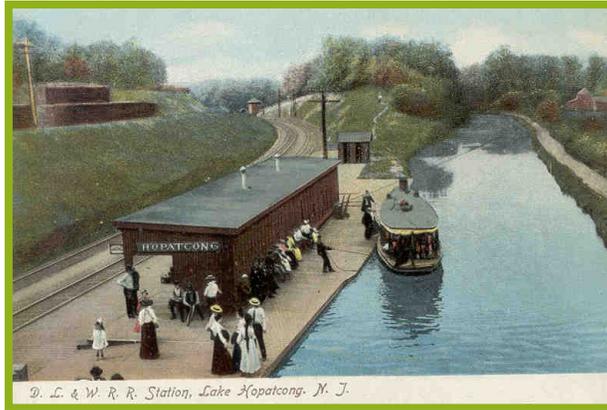
NJDOT also has a *Statewide Bicycle and Pedestrian Master Plan* (2004). It includes an inventory of bicycle facilities, a bicycle demand model (BDM) that estimates "latent demand" for bicycle travel for the entire state

by census tract, and a bicycle compatibility index (BCI) that assesses the suitability of specific roadway segments for bicycling as a function of factors such as the presence of shoulders, the shoulder width and traffic volumes. By matching those places with the highest latent demand with the least compatible facilities, the master plan identified areas of high priority for investment in bicycle compatible improvements.

Similarly, the Bicycle and Pedestrian Master Plan contains a statewide pedestrian compatibility index (PCI) that estimates the potential for pedestrian trips by combining census data on population, employment and access to public transit with roadway density and community character data. This analysis also indicates areas where funding for pedestrian improvements should be prioritized.

Municipalities should be aware of the relevant capital projects identified in these plans, to the extent they are affected by them. Municipalities should also be aware of how they are rated in the various transportation models used by these two state agencies to prioritize projects and allocate project funding.

There are three federally-designated Metropolitan Planning Organizations (MPOs)



*The Morris Canal and the Pennsylvania Railroad came together at Lake Hopatcong.*

active in New Jersey: the North Jersey Transportation Planning Authority (NJTPA) which is based in Newark and covers Bergen, Passaic, Sussex, Warren, Hunterdon, Morris, Union, Essex, Hudson, Middlesex, Somerset, Monmouth and Ocean Counties; the Delaware Valley Regional Planning Commission (DVRPC), a bi-state agency based in Philadelphia that covers the surrounding Pennsylvania counties as well as Mercer, Burlington, Camden and Gloucester counties in New Jersey; and the South Jersey Transportation Planning Organization (SJTPO), which is based in Atlantic City and covers Salem, Cumberland, Cape May and Atlantic counties.

MPOs were created by the federal government in the early 1970's and given additional authority in 1991 through the federal Intermodal Surface Transportation Efficiency Act (ISTEA). MPO approval is required for allocating federal funding for highway and transit projects, as

well as compliance with federal air quality standards. MPOs are required as part of their certification to develop Regional Transportation Plans providing a transportation blueprint for the next 20 years. The MPOs conduct independent research and analysis on travel conditions and needs in their region and are a good source of data and information. In addition, the MPOs also fund regional and local transportation planning initiatives through their Unified Work Programs.

New Jersey also has a number of special purpose agencies, such as the **New Jersey Turnpike Authority**, with jurisdiction over key elements of the regional transportation system. There are also a number of powerful bi-state agencies, such as the **Delaware River Joint Toll Bridge Commission**, the **Delaware River Port Authority**, the **Port Authority of New York and New Jersey** which are responsible for key elements of the transportation infrastructure, such as bridges, tunnels and in some cases mass transit systems, such as PATH and the PATCO high-speed line.

New Jersey's three regional agencies – the **Meadowlands Commission**, the **Pinelands Commission** and the **Highlands Council** -- have focused on their primary missions and have been relatively uninvolved with trans-



*The Girard Avenue streetcar in Philadelphia is part of the contemporary streetcar renaissance in the US. Dozens of cities across the country have reinstated or are in the process of reinstating vintage and contemporary streetcars.*

portation issues, although as regional entities they are authorized to play a role. The legislation that created the **Fort Monmouth Economic Redevelopment Authority**, the most recent addition to this small family of regional agencies, specifically authorizes it to utilize certain tools to fund transportation improvements in its part of New Jersey.

New Jersey's 21 counties also play an important role in transportation and circulation planning. They are responsible for maintaining, regulating and improving the county road system, which is intended to provide sub-regional connections linking local road networks to the state and inter-state highway systems. Some counties are active in sponsoring inter-municipal dialogue and initiatives, including transportation initiatives. Some counties have undertaken bicycle-planning initiatives; and most are active

transit providers, primarily offering services to the elderly, people with disabilities and transit-dependent populations.

Finally, municipalities have jurisdiction over the local transportation infrastructure, which includes local streets and may also include bridges, overpasses and tunnels, in addition to sidewalks, bicycle paths and so forth. A few municipalities also manage and sometimes own small transit systems, such as jitney services serving train stations, or downtown circulator trolleys. In addition, local school districts may own their own fleet of school buses, a specialized form of transit that could be better utilized, given the considerable downtime to which it is subject.

The many layers of government agencies in the field of transportation makes for a crowded and confusing decision-making landscape where it is not always easy to determine jurisdiction.

There are also a variety of non-governmental organizations involved with transportation. **Transportation Management Associations** (TMAs) are non-profit organizations funded through the NJDOT and private contributions that are active in providing specialized forms of transit, as well as ride-sharing and other similar services. Many institutions of higher education

run their own transit system to move students and faculty around campus and to nearby key destinations. Similarly, many institutional employers, such as hospitals, operate shuttle services for the convenience of their patrons and workforce.

### **How Much Does A Circulation Plan Element Cost?**

In times of great fiscal constraints such as those we currently live in, this is perhaps the first question that most local officials will ask. We can see the benefits, but can we afford it? The answer to the question of how much it costs is .. "it depends". The "out-of-pocket" cost of a local circulation plan will vary tremendously, depending upon the level of complexity of the town in question, how ambitious the plan is, the level of sophistication of the technical tools and models employed, and how much effort is deployed in the public participation and outreach process. Jersey City's award-winning 2009 circulation plan cost \$280,000 in consultant fees and perhaps another \$50,000 in staff time. This is likely to be the gold standard in NJ for the foreseeable future. After all, Jersey City is the state's 2<sup>nd</sup> largest city, and faces complex circulation issues that most NJ municipalities can only dream of. Similarly, Newark has hired a consultant to develop its new circulation plan. The plan will

cost \$240,000. Again, Newark is New Jersey's largest city and has a very complex set of transportation and land use conditions.

On the other hand, smaller and less complex jurisdictions might be looking at \$20,000 to \$50,000 in out of pocket consultant costs for a competent circulation plan element, depending upon the scope.

So, cost is certainly a factor. But for any municipality interested in developing a circulation plan element **and** keeping costs down, the important thing to keep in mind is that much of the legwork can be competently done by volunteers. There are likely to be knowledgeable transportation professionals living in the community that can be recruited to volunteer their time and expertise; and there are many users of the circulation system that can be convinced to help out, provided they are given clear instructions, discrete tasks and a clear sense of mission.

In an age of GPS and interactive websites, data gathering has taken on a whole new dimension. Any motivated high school student can design a web-based user-driven system to populate a transportation questionnaire. Which are the most intimidating pedestrian crosswalks in town? Where are the most frustrating intersec-

tions? Which traffic lights are poorly timed? Where are the critical missing segments in the sidewalk (or bikeway) system? Where would you like to ride your bike to, but are deterred because of difficult access? A concerted mapping and survey effort, staffed by volunteers and building upon the vast amount of public access data available can go a long way in keeping down costs and providing useful information and input.

Another inexpensive option can be found in the planning studios available at the many colleges and universities in New Jersey. These studios are often available at no cost or for a nominal cost and can both collect useful information and “stir the pot” in terms of creative ideas. University planning and urban design studios, either through Rutgers or NJIT, have been used all over New Jersey, in places such as Plainfield, Pleasantville, Newark, New Brunswick, Jersey City, Hoboken, Trenton, West Windsor and many others.

The flip side of the cost equation, for local officials to consider, are the potential benefits of having a state-of-the-art circulation plan. It may be difficult to put a number on these benefits and quantify them in dollars but they should not be ignored. If you are trying to attract a major employer to town, it is critical to



*In the early 20th century bicycling did not require a separate wardrobe.*

demonstrate that the town has its act together in terms of strategies to mitigate current transportation constraints and achieve future transportation improvements. Similarly, if a town is trying to capture federal, state or county grants for transportation improvements, having a coherent plan that convinces the funding agency that its investment fits into a smart and coherent plan will make a huge difference.

The planning profession believes that a reasonable public investment, at the right time, in competent circulation planning – in particular when coupled with supporting land use policies – will yield considerable financial benefits to the jurisdiction involved. The public expects our local governments to take the lead and be in charge when it comes to these issues. In the

absence of a tangible and coherent plan, the public trust is betrayed and leadership is unfulfilled.

### **Purpose of this Guide**

In spite of the growing interest in New Jersey and across the nation in limiting auto-dependency and promoting other, more sustainable forms of transportation, this interest has been running ahead of existing practice in almost every way, including existing federal and state regulations, priorities in capital investment programs, transportation industry standards and zoning and other local land use regulations. Most of these were adopted over the last half of the twentieth century to manage suburbanization and the growing use of the automobile and changing them to reflect new priorities and current values has proven to be a frustratingly slow and tortuous process.

Indeed, changing this complex array of government regulations and industry standards is an enormous task likely to take a while. And, like the debate over separate or integrated bike paths, there is considerable debate around the country on *how* to balance the entire array of land use and transportation plans, regulations and investments to better address all modes of transportation; and how to shift from auto-dependency toward walking, biking and transit

service, while still accommodating the automobile for some sizeable portion of future trips. This debate is inextricably linked to the controversy over how to manage and fund such a system.

New Jersey has the opportunity to advance this new thinking and lead the way for the rest of the nation as a result of its unique set of circumstances: a lack of developable “greenfield” sites, proximity to global cities and employment centers, a major statewide transit system, struggling inner cities and decaying inner and outer ring suburbs, advanced demographic shifts, a progressive and risk-taking development industry, a tradition of statewide growth management planning and regional planning agencies with strict regulatory oversight.

As such, we offer this Guide to local officials who may be interested in advancing change in their own communities, without waiting for the whole system to change. This Guide is written to help local officials understand (a) the true value of engaging in sustainable multi-modal circulation planning, and (b) how to develop a truly sustainable multi-modal circulation plan that is an integral part of an enlightened, 21st century forward looking community master plan.

The Guide has in it the components of a model circulation element for local officials to consider. It also has an inventory of the kinds of actions that local officials can undertake, as well as those that they can advocate that their neighbors and other branches of government undertake to increase the share of trips taken without private motor vehicles in their communities.

#### *Additional Reading:*

*Stephen Goddard – Getting There: The Epic Struggle Between Road and Rail in the American Century, The University of Chicago Press, 1994*

*New Jersey Office of State Planning - Designing New Jersey, Trenton 2001*

*Robert Fishman – Bourgeois Utopias: The Rise and Fall of Suburbia, Basic Books, 1987*

*Kenneth Jackson - Crabgrass Frontier: The Suburbanization of the United States, Oxford University Press, 1985*

*Clay McShane – Down the Asphalt Path: The Automobile and the American City, Columbia University Press, 1995*

*John Reps – The Making of Urban America: A History of City Planning in the United States, Princeton University Press, 1965*

## **Chapter Two: Legal Considerations in Circulation Planning in New Jersey**

What authority do local governments have in terms of transportation and circulation planning?

What are the limits of their jurisdiction? Who makes the rules and adopts standards?

This chapter will provide an overview of the legal framework behind local circulation planning.

## Chapter Two: Legal Considerations in Circulation Planning in New Jersey

**T**he Enabling Framework for Circulation Planning In New Jersey, circulation planning is by and large a local responsibility, as part of the municipal master planning functions authorized under the *Municipal Land Use Law* (MLUL), the state’s enabling planning statute. Circulation planning is also a local responsibility under the *Local Redevelopment and Housing Law* (LRHL), which authorizes and regulates local redevelopment activities.

### The Municipal Land Use Law

The MLUL (NJS 40:55D et seq) is the state’s enabling planning statute.

One of its purposes is to “encourage the location and design of transportation routes which will promote the free flow of traffic while discouraging location of such facilities and routes which result in congestion or blight” (NJS 40:55D-2h). Related purposes include to “promote a desirable visual environment and [...] good civic design and arrangements” (NJS 40:55D-2i), and “to prevent urban sprawl” (NJS 40:55D-2j).

The implication that the “free flow of traffic” is an antidote to “congestion or blight” is dated

and reflects an earlier period when the nascent discipline of traffic engineering was focused on facilitating mobility by speeding travel on roadways. Today there is greater recognition that streets must be designed and operated for the benefit of all users, and not just to promote the “free flow of traffic”. In an era of complete streets and traffic calming, achieving higher speeds on most local streets is no longer desired or encouraged.

It is worth noting, on the other hand, that the MLUL does not specify “vehicular traffic” in its reference to free flow; and that presumably this purpose should equally apply to pedestrian and bicycle traffic, as well as transit.

The above purposes of the MLUL give local governments broad discretion to define the features of “appropriate land development”, including the circulation system, and thus control physical form and community design. The reference to “good civic design and arrangements” suggests that municipalities are encouraged to integrate the planning and design of public buildings, public spaces and community facilities with the planning and design of private development. The explicit reference to the prevention of “urban sprawl” can be interpreted as a specific authorization for municipalities to

shape physical form in a distinct direction -- to promote compact development.

The MLUL defines “circulation” as “systems, structures and physical improvements for the movement of people, goods, water, air, sewage or power by such means as streets, highways, railways, waterways, towers, airways, pipes and conduits, and the handling of people and goods by such means as terminals, stations, warehouses, and other storage buildings or transshipment points” (NJS 40:55D-3).

### The Local Redevelopment and Housing Law

Redevelopment in New Jersey is governed by the 1992 Local Redevelopment and Housing Law (NJS 40A:12A). The redevelopment statutes provide municipalities with an enhanced level of control over physical planning and design, including circulation planning.

The scope and applicability of the redevelopment statutes in New Jersey have been broadened beyond the traditional dilapidated or blighted conditions commonly found in older urban areas. In addition to these conditions, the current statute permits a redevelopment designation for areas with:

- “.. faulty arrangement or design, [...] deleterious land use or obsolete layout, or any combination of these or other factors detrimental to the safety, health, morals or welfare of the community” (NJS 40A:12A 5d); as well as areas where
- “.. a growing lack or total lack of proper utilization of areas caused by the condition of the title, diverse ownership of the real property therein or other conditions resulting in a stagnant or not fully productive condition of land potentially useful and valuable for contributing to and serving the public health, safety and welfare.” (NJS 40A:12A-5e)

This broader language can be applied to suburban and rural conditions, in addition to more conventional urban conditions. For example, older suburban arterials with strip commercial development on small parcels, exhibiting poor vehicular and pedestrian circulation, inadequate parking, difficult access and generally a poor layout can be subject to a redevelopment process which assembles land, rationalizes circulation, creates a pedestrian realm and public spaces, enforces access management and redefines building masses.

The two enabling statutes provide municipalities with a number of important tools to shape the circulation system, as well as the land use pattern: the municipal master plan, zoning and land development regulations, the official map and the design review process under the MLUL; and the redevelopment plan, under the LRHL.

### **Circulation Planning Tools Provided by the Municipal Land Use Law**

The MLUL authorizes municipalities to control physical form and explicitly engage in circulation planning, and provides specific tools that can be used for that end. However, the MLUL does not require municipalities to take full advantage of this authority. Some tools, such as



the bulk standards attached to the zoning ordinance, are widely used by municipalities; others, namely the provisions allowing municipalities to design their street system and reserve public spaces, are rarely used.

### **Master Plan Elements**

The master plan provides the foundation for many aspects of local planning, including circulation planning. The master plan’s description of the desired character for the community, and the ways in which that character may vary from neighborhood to neighborhood constitute a solid foundation for the regulatory framework comprising the zoning and land development provisions that will in turn implement those intentions.

Control of physical form at a larger scale is achieved first and foremost through design of the street system and the location of important public spaces, buildings and facilities. These key objectives can be achieved through the land use plan and circulation plan elements of the master plan.

The land use plan element (NJS 40:55D-28) can designate the “[...] existing and proposed location [...] of land to be used in the future for [...] public and private purposes or combinations

of purposes”. Public areas are broadly defined by the MLUL to include

- (1) public parks, playgrounds, trails, paths and other recreational areas;
- (2) other public open spaces;
- (3) scenic and historic sites; and
- (4) sites for schools and other public buildings and structures.

The circulation plan element can designate the “[...] existing and proposed circulation facilities”, that is to say the vehicular, pedestrian and bicycle circulation networks.

Together, the land use plan and circulation plan elements can define the basic physical framework of the community – its circulation system, including pedestrian and bicycle networks – and the location of all public buildings and public spaces. The land use plan element can similarly depict different neighborhoods, areas or districts, along with the desired physical character – intensity of development, predominant land uses, building heights, and so forth -- for these different parts of the community. The land use plan and circulation plan elements of the municipal master plan are not merely indicative. They provide one of the two available vehicles -- the other being the official map

-- for municipalities to act proactively and actually design their street systems and reserve specific parcels for public spaces.

The provisions of the land use plan and circulation plan elements can be visually combined in the form of an “illustrative site plan”, depicting the generalized street system, location of major public spaces, location of major civic buildings, generalized distribution of land uses and mix of uses, generalized distribution of densities and intensities, private building lots and even approximate building footprints. An illustrative site plan, when adopted as part of the municipal master plan, and if strongly supported by appropriate zoning and land development regulations, will provide explicit guidance to the local review agencies in carrying out the community’s design objectives.

### Official Map

The official map is a powerful tool offered to municipalities for the purposes of controlling their circulation system. Like the land use plan and circulation plan elements of the master plan, the official map gives municipalities the opportunity to reserve land for future street alignments, as well as for public spaces, flood control areas and other public areas.



*An ordinance passed in Fanwood in 1897 regulating bicycles and tricycles required them to have a bell and a lamp, and restricted riding on sidewalks or at speeds over 12 mph.*

The MLUL refers to the official map in the following terms:

“The official map shall be deemed conclusive with respect to the location and width of streets and public drainage ways and the location and extent of flood control basins and public areas, whether or not such streets, ways, basins or areas are improved or unimproved or are in actual physical existence”. (NJSA 40:55D-32)

The official map gives a municipality the authority to deny permits to build on the reserved areas. The map – showing street alignments, sites reserved for public uses, and areas reserved for stormwater and flood control --

provides a very clear picture, to property owners, developers and to the community at large, of the municipality's intentions with regard to physical form.

Adoption of the official map does not preclude owners of property encumbered by it from submitting alternative development plans to the municipality, for consideration. If the property owner and municipality are unable to reach an agreement, the lands reserved through official map designation must be purchased for the intended purposes by the municipality, using condemnation as a last resort. Municipalities have one year from the date of approval of a final plat affecting those lands to effectuate these procedures. (NJS 40:55D-44)

Since most public right-of-way is acquired at no cost to the municipality through the private subdivision process, implementation of the official map without the cooperation of the private property owners can be expensive. It is always advisable to include the affected property owners in a collaborative planning and design process, which can demonstrate conclusively the advantages of the proposed alignments, and to then use the official map as a tool to effectuate that plan. Of course, the municipality can also pursue through the official map alterna-

tives to land acquisition – such as deed restrictions, easements, purchase by a non-profit entity, open space dedication or other -- that may achieve the same objectives.

Procedurally, the MLUL requires the official map to be first referred to the planning board (40:55D27A), prior to adoption by the governing body (40:55D-32). The intention is that the official map be generally consistent with the relevant provisions of the master plan. It can be inconsistent with the master plan only if it is adopted by an affirmative vote of the governing body, with the reasons for the inconsistency recorded in the minutes of the meeting at which the action is taken by the governing body.

The official map has been upheld by the New Jersey courts, with some reservations. In a 1991 case -- *Nigro v. Planning Board of Saddle River* (122 NJ 270) – the court upheld the integrity of the official map, up to a point. The court confirmed the alignment of major streets and other facilities as shown on the official map, but challenged the official map's authority relative to minor streets. This may have been the result of insufficient legwork on the part of the municipality in terms of the areas it wished to reserve, which had not been subject to field survey. William Cox, in his celebrated publica-

### *The Hoboken waterfront.*

*The city of Hoboken used its official map to create a new street alignment along its waterfront. The road – an extension of Sinatra Drive – will cut through a number of redevelopment parcels, and essentially demarcate the waterfront park and walkway to the East from the new office and residential development to the West. The official map has been instrumental in securing the integrity of this important street.*

tion New Jersey Land Use Administration (Gann Law Books, 2009 edition) recommends that the official map should be as exact and specific as possible, and that properties targeted on the official map for future acquisition be accurately surveyed.

## **Zoning and Land Development Regulations**

While in NJ the master plan is by and large an advisory document, its intentions are meant to be carried out through zoning and land development regulations, which are regulatory documents adopted as part of the municipal code. For municipalities with an interest in circulation planning, consistency between the municipal master plan's land use and circulation elements and the relevant provisions of the municipal code is essential.

## **Subdivision Controls**

Subdivision controls allow a municipality to shape the parcelization of land, or "platting" as it is often called, by setting minimum parameters for lot size and lot configuration. Through

subdivision controls, municipalities can require new streets to shape blocks of certain dimensions, by setting minimum and maximum distances from intersection to intersection, and by establishing general rules for block size and configuration. So, for example, the subdivision ordinance may require blocks to have between 200 and 250 feet on the short side, and between 200 and 600 feet on the long side, and to be rectangular. Or, the subdivision ordinance may require all platting to follow a uniform grid, of say 200 by 400 feet.

The subdivision controls will also establish the right-of-way widths for different types of streets and other elements of the circulation system.

### Site Plan Standards

The site plan ordinance contains many of the design criteria against which the planning board will judge a given development application. Along with the subdivision controls and the zoning, the site plan standards constitute a municipality's core regulatory framework for shaping development. The site plan standards will determine whether there is a sidewalk (or bike path) along the frontage of a given lot, how wide it is, whether there is room for planting of street trees and for street lights within



the public right-of-way, whether curb side parking is to be provided for, and so forth.

### Engineering Standards

Whether embedded in the site plan standards or presented as a separate section, most municipal codes have a section (or sections) dealing with engineering standards, some of which are relevant to the circulation system: street types and cross-sections, parking requirements, parking dimensions, sidewalk and bike path specifications, curb cuts, and streetscape provisions are all relevant to the circulation system. Some municipalities choose not to adopt their own standards and prefer instead to adopt, by reference, standards found in published technical manuals (see section on Design Standards and Guidelines for Circulation Planning, below).

### Tools Provided by the Local Redevelopment and Housing Law -- The Redevelopment Plan

A redevelopment plan is the document that establishes the land use and zoning parameters for reuse of a property or properties within an

area designated as “in need of redevelopment” or “in need of rehabilitation”. Its mandatory contents are defined in the LRHL.

The LRHL grants municipalities the power to condemn property within a redevelopment district, and according to an adopted redevelopment plan, on its own behalf or on behalf of a third party, the designated redeveloper. Condemnation can be used to acquire new public (or private) rights-of-way for new streets, bike paths or other elements of a planned circulation system.

The redevelopment plan can contain an illustrative site plan as mentioned previously, in which case it becomes a precise instrument for controlling physical form, including the circulation system. The LRHL provides local authorities with a powerful framework for undertaking a variety of smart growth initiatives, such as redeveloping failed shopping centers, brown-field sites or other obsolete land uses into vital, mixed-use projects; restructuring the circulation system to create livable streets, restoring a pedestrian atmosphere, or developing missing links that establish a more integrated circulation network; or creating new formal public spaces or sites for public buildings.

## Public and private rights-of-way

Most local streets and other rights-of-way in New Jersey are deeded to municipalities as part of the land subdivision process and therefore become public assets. The municipality is responsible for cleaning and maintaining these rights-of-way, enforcing traffic laws, removing snow in the winter and leaves in the fall, and so forth.

Sidewalks are an exception, in that in most municipalities, although the sidewalk is generally located within the public right-of-way, and the municipality carries the legal liability for any accidents that may occur on the sidewalk, the adjacent property owners are deemed financially responsible for paying, in whole or in part, for sidewalk maintenance and replacement.

Some municipalities, in an effort to minimize their portion of the costs of maintenance and upkeep, have encouraged private streets in new developments governed by a homeowners association or similar entity. In those cases the homeowners association may be responsible for snow clearing, leaf removal and other maintenance and upkeep tasks. However, New Jersey law requires municipalities to reimburse the

homeowners association for the reasonable costs of providing these services privately (NJS 40:67-23). If they are provided publicly, the homeowners association must pay for an insurance rider covering the municipal vehicles used if the road does not comply with the adopted municipal engineering standards.

## Design Guidelines and Standards for the Circulation System

While local governments in New Jersey have the authority and a variety of tools to engage proactively in transportation and circulation planning, the technical guidelines, standards and specifications to which the various components of the transportation and circulation system must conform are largely determined by other entities and often stipulated by law. Local governments are by and large not authorized to establish their own engineering standards when it comes to specifying the design aspects (other than the alignment) and construction details of public rights-of-way. In part this reflects concerns over the assumption of liability if a public right-of-way is not built to accepted national standards. As such the geometric profile and overall character of a street or other right-of-way – how wide it is, whether it has street trees



*A barrier-free pedestrian infrastructure is essential for people with physical disabilities to circulate unassisted and with dignity.*

or whether it has a planted median -- may not necessarily be established locally.

In particular, the question of the minimum pavement widths required to safely provide access to fire protection and other emergency vehicles has been controversial and divisive. The emergency service providers would like unrestricted access and generous pavement widths to allow their vehicles to circulate unimpeded and reach their destinations as quickly as possible; while the environmental community, new urbanists, smart growth advocates and many others have argued in favor of narrower pavement widths and against designing the entire system for the occasional needs of a highly specialized, albeit important user. While this discussion is not necessarily over, there seems to be a greater convergence and willingness to compromise among the participants,



*Smart cars occupy a considerably smaller footprint and consequently require much smaller parking spaces.*

which suggests that we may see consensus in the future on this issue.

## National Guidance

All entities engaged in circulation planning or otherwise involved in other aspects of the circulation system refer to engineering guidelines created by national and international professional organizations, sanctioned by the federal government and adopted by each state.

The American Association of State Highway and Transportation Officials (AASHTO) is perhaps the most influential in setting the engineering design of streets and highways. AASHTO's "A Policy on Geometric Design of Highways and Streets", also known as the "green book", now in its 5th edition is an industry standard. This publication has evolved from dealing exclusively with motor vehicles to

include guidance on the design of both pedestrian and bicycle facilities.

Other major players include the Institute for Transportation Engineering (ITE), an international membership organization based in Washington, DC that has been extremely influential in developing guidelines for trip generation, parking and many other technical aspects of the transportation and circulation system. ITE's "Trip Generation" now in its 8th edition is an industry standard, as are the "Urban Street Geometric Design Handbook", the "Traffic Engineering Handbook" and "Parking Generation".

The "Manual on Uniform Traffic Control Devices" (MUTCD), jointly developed by ITE and others on behalf of the Federal Highway Administration (FHWA) sets the national guidelines for all traffic control devices, including traffic signs, pavement markings, signals and other devices used to regulate, warn, or guide traffic. These guidelines apply to public facilities, as well as to privately built and operated rights-of-way open to public travel. The 2009 Edition of the MUTCD became effective as of January 15, 2010. Federal statute (23

CFR) gives states two years to adopt the MUTCD, or adopt a state manual that substantially conforms with the national model. New Jersey statutes dealing with streets and other rights-of-way refer frequently to the MUTCD.

In New Jersey, NJDOT has an adopted "Roadway Design Manual" with guidelines pertaining to the state highway system. This is a modified version of AASHTO's "green book". NJDOT expects the geometric design of streets and highways not part of the state system to substantially conform to the AASHTO manual.

In 1996, NJDOT adopted "Bicycle Compatible Roadways and Bikeways: Planning and Design Guidelines" and "Pedestrian Compatible Planning and Design Guidelines" to guide the planning, design and construction of bicycle and pedestrian facilities in the state.

County engineering departments also adopt engineering guidance for the design of county roads and other county rights-of-way. These are generally slightly modified versions of the national standard.

## Residential Site Improvement Standards

The New Jersey Residential Site Improvement Standards (NJAC 5:21) adopted pursuant to the Uniform Site Improvement Act (NJS 40:55D-40.1 et seq) imposed state mandated design standards applicable to certain aspects of residential development anywhere in the state. Subchapter 4 of the Residential Site Improvement Standards (RSIS) preempted local authority to establish street design standards. A limited template of 23 street types was imposed, with the intent of creating uniformity



throughout the state. The RSIS has reduced municipal standards calling for excessive street width and other over-engineered requirements

in many suburban and rural municipalities. On the other hand, the RSIS has also curbed individual expression in street design, in that it requires compliance with a limited range of standardized, generic street cross-sections with a distinct suburban orientation. Subchapter 4 also mandates minimum residential parking ratios, as a function of housing type, regardless of the physical context where the housing is located.

The RSIS contemplate local deviations under certain conditions, through the adoption of “special area standards” for historic districts, infill projects in urban areas, redevelopment areas, scenic corridors and many others. Municipalities have been availing themselves of the special area provisions and reclaiming their right to define unique street design standards to establish a distinct identity for their downtowns and neighborhoods and to require reduced parking ratios to better match local realities and objectives.

## Pedestrian Safety

In New Jersey drivers are now subject to a \$200 fine, 15 days of community service and four points on their license if they do not stop and remain stopped at a crosswalk to allow pedestrians to safely pass (NJS 39-4). Drivers

may not pass a vehicle that is stopped to allow a pedestrian to cross at a cross-walk, and must also yield to pedestrians at unmarked crosswalks or at intersections lacking pedestrian signals (NJS 39:4-36). Pedestrians also face penalties – a \$54 fine and community service -- if they do not exercise due caution and fail to yield the right of way to motorists anywhere other than at a crosswalk.

## Access Management: State, County and Local

New Jersey adopted the State Highway Access Management Act (NJS 27:7-91 et seq) in 1989. As the name indicates, the act seeks, among others things, to regulate and manage access from adjacent properties to state highways, including existing streets that provide access to state highways.

According to AASHTO’s A Policy on Geometric Design of Highways and Streets, there are three basic forms of access control:

- *Full Control Access.* Preference is given to through traffic by providing access connections only at selected public roads and by prohibiting private driveway connections.

- *Partial Control of Access.* Preference is given to through traffic with some private driveway connections allowed.
- *Driveway and Approach Regulations.* Each abutting property is allowed access to the street or highway, with location, number, and design of access points governed by regulations.

The NJ Highway Access Management Act directed the Commissioner of NJDOT to develop and adopt an Access Management Code (NJAC 16:47). The code establishes six levels of access – from fully controlled access on interstate highways, toll roads and others to open access, limited only by visibility and safety considerations. The code also establishes other provisions, including minimum and desirable standards for the spacing of driveways and intersections. It further allows counties and municipalities to adopt an access management code for roads under local jurisdiction (NJS 27:16-1 and NJS 40:67-1, respectively).

Counties and municipalities have not taken advantage of these provisions in large numbers due to cost considerations and the complexity of the technical work required. There may also be misgivings on the part of local governments with respect to the benefits that might accrue as a result of imple-

menting an access management plan.

Access management may offer the greatest benefits to municipalities when applied to previously developed areas. In newly developing areas, vehicular access to major roads can be managed through other mechanisms, such as the land development regulations. In designated redevelopment areas, access can be managed through an adopted redevelopment plan. But in previously developed areas, in the absence of a designated redevelopment plan, access can only be controlled through an adopted access management plan.

### **Who has jurisdiction over the transportation and circulation systems?**

It should be apparent from the previous discussion that the transportation and circulation systems present a complex legal and jurisdictional landscape. In New Jersey, many seemingly local decisions – such as when it is justified to install a signalized intersection, a stop sign or a traffic calming device – have been closely guarded by NJDOT. Recently, the NJ Legislature has taken small steps to transfer some of these responsibilities down to local governments. However many important decisions regarding local circulation still require NJDOT approval.



Local governments are currently authorized to take the following actions with respect to streets under their jurisdiction, consistent with the MUTCD:

1. prohibit or restrict general parking, and designate restricted parking and time limit parking;
2. install parking meters;
3. designate loading and unloading zones;
4. approve street closings for periods up to 48 continuous hours;
5. establish angle parking;
6. reinstate or add parking on any street;
7. install or place an in-street pedestrian crossing right-of-way sign at a marked crosswalk or unmarked crosswalk at an intersection;
8. designate stops, stations, or stands for buses, taxis and trolleys.
9. alter speed limits;
10. limit the use of streets to certain class of vehicles;
11. designate one-way streets;
12. regulate the stopping or starting of street cars at special places;

13. regulate the passage or stopping of traffic at certain congested street corners;
14. designate streets or roads with a grade in excess of 5% where buses and trucks over four tons may be required to use a lower gear when descending;
15. install STOP signs at intersections located within 500 feet of a school, playground or youth recreational facility if the street is contiguous to those activities.

In New Jersey, traffic calming devices – such as speed humps, speed tables, bulb outs and others – are regulated (NJS 39:4-8.10). Local governments are only authorized to construct speed humps on (a) two-lane residential streets and on one-way residential streets with a posted speed limit of 30 mph or less than 3,000 vehicles per day; and (b) where appropriate on streets within 500 feet of a school or a school facility when that street is rebuilt or repaired (NJS 39:4-8.10b). Speed humps may also be constructed on private roads (NJS 39:5A-1). The design and construction of speed humps must conform to NJDOT’s technical standards and signage must conform to the MUTCD.

Municipalities are also authorized to establish, by ordinance, a system of truck routes and exclude trucks weighing over four tons (vehi-

cle plus load) from streets other than those designated as a truck route (NJS 40-67-16.1). Local deliveries and public utility trucks are exceptions. Municipalities may not exclude trucks from state or county highways within the municipality without NJDOT permission.

#### **Additional Reading:**

*William Cox and Donald Ross – New Jersey Zoning and Land Use Administration, Gann Law Books, 2010.*

*American Association of State Highway and Transportation Officials - A Policy on Geometric Design of Highways and Streets.*

*NJDOT -- Bicycle Compatible Roadways and Bikeways: Planning and Design Guidelines, 1996.*

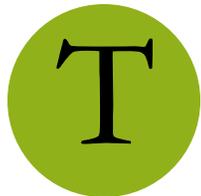
*NJDOT -- Pedestrian Compatible Planning and Design Guidelines, 1996.*

## **Chapter Three: Key Concepts and Contemporary Ideas in Circulation Planning**

Transportation and circulation planning is a rapidly evolving field and one that attracts growing attention.

This is attested by the increasing number of professional organizations, academic programs, conferences and professional and academic publications dedicated to the topic. In this section, we try to summarize both basic concepts and relevant contemporary ideas in this dynamic field.

## Chapter Three: Key Concepts and Contemporary Ideas in Circulation Planning



### Things We Knew and Forgot

As previously discussed, in the late 19th and early 20th century most communities in the US were laid out primarily using the grid. Many variations on the grid exist, in terms of block size, block dimensions, right-of-way widths and so forth, but the underlying framework was similar. The grid is simple to apply and easily understandable, but it can also be repetitive and monotonous. And because it offers almost unlimited access in every direction, it does not by itself provide much protection from traffic in more sensitive areas, such as lower density residential neighborhoods.

In an effort to remedy some of the perceived shortcomings of the standard grid, planners and designers began to experiment with a variety of different ways of laying out the street system. The planned community of Radburn in Fair Lawn (Bergen County) which was built in the 1930s, represents the first large scale application of a radical alternative to the grid. It was the first systematic application of the cul-de-sac model to a residential neighborhood, as a way to improve privacy. The cul-de-sac permitted the creation of “superblocks”, by allowing

access to, but not through, these residential clusters. All the traffic that would otherwise have dispersed through the grid was directed in Radburn to larger collector streets along the periphery of the superblocks and ultimately to arterial roads.

Coupled with the increasingly widespread use of single-use zoning, the Radburn circulation framework, with its strict functional hierarchy of streets and systematic reliance on cul-de-sacs created a template, which would be applied, albeit with many variations, to most suburban development in the US for the next 50 years. The resulting circulation system is sometimes called a “sparse” network, in recognition of the dramatically lower number of intersections, ie opportunities to change direction, as opposed to the highly interconnected traditional grid.

The sparse network accommodated the growing reliance on private vehicles as the dominant mode of transportation far better than the conventional street grid ever could. As such, the sparse network became the new paradigm of choice in building new communities (and rebuilding older ones) in the US. It was given a level of authority and legitimacy by the emerging discipline of traffic engineering and became

the accepted model driving local land use and transportation decisions.

While many recognized the shortcomings of an increasingly auto-dependent development pattern, it was not until the end of the 20th century that the planning and design professions began to seriously challenge this modern street paradigm and to develop alternatives. Today, a considerable amount of empirical evidence exists that allows us to objectively question the assumptions and implications and dispassionately compare the performance and impacts of different land development patterns and of different approaches to transportation and circulation planning. The shortcomings of the sparse network model are recognized.

This does not however mean a wholesale return to the 19th century grid model. New “hybrid” models that combine the advantages of the grid with more contemporary considerations have been developed and are being used. The modified grid represents the synthesis of two traditional North American approaches to land development: the traditional, nineteenth-century grid plan, and the curvilinear pattern of curving streets and cul-de-sacs of 20th century suburbia. The modified grid, when designed correctly provides efficient vehicular traffic, with-

out sacrificing safety and convenience for pedestrians. At the neighborhood scale it can treat pedestrians preferentially by making their routes more direct than vehicular ones. It also provides new opportunities for bicycle routes on lower volume streets.

## Circulation Planning and Public Health

Public health practitioners have become increasingly involved in community design issues, and have demonstrated a particular interest in the interface between land use, transportation and public health. There is a growing body of research and technical studies probing the relationships between community design, land use planning, transportation and circulation planning and public health outcomes.

It is not difficult to understand the public health profession's interest in these issues: the nation faces an unprecedented obesity epidemic for both adult and child populations. Obesity is an excess accumulation of body fat and a well-established risk factor for numerous chronic diseases, including diabetes, heart disease, high blood pressure, gall bladder disease, arthritis, breathing problems, and some forms of cancer. The numbers are alarming. In 1991, not a single state had an obesity rate over 20%; in 2010, more than 38 states have obesity rates over 25%.

Obesity in New Jersey has consistently increased over the last 20 years. A 2003 study conducted by New Jersey's Departments of Health and Education found that 20% of 6th graders were obese and another 18% were overweight. The Behavioral Risk Factor Surveillance System indicates that in 2005, 37% of New Jersey residents were overweight and 22% were obese. And the 2005 NJ Student Health Survey found that 12% of students in grades 9-12 were overweight and another 15% percent were at risk of becoming overweight. In NJ in 2010, 25% of high school students were overweight, including 10% who were obese. Boys were more likely to be obese than girls and blacks more than other races and ethnicities: in 2010, 36% of blacks were obese, compared to 25% Latino and 23% white.

Almost one quarter of New Jersey residents age 45-54, and almost one-third age 55-64, are obese.

All told, more than half of New Jersey residents risk serious health problems as a result of being overweight. Nationally, nearly 80 percent of diabetes patients are obese; 70 percent of diagnosed cases of heart disease are related to obesity; 26 percent of obese people suffer from hypertension; and almost half of breast cancer cases are diagnosed among obese women.



*Neighborhood traffic circles slow traffic speeds, reduce accidents and create opportunities for neighborhood landscaping projects.*

Research has conclusively linked the increase in obesity rates with two major factors: a poor diet combined with the absence of physical activity. This latter factor is linked with physical environments that foster (or require) an auto-dependent lifestyle, where children no longer walk to school and adults no longer walk anywhere. Childhood obesity rates are particularly alarming in less affluent and minority communities.

Nationally, over 40% of children walked or biked to school in 1969. Today, according to a recent study by the National Center for Safe Routes to School, 55% of public school students are driven to school by a family member, 30% take a school bus and only 13% walk or bike. Less than half of children living close to school will walk or bike to classes. For children living in low-density areas, the leading reasons given by parents for not letting their children walk to school are distance and absence of adequate pedestrian infrastructure. For children

living in higher density areas, the leading reasons are traffic and crime.

All of the nation's leading public health institutions, including the Center for Disease Control and the American Academy of Pediatrics, have targeted the need to create communities with better walking and biking environments as a critical component in fighting both adult and childhood obesity.

In addition, as our population ages and becomes more mobility-challenged, there is a huge concern among the public health community regarding elderly populations which, no longer able to drive or cope with hostile circulation systems, will be at a high risk of becoming home-bound.

For every age cohort, the benefits of walking 30 to 60 minutes a day are well recognized. Greater physical activity reduces the risk of cancer, type II diabetes, heart disease, high blood pressure, bad cholesterol, anxiety and depression, and increases bone health and overall life expectancy. Frequent walking has also been linked with delays in the onset of Alzheimer's.

Circulation planning can contribute significantly to public health outcomes by facilitating the

type of incidental physical exercise that results from a land use pattern and circulation system that makes walking and biking viable modes of transportation for a variety of trips: school, shopping, socializing, work, entertainment, worship and others. The more types of activities and destinations are reasonably accessible by walking and biking, the greater the likelihood that people will use these modes and consequently engage in incidental physical activity.

In addition, the public health benefits of transit-rich locations – where people drive significantly less, take more transit, and make more trips by walking or bicycling -- have also been well established. The shift away from private vehic-



*Discontinuities in the sidewalk network present serious mobility challenges to anyone with a disability.*

ular trips reduces air and water pollution, and increases physical fitness and mental acuity. Research suggests that improving the quality of public transit may be one of most cost-effective ways to improve public health outcomes.

### **Mobility and Accessibility**

The concept of *accessibility* refers to people's ability to reach goods, services and activities -- the ultimate goal of most transportation – in the most efficient, environmentally-conscious, cost-effective and budget-appropriate ways.

It contrasts with the concept of *mobility*, which is neutral with respect to social equity or environmental concerns, and assumes that the ability to move around unimpeded should be an over-riding public policy objective on its own. Mobility is only concerned with physical movement – number of trips, distance covered, average speed – and does not adequately capture those potentially more benign, yet frequently ignored transportation alternatives.

Accessibility consequently seeks different and smarter ways to measure success: simply moving more vehicles in a shorter period of time is not viewed as an appropriate measure of success when, in fact, it is questionable whether those added trips are ultimately justifiable.

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 The high cost of car payments, gas & maintenance getting to you & your wallet...  
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*Hoboken has one of the most creative public parking policies in New Jersey. The city offers residents a variety of incentives to not own cars.*

Transportation statistics and transportation system performance measures are seen as biased since they mostly measure speed and distance and view growth in these indicators as a measure of success, instead of measuring actual outcomes. Conventional measures of transportation activity are seen as flawed and favoring motorized modes at the expense of other forms of transportation.

Many factors affect accessibility: the quality and affordability of the available transportation options, the level of connectivity in the transportation system, feasible alternatives to physical movement and prevailing land use patterns. Levels of accessibility can be evaluated with respect to particular demographic groups, mode, location or activity. Conventional transportation planning often overlooks and/or undervalues these factors and perspectives. Yet smarter approaches to accessibility planning can help expand horizons and find better solutions to transportation problems.

## Green Transportation

Sustainable (green) transportation refers to any means of transportation with low impact on energy and the environment, and includes walking and cycling, transit, electric vehicles, hybrid vehicles, car sharing and other transportation systems that are fuel-efficient, space saving and promote healthy lifestyles. Different types of mobility options need to be weighed against the environmental, social and economic costs that transportation systems pose, in order to make critical and strategic decisions that provide cost efficiency based on the impacts on energy and the environment.

As previously mentioned, the transportation sector has significant impacts on the environment, accounting for up to 40% of NJ energy

consumption and carbon dioxide emissions. Greenhouse gas emissions from transportation are increasing at a faster rate than any other energy-using sector. Vehicle emissions are also a major contributor to local air pollution and smog.

The social costs of transportation include crashes, air pollution, strain on household budgets, physical inactivity, time taken away from the family and vulnerability to fuel price increases. Many of these negative impacts fall disproportionately on those social groups that can least afford them and are least likely to own and drive cars. Traffic congestion imposes economic costs by wasting people's time and by slowing the delivery of goods and services.

Traditional transportation planning aims to improve mobility, especially for vehicles, but fails to adequately consider the wider impacts. The real purpose of transportation should be access -- to work, education, goods and services, friends and family -- while simultaneously reducing environmental and social impacts. Communities that are successfully improving the sustainability of their transportation networks are doing so as part of a wider agenda to create more vibrant, livable and equitable places.

The green transportation hierarchy favors those modes that demonstrate greater efficiency in

### **Green Transportation Hierarchy**

*The green transportation hierarchy reflects the costs and benefits associated with the different modes of transportation. Walking is at the top of the hierarchy because it costs nothing and does not impact the environment. Bicycling comes second because of the cost of the bicycle and the environmental impacts associated with manufacturing the bicycle and its components. Public transportation in large measure still relies on fossil fuels, but with appropriate ridership levels the per capita environmental costs are lower than if each transit rider were travelling in individual motor vehicles. Service and freight vehicles are necessary to keep our economy running, carry heavy and often complex equipment and get necessary work done. Taxis frequently carry multiple passengers as do, by definition, multiple occupancy vehicles, such as car pools and van pools. At the bottom of the hierarchy, the single occupant vehicle – regardless of whether it is a zero-emissions vehicle -- is the most inefficient mode of transportation in terms of resource allocation, both with respect to the vehicle itself as well as to the infrastructure it relies on.*

1. Pedestrians
2. Bicycles
3. Public Transportation
4. Service and Freight Vehicles
5. Taxis
6. Multiple Occupant Vehicles
7. Single Occupant Vehicles

terms of environmental impacts, space, energy and other costs.

### **Permeability and Connectivity**

Permeability and connectivity are terms used to describe the extent to which the circulation system allows (or restricts) the movement of people and/or vehicles in different directions. The terms are often used interchangeably, although there is a subtle difference in meaning. "Connectivity" refers solely to the number of connections to and from a particular place; whereas "permeability" refers also to the capacity of those connections to carry people or vehicles. In other words, connectivity measures the number of links a circulation system offers. The greater the connectivity, the greater the number of options (routes) for circulating within the system. Cul-de-sacs, dead-ends, no left turns, medians, one-way streets and other physical or regulatory features reduce connectivity. Permeability adds a measure of capacity to this analysis. Connectivity is also used to describe the level of integration between different modes or types of transportation, such as in a multi-modal transit hub.

The benefits of circulation systems with higher levels of street connectivity and permeability are well established and supported by national research. Permeability and connectivity permit ease of movement and avoid isolating neighbor-

hoods. Neighborhoods that lack permeability, e.g. those severed by arterial roads, or with many cul-de-sac, discourage movement on foot and generate more car trips. However, a formulaic approach to street connectivity is not recommended, as there are also conditions, circumstances and cost considerations that reasonably justify or indeed require imposing limits. A balanced approach to establishing the appropriate level of connectivity is therefore recommended.

- Unfiltered permeability is associated with the traditional street grid where pedestrians, cyclists and motor vehicles follow the same routes.
- Filtered permeability is an approach that suggests walking and bicycling networks should be more permeable than the street network for motor vehicles. An additional overlay of bicycle and pedestrian only connections, over and beyond those offered by the shared street network, encourage walking and cycling by providing an attractive environment free from traffic and perhaps a time and convenience advantage over driving. Filtered permeability offers facilities, in some locations, where cyclists, pedestrians (and sometimes transit) have separate rights-of-way from motor vehicles, in addition to the shared rights-of-way elsewhere.

The "connectivity index" is a quantitative tool to measure how well a street network connects destinations. This is accomplished by computing the

ratio of segments of streets to intersections or dead-ends. A higher score indicates more travel choices in itinerary, and therefore greater permeability. More cul-de-sacs and dead ends, and longer block dimensions result in lower scores. The index can be calculated separately for vehicles, pedestrians and bicycles if there are separate routes.

### **Street Networks and How They Perform: Sparse vs. Inter-Connected Systems**

Streets define blocks -- their size and configurations. Blocks constitute the basic building block of communities from a community design perspective. Block size can vary considerably, and there is no formula for achieving the perfect block size. The Portland (OR) block is 200 by 200 feet; the Hoboken block is 200 by 400; and the Newark block is 400 x 150. In Manhattan, blocks vary from 200 by 600 feet to 200 by 1,100 feet; those longer cross-town blocks are considered excessive by many. Many other templates exist, but it is generally accepted that blocks should be between 200 and 300 feet in one dimension and 200 and 500 feet in the other. Block sizes should obviously be tailored to accom-

modate the spatial needs of the types of uses anticipated.

Depending upon the average block size, this system will yield a variable number of intersections.

The average street lane can carry in the range of 1,700 – 2,000 vehicles an hour. For two-lane streets, 3,200 passenger vehicles per hour is the stipulated capacity. Lane capacity does not increase as a linear function when additional lanes are added. This means that the same number of lane miles have a higher capacity as two lane streets rather than multi-lane arterials. Lane widths can vary between 8 feet (for a very low volume neighborhood street) and 14 feet (for highways) in width, and usually average between 10 and 12 feet in width.

Traditional grids were layed out using a mile square template for major arterials. This model still works quite well. The square mile grid means that the outer edge of every neighborhood is no further than 1/2 mile (10 minute walk) from an arterial, where transit service can be provided and more intensive commercial uses might be located. Lower order arteri-

### *Measuring Connectivity*

*There are a number of ways to measure connectivity.*

#### *Indicators of connectivity include:*

- *Links and nodes: Number of street links divided by the number of nodes (intersections). Ranges from 1.00 (poorest level; all cul-de-sacs) to 2.50 (fully interconnected). The lowest score for a walkable community is 1.4 to 1.6.*
- *Intersection ratio: The ratio of intersections divided by intersections and dead ends, expressed on a scale from 0 to 1. A score greater than 0.75 is desirable.*
- *Average intersection spacing: For walkability, a maximum distance of 660 feet; desirable spacing is less than 400 feet.*
- *Intersection density: The number of street intersections within a given area, such as a square mile. The more intersections, the greater the degree of connectivity.*
- *Blocks per square mile: For walkability this index should be at least 100.*
- *Directness: Actual travel distance divided by direct travel distance. Ideal score is 1.0. For walkability, score should be 1.5 or less.*

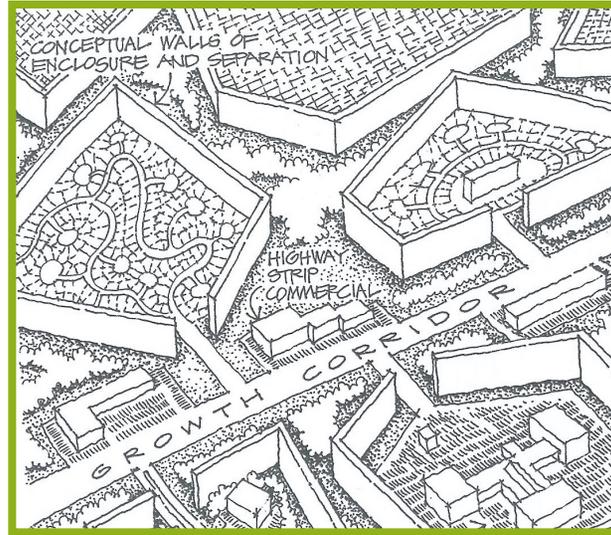
*Source: Designing Walkable Urban Thoroughfares: A Context Sensitive Approach. ITE/CNU 2010*

*We should point out that while these quantitative tools can be helpful in clarifying the factual basis, they should always be used judiciously and with intelligence. No set of metrics can substitute for intelligence and human or societal discretion.*

als occur every 1/4 mile and constitute appropriate locations for neighborhood shopping and other activities with a more localized or specialized market or customer base. In denser urban environments, arterial spacing may need to be 1/2 mile or even 1/4 mile, depending upon the number of lanes available for the arterials. If no 6-lane arterials are desired, the spacing should be less than 1/2 mile. Travel demand forecasting models will inform that determination.

A 21st century enhancement of this model requires inclusion of a network of bicycle facilities with parallel routes, establishing direct connections to major trip generators such as schools, libraries, mixed-use areas and parks. These bicycle facilities may include one or more of the following: on-street bike lanes, dedicated bike paths, or shared lanes on low volume traffic-calmed streets.

An interconnected street network reduces traffic on arterial streets because vehicle trips are dispersed throughout the system, rather than concentrated. This increases the performance of the arterial streets and minimizes the opportunities for cut-through traffic. If seeking to optimize flow on the arterials, then the block pattern should be laid out with the long sides of the blocks facing the arterial. That will reduce the number of intersections and therefore the amount of friction in the system. Intersections will occur only every 400 to



600 feet. On the other hand, this maximizes the arterial frontage, which is exposed to greater noise and traffic. So there are trade-offs, and it may be advisable to preferentially locate less noise sensitive uses (office, retail) along the arterials and shift more noise-sensitive uses (residential, educational) to the side streets.

Increased connectivity in the street network calls for finding a balance between reducing traffic on arterial streets without encouraging excessive increases in traffic on side streets and residential neighborhoods. To contain excessive traffic on local residential streets, traffic calming and other strategies should be employed.

When compared with low-connectivity suburban-style street networks, interconnected street systems have been shown to decrease vehicle miles traveled (VMT), trip lengths and travel time, and to facilitate walking, bicycling and transit use as a result of the shorter travel distances to various destinations and to passenger

rail and bus service. But the interconnected street network must be coupled with a land use pattern that reinforces these outcomes and provides both an attractive walking and bicycling environment and relevant destinations.

Greater connectivity improves the delivery of emergency services, mail and package deliveries, and the operations of garbage and recycling services, police and other municipal service workers, because it increases access and dramatically reduces cul-de-sacs. It may be appropriate to designate certain streets as emergency service routes and limit traffic calming or similar interventions to facilitate emergency service vehicles.

Greater connectivity also provides a superior environment for transit operators, by creating shorter and more direct routes and placing potential riders closer to transit service. The sparse networks with multiple cul-de-sacs and winding streets found throughout suburbia were not designed with transit in mind and indeed make it considerably more difficult to provide transit service. The superblock layout and limited number of access points makes access by transit vehicles difficult and inefficient, and the winding street alignments increase bus travel distance, thereby increasing trip travel time and decreasing passenger convenience. Interconnected street networks offer transit

planners greater flexibility in terms of service design, and the ability to better customize service to reach specialized markets. Interconnected street networks also offer more flexibility for buses to deviate from a fixed route to pick up or drop off passengers at locations off the scheduled route. This occurs mostly in lower density environments and caters to the elderly or disabled who have difficulty reaching a bus stop.

## Functional Classification

FHWA, state DOTs and county engineering departments classify roads according to their function, and establish standards for design, access and others according to this classification. The conventional classification starts with freeway/expressway at the top, followed by principal arterial, collector (minor arterial), sub-collector and residential access street. This classification is entirely motor vehicle oriented and focused on moving vehicles. It is therefore of limited interest to local circulation planners, because it does not adequately address the land use context in which different types of streets are located, and which to a large extent determine how they operate, nor does it capture the complexities and nuances in design and function of the local street network. Alternative classifications have been proposed which attempt to better handle these aspects. One example can be found in the functional classification described in the Transect.

## Level of Service (LOS)

Traffic engineering uses the concept of “level of service” to define functional conditions along a particular stretch of street or intersection. Levels of service were originally linked to the roads in the functional classification system, but they can also be applied to other modes as well, such as pedestrian and bicycle facilities, and transit services.

### *Vehicles and Dimensions*

*There are a wide variety of motor vehicles on the roads in the US, with very different dimensions and characteristics. Limousines might be 20 feet long, a Lamborghini is 6 7/8 feet wide, a Dodge Ram pick-up truck is 8 feet wide and a Hummer weighs around 7,500 lbs, while a Daihatsu weighs only 1,600 lbs.*

*Indeed the dimensions of the average motor vehicle have changed considerably over time and continue to change today. We now have both smaller and larger vehicles than previously.*

*In general small cars measure around 5.75 feet by 15 feet, while large cars measure 6.25 feet by 16.75 feet. Vans, on average, measure 6.75 feet by 18.25 feet; trucks measure 6.75 feet by 18.9 feet; and sport utility vehicles 6.75 feet by 17 feet.*

*Different classes of vehicles also have different maneuverability requirements. In addition to travel lane width, turning radius is a critical dimension that will determine whether larger vehicles are able to negotiate corners without mounting curbs or encroaching into on-coming traffic. A curb radius of 10 or 15 feet is appropriate for local, neighborhood streets, but will present challenges for larger vehicles. Emergency service vehicles (fire and first aid), moving and delivery trucks, utility trucks, buses and others have different requirements from the majority of light passenger vehicles, and may require larger curb radii. Farm vehicles and military vehicles pose their own sets of challenges.*

*Clearly we cannot design our circulation systems for either the largest, widest and heaviest users, or for the smallest and lightest vehicles. Similarly, it is neither cost-effective nor desirable to design for the occasional, albeit important user. Many communities struggle to find the appropriate compromise. The planning, traffic engineering and emergency response professions have looked at these issues carefully and there is now expert guidance on these issues, which should make these decisions easier in the future.*

There are 6 LOS, like grades in school: from A (best) to F (worst). For roads, the LOS reflects the average speed at which vehicles are able to travel; and for intersections, it reflects the amount of time (number of cycles) it takes to get through the intersection. For example, a signalized intersection is currently considered to have an LOS A if there is a delay of 10 seconds or less and an LOS F if there is a delay of 80 seconds or more. (In 1985, A was 5 seconds and F was 60 seconds, which suggest the traffic engineering profession has become more accepting of delays.)

While the LOS is useful as a standardized measure of performance (of a particular facility at a particular time of day), which therefore allows for objective comparisons between different facilities, it is critical to keep in mind that it should not lead to pre-determined solutions (ie, intersection widening if the LOS is F) nor should it even necessarily imply that there is a problem. The community must determine whether the condition measured is in fact a problem; whether it is a high-priority problem that deserves immediate attention and resources; and what type of solution might best address the problem.

Early efforts to apply the LOS concept to pedestrian facilities illustrates some of the difficulties. It was originally conceived to reflect the density (number of people) on a given section of sidewalk, and consequently gave higher ratings to un-crowded areas, where most people do not want to be. In fact, the pedestrian rating system might have worked better if it were inverted.

There are many ways to address “deficient” LOS ratings – redirecting traffic, travel demand management solutions, mode shifts, interventions in other parts of the circulation system, etc -- that may not require a physical intervention at that particular location. The appropriate local response to a bad LOS rating at a particular location should be informed, smart and reflect the community’s sense of priorities. The whole concept of LOS is currently being re-examined by the transportation establishment.

### **Trip Generation and Mode Split**

Trip generation refers to the number of trips originating or ending at a particular location. The Institute of Transportation Engineers Trip Generation is the industry standard for calculating trips generated by different land use classifications. It is based on a comprehensive national database of (mostly suburban) case

studies. Trip generation rates are correlated to particular land uses, and distinguish between daily totals, peak periods and day of week.

Unfortunately, this source presents an over-simplified picture of reality: it is focused on private motor vehicle trips, and excludes all other modes of transportation; it does not distinguish between different land use patterns, densities and transportation conditions; and it does not take into account the availability of transit. In short, it suffers from the same shortcomings as the ITE parking generation manual (see parking section).

These shortcomings have been recognized by the professional community, and studies are underway to provide a more nuanced and realistic set of multipliers, that can take into account not only the surrounding land use context, but also household characteristics, demographics, transit availability and propensity to use non-motorized modes.

Most NJ municipalities have not incorporated trip generation rates into their land development regulations. As a result, discussions of trip generation take place on a case-by-case basis between the planning board and its professionals, and the developers and their profes-

sionals. Vehicular trip generation rates are relevant to determine traffic volumes entering and leaving the site, calculate potential off-site improvements needed and evaluate impacts on the surrounding community. These discussions are often contentious and sometimes poorly grounded empirically, given the costs of conducting the base studies tailored to each individual project. Trip generation is not a science.

### **What Are Complete Streets?**

“Complete Streets” is a growing national movement that seeks to provide all users with safe and equitable access to the transportation and circulation systems, regardless of age or ability. It recognizes that our circulation infrastructure in the last 50 years has been built primarily to accommodate motor vehicles, to the disadvantage of all other modes of transportation. Complete Streets seek to reverse this, by instead creating integrated, multi-modal networks that work equally for all modes of transportation.

Complete Streets is a policy that provides direction for transportation engineers and planners to always carefully consider the needs and abilities of all users and modes of transportation during the design of a transportation network and to balance their safety and convenience. It is not a prescription to apply sidewalks and bicycle lanes

to every road, but rather to direct planning decisions to consider all users.

#### **Complete streets are intended to:**

- Reduce auto-dependency, VMT and GhG emissions.
- Improve safety conditions for the transportation system users at greatest risk: pedestrians, bicyclists, children, the elderly, people with disabilities and transit users.
- Improve bicycling and walking connections between and among major trip generators such as employment centers, schools, residential neighborhoods, recreation, retail centers and public facilities.
- Increase incidental physical activity and facilitate a more healthy lifestyle.
- Improve quality of life.

NJDOT has adopted a Complete Streets Policy for all projects built on public rights-of-way that receive federal or state funding and encourages local jurisdictions to adopt a similar policy applicable to projects with other sources of funding.

In New Jersey, some local governments, such as Montclair have similarly adopted Complete Streets policies.

#### ***Trip Generation Rates***

*ITE provides trip generation rates for every major category of land use, and for many minor ones as well -- the 7th and latest edition lists over 1,000 land use and use combinations. So, for example, a single-family detached dwelling is estimated to generate about 10 trips per average week-day, but a high-rise apartment might generate only 4 and a retirement community only 3.*

*Research in traditional, mixed-use compact communities indicates that those households make on average the same number of trips, but significantly less trips by car, less external trips and involving considerably less VMT even in the absence of competitive transit service.*

*Recent research also shows that trip generation rates in higher-density, mixed-use environments are notably less than rates for lower-density, single-use environments. (Similar findings apply to parking needs – see parking section). Research indicates that trip generation rates for projects located in urban transit-oriented developments (TODs) may be less than 1/2 the rates calculated elsewhere, and 25% less in suburban TODs.*

*NJDOT has designated seven Scenic Byways:*

- *Bayshore Heritage Byway*
- *Delaware River Scenic Byway*
- *Millstone Valley Byway*
- *Palisades Interstate Parkway Scenic Byway*
- *Pine Barrens Byway*
- *Route 57 Byway*
- *Upper Freehold Historic Farmland Byway*

## **Pedestrian Friendly Planning**

Walking is the oldest form of transportation, and still the most pervasive. Every trip for someone who is mobile starts and ends by walking. Humans start walking, on average, at 11 months and will continue to walk until very late in life.

The average walking speed is 3 to 4 mph in adults. Younger people may walk 10 to 20% faster, and the elderly 20 to 30% slower. The subtleties of walking speeds are particularly important when setting pedestrian crossing times at cross walks and in similar situations.

Planners often use the 5-minute walk, ie 1,320 feet as a convenient template to measure easy accessibility, because research has shown that most people will not think twice about walking such a short distance. In fact, most people are prepared to walk much further, a finding that is substantiated by empirical research with average customer at shopping malls. Research has also shown that people will walk further to take a train (15 minutes or more) than a bus (10 minutes).

Of course, how much and how far people walk is a function of many things, not just distance: phys-

ical ability, the visual quality of the surrounding environment, the presence or absence of pedestrian infrastructure (sidewalks, crosswalks), the presence of other pedestrians, a sense of safety, the amount of traffic, and other factors.

Appropriately signalized and conveniently located crosswalks are critical for pedestrians. It is important to keep in mind that the wider the street, the more dangerous it is for pedestrians. The National Highway Traffic Safety Administration indicates that most pedestrians are killed on arterial roads, which are wider, have higher capacities and are designed for higher vehicular speed; only 1/3 of pedestrian deaths occur on smaller collector and local roads.

## **Design Guidelines for Pedestrian Facilities**

Sidewalk widths should be commensurate with the anticipated level of pedestrian traffic, and always wide enough to accommodate two baby strollers crossing in opposite direction. In lower density developments a 4-foot width may suffice, and that is the minimum sidewalk width stipulated by the RSIS for residential areas. (The RSIS indicates the types of residential streets for which sidewalks are required, on one or both sides). However, 5 to 6 feet is preferred, in particular considering that utility poles, pole mounted street signs and other vertical appurtenances create obstacles that reduce sidewalk width.

## **Measuring Walkability**

*There are a number of tools available to measure and rank “walkability”, that is, how pedestrian-friendly a place is.*

*Some of these tools are internet-based algorithms that rely on public domain GIS data. One such example is Walk Score, which scores a place on a scale from 0 to 100, ie from “car-dependent” (0 –24 points: almost all errands require a car) to “walkers paradise” (90 – 100 points: daily errands do not require a car). The Walk Score algorithm takes a particular address as the starting point, measures distances to a variety of amenities (shopping, etc) and attributes a score to that address based on the number of points computed. Nearby amenities (within ? mile) score higher than those further away. Anything over 1 mile is not considered. Unfortunately, Walk Score does not have sufficient data to take into account a number of key factors: whether there is pedestrian infrastructure (sidewalks, paths), major barriers (cul-de-sacs, heavy traffic arterials, and others). As such, it can provide a first approximation to walkability, but not an accurate representation on the actual conditions on the ground. (continued)*

*A more sophisticated, place-based application has been developed for King County (Washington State) by Sustainable Seattle. Called the Walkability Index it considers residential density, the number of street connections, and the mix of homes, stores, parks, and schools in a neighborhood. For each King County Census block group, a “walkability” index was derived as a function of net residential density, retail floor area ratio, land use mix, and intersection density. The measures were computed from parcel-based land use data, street centerline files and census data. Retail floor area was also used because access to retail uses has been found to stimulate pedestrian activity. The following algorithm was used:*

*Walkability = [(2 x z-intersection density) + (z-net residential density) + (z-retail floor area ratio) + (z-land use mix)]*

*Other tools to measure walkability are readily available. Municipalities are encouraged to use one of them, or devise their own, as a tool to assess their local conditions.*

Indeed 6 feet is required for two wheelchairs to cross. In commercial or mixed-use areas, sidewalks should have 8 to 10 feet in width, and in downtown or Main Street conditions they should be wider and capable of reasonably accommodating outdoor merchandise displays, sandwich board signs, outdoor cafes, street furniture, street trees, parking meters, landscaped beds and all the other items that take up sidewalk space.

In existing built places, where conditions are too tight to allow for these dimensions, consideration should be given to expanding sidewalk widths at the expense of the cartway (the paved area of the street, from curb to curb, or from edge of pavement), since these are often over-engineered.

Where cartways are already at a minimum (7-foot wide travel lanes) consideration should be given to creating a shared space condition by removing the curb, replacing the blacktop with pavers and eliminating any distinction between cartway and sidewalk.

At a minimum, a vertical clear space of 8 feet should be maintained above any sidewalk. Planting strips along the curb are optional and will vary depending upon the type of place, but should always be wide enough to sustain the type of plantings and street trees chosen.

Sidewalks are a critical element in the local circulation system and as such need to be maintained to remain functional. New Jersey municipalities should develop and adopt a sidewalk maintenance plan consistent with the applicable legislation and regulations: Americans with Disabilities Act (ADA), ADA Guidelines for Buildings and Facilities, the US Access Board’s 2005 Draft Public Rights-of-Way Accessibility Guidelines and the NJDOT

Sidewalks should be constructed and maintained to avoid vertical changes in excess of 1/4 inch or surface gaps over 1/2 inch. A 5% (1:20) longitudinal slope is often considered the maximum, along with a 2% (1:50) cross-slope.

It is also important to remember that although a place may have all the pedestrian infrastructure described above, people will not walk unless there is a reason to do so. Pedestrian trips – other than trips made for recreational purposes or purely for physical exercise – have a purpose and a destination. If there are no destinations within walking distance, people will not walk. So providing relevant destinations is key to stimulating walking. Similarly, the quality of the walking trip has been determined to play a role. People are more likely to walk if there is something to look at – interesting architecture, a beautiful park, display windows with retail merchandise, other people. Blank walls,

surface parking lots or boarded-up buildings do not constitute stimulating walking environments for the average person.

## **Bicycle Friendly Planning**

Bicycles were enormously popular in the US until the turn of the 20th century. There were many bicycle clubs that organized outings for bicyclists (“wheelmen”) of both sexes. Bicycles were used both for recreation and for mobility. After the introduction of the automobile, the popularity of bicycles plummeted. And until recently, bicycles in the US were generally viewed as vehicles kids rode until they were old enough to get their drivers licenses, and some adults rode on week-ends or on vacation for recreation. Serious bikers rode long distance on week-ends. In suburbia, recent emigrants could be found precariously riding bicycles along the narrow shoulders of fast moving arterials. And in some larger cities, daredevil courier bikers took their lives in their hands and shot in and out of traffic.

This paradigm is changing rapidly. Today, we have Wall Street brokers, physicians and power attorneys commuting to work by bike. A growing number of people ride their bike to work or for errands. In some communities, bikes have become fashionable and chic, and well-dressed women can be seen peddling around town, perhaps with a pet in their bicycle basket. Bike clubs have begun to sprout again and bike tourism is on the rise.

Worldwide, it is estimated that there are 1 billion bicycles, about twice as many as cars. It is the primary means of transportation for short trips in many parts of the world. About 19 million bicycles are purchased every year in the US.

### ***Pedestrian Audit***

*This questionnaire from the National Center for Bicycling and Walking is one of the tools communities can use to assess pedestrian conditions.*

- *Are sidewalks continuous along the entire route? if not, where are the gaps?*
- *Are the sidewalks in good repair, or are there broken sections that would impede travel when using a wheelchair, walker or baby stroller?*
- *Are there marked crosswalks and pedestrian signals to help people cross busy streets and intersections?*
- *Can slow-moving pedestrians get across the street in the time allotted by the signal?*
- *Do drivers yield to pedestrians at driveways and crosswalks?*
- *Are there utility poles, signs, vending machines, dumpsters, shrubbery, or overhead obstacles blocking the sidewalk?*
- *Are there trees along the street to provide shade and separation from traffic?*
- *Do the street, adjacent buildings, and landscaping provide a pleasant visual environment?*
- *Are there frequent benches or other places to sit and rest?*
- *Are storefronts attractive and inviting? Are the windows lit at night?*
- *Are there other people walking along the way?*
- *Was the walk enjoyable? Why or why not?*
- *Are there areas where you were concerned for your personal safety? Why? (This might capture concerns about street lighting if the audit is done a night.)*
- *Would you repeat this walking trip again? Why or why not?*

Bicycles are a very energy-efficient means of transportation. A cyclist riding at the average speed of between 10 and 15 mph uses the same amount of energy they would need if walking. At average speed, a cyclist can travel 2 to 2.5 miles in 10 minutes, and 2.5 to 3.75 miles in 15 minutes. That is 3 to 4 times faster than walking. For planning purposes, this extends the reach of non-motorized access to a particular destination by a factor of between 3 and 4.

While the number of bike trips is still a tiny percentage of all non-recreational trips, there is both a growing interest in bicycle friendly places and a growing constituency to advocate for them. Communities such as Boulder, Colorado; Portland, Oregon; and Santa Cruz and Berkeley, California have invested significantly in bicycle infrastructure and can point to tangible gains in the number of trips taken by bike. Many communities have created pedestrian and bicycle committees to act in an advisory capacity to local government, including planning boards.

Of course, bicycles will not be appropriate for short trips in all circumstances: bad weather, heavy loads, night time conditions and many other factors may discourage bicycle trips from occurring.

Like pedestrians, bikes do not require a completely separate circulation infrastructure in order to

become more widely used and accepted. Yes, it is nice when separate facilities can be provided; but in most cases, it is enough to create a better balance between motor vehicles, bikes and pedestrians, where bikes feel they belong, not just tolerated. In other words, a Complete Street approach.

Bicycle lanes are a portion of the roadway designated for preferential or exclusive bicycle use by way of striping, signage or pavement markings. Bikeway is a generic term that indicates that a street, road or path has been designated for bicycle travel, whether exclusively or shared with other vehicles and users. Shared-use paths are physically separated from motor vehicle traffic and can support walking, jogging, wheelchair users and in-line skating, in addition to bicycling. They typically have a 10-foot wide hard surface (asphalt, concrete or packed aggregate). Some shared use paths have resulted from “rails-to-trails” projects, that is the conversion of abandoned railroad rights-of-way. Shared-use paths can play an important role in better connecting origins and destinations, complementing the conventional circulation system that is shared with motor vehicles.

The RSIS stipulates that for residential neighborhoods separate bicycle paths and lanes shall be required only if they are specified in the adopted municipal master plan and/or official map.



### ***Biking in Portland***

*Portland, Oregon is perhaps the US city with the most aggressive and ambitious public effort to promote bicycling as a viable, everyday form of transportation. Bike trips have more than tripled since 1991, when the city began to focus public resources in support of bicycling. The current estimate is that 7% of all trips in the city are made by bike, which is unparalleled in North America. To achieve this, Portland, among other things, built 300 miles of bike paths, reportedly at a cost equal to 1 mile of urban freeway. But Portland's goal is to reach 25% of all trips by bike by 2030. For that, it plans to build another 600 miles of bike paths over the next 20 years.*

## Design Guidelines for Bicycle Facilities

Standard bike lanes are 4 to 6 feet wide. That is also the standard width for bicycle-compatible paved shoulders. Bike paths are usually 10 feet wide, although in high traffic areas they may need to be wider. The NJDOT Bicycle Compatible Planning and Design Guidelines recommend 11 to 14 feet in width, depending upon the Average Annual Daily Traffic (AADT) for shoulders with a bicycle lane and parking; and 4.5 foot wide free-standing bicycle lanes.

Bicycle-safe drainage grates at stormwater inlets are absolutely essential.

### **Bicycle Audit**

This questionnaire from the National Center for Bicycling and Walking is one of many tools that can be used to collect information on bicycle conditions.

- Are you able to find a comfortable route to your destination?
- Is secure bicycle parking available at your destination?
- Is there sufficient operating width along the route? (refer to standards on page 15.)
- Are alternate, quieter routes to your destination available?
- Is the roadway surface in good repair?
- Do traffic signals detect your presence?
- Are drivers friendly and tolerant toward bicyclists?
- Is there a place to clean up and change clothes at work or school?
- Did you enjoy your bicycling experience?  
Why or why not?

### *Biking in New Jersey*

*A recent survey of NJ bicyclists conducted by the Voorhees Transportation Center for the NJDOT provides insights into who bikes – and who doesn't – in the Garden State. Some highlights include:*

- *Nearly 80% of NJ residents age 18 and over have access to a bicycle for their use.*
- *More than 1/3 of respondents reported bicycling in the last 6 months.*
- *More men (46%) than women (27%) bike.*
- *Younger people are more likely to bike than older (65+) people.*
- *Whites are much more likely (41%) to bike than African Americans (24%)*
- *More affluent households bike much more than lower income households. In fact, the lower the income, the lower the likelihood of biking.*
- *More educated households bike more than less educated ones.*
- *Single-family housing dwellers bike are almost two times more likely to bike than apartment dwellers.*
- *Only 3% of school age children were reported biking to school.*

*The results of this survey are consistent with findings from Portland and elsewhere that suggest that the minority, inner-city populations that would benefit the most – both economically and in terms of public health -- from increased biking are the ones that are the least likely to engage in it. More affluent and more educated households are clearly more receptive to biking. Improving the quality of the bicycle-friendly infrastructure will increase the share of this population that bikes. But providing better bicycle-friendly facilities in minority neighborhoods will not by itself substantially increase bicycling. Making biking a socially-acceptable and desirable activity in these neighborhoods is a challenge that will require significant local leadership.*

*A second challenge this survey points to is the need to dramatically increase the levels of bicycling to school, which will require educating local elected officials, School Boards, parents and local police departments.*

- Would you repeat this bicycle trip again?  
Why or why not?

### **Berkeley's Bicycle Boulevards**

Bicycle boulevards are a concept that is gaining some traction. The city of Berkeley (California) has perhaps the most ambitious bicycle boulevard plan. The bicycle boulevard does not require creating new, dedicated rights-of-way, but rather modifying existing streets to give bicycles priority and to enhance the safety of convenience of bicyclists.

The 1999 Berkeley bicycle boulevard plan seeks to:

- Achieve low traffic volumes (or bike lanes where traffic volumes are medium);
- discourage non-local motor vehicle traffic;
- achieve free-flow travel for bikes by assigning the right-of-way to the bicycle boulevard at intersections wherever possible;
- control traffic to help bicycles cross major streets; and
- create a distinctive, easily recognizable look that conveys to cyclists that they are on a bike boulevard and signals to motorists that the street is a priority route for bicyclists.

The plan identified Berkeley's seven bicycle boulevards, using the following criteria:

- Local street or low-volume collector.

- Not a transit or truck route.
- Very little commercial frontage.
- Within 1/4 mile of a major street or a high-traffic collector street.
- Spaced between 1/4 and 1/2 miles from another bicycle boulevard, (approximately the traditional spacing of major streets).
- Reasonably continuous and extending across over half of the City.
- Few jogs with main segments at least 0.5 mile long.
- Traffic signals at major intersections, or where traffic signals are potentially feasible.
- Access to major destinations.
- Connections to routes in neighboring cities.

### **Transit**

There are a wide variety of transit modes operating around the world, travelling by air (airplanes and aerial trams), on water (ferries), on roads (buses, jitneys), and on rail (heavy rail, light rail, trolleys and subways).

In New Jersey, buses carry the most transit riders, followed by heavy rail and light rail. (The distinction between heavy rail and light rail is regulatory and does not reflect, as the name would suggest, a significant difference in weight). Bus Rapid Transit (BRT) -- a faster, more efficient type of bus transit -- has recently

started service on an experimental basis. The transit community views BRT as a step up from conventional bus and a promising, cheaper alternative to light rail.

Transit systems everywhere in the world receive public subsidies. Fare-box recovery -- the revenues from ticket sales to riders -- constitute a fraction of total capital and operating expenses even for the best managed and most heavily patronized transit systems. The funding mechanisms used to subsidize transit vary widely within the US and around the world. Most successful transit systems have dedicated sources of funding. Many have also capitalized on the higher real estate values that result from proximity to high volume transit stations, and capture a portion of this added value to supplement other sources of revenue. NJT is the nation's largest transit system without a dedicated source of funding. NJT receives funding from the federal government, the State's Transportation Trust Fund and general fund appropriations. To be viable, even with public subsidies, transit systems require some level of fare-box recovery, which in turn requires certain ridership levels. Ridership increases with average density. As a rule of thumb, bus requires a minimum of 6 – 8 dwelling units/acre and light rail a minimum of 15 – 20 dwelling units/acre. New

heavy rail systems require considerably higher densities.

## Transit-Friendly Planning

Transit-friendly planning seeks to marry the land use system with transit options such that they are mutually reinforcing – providing increased levels of ridership for transit and increased value and convenience for the residents and employers located therein.

The transit-friendly planning literature sometimes distinguishes between transit-oriented development (TOD) and transit-supportive development (TSD).

- TOD is the type of higher density, mixed-use development that measurably increases transit ridership. It is transit-oriented by design, and the planners need to carefully understand the types of real estate markets and consumers (residential and others) that will be attracted by the proximity to the types of service offered by that particular transit provider at that particular location. This is critical, because not every transit opportunity is identical. In general, TOD consists of housing, with other supportive uses such as retail and services, and employment centers that reach a certain critical mass, including institutions such as hospitals, colleges and universities.



*Rain gardens, bio-swales, pervious pavements and other green technologies improve water quality outcomes in surface parking lots and create nicer places.*

- TSD, on the other hand, is the type of development that may support transit, but is not necessarily functionally and physically related to it. For this type of development, transit may be an incidental amenity, but not a strategic one with respect to their location. There are many documented examples of uses located in or very near station areas that have little synergy with the transit facility. Nevertheless, these uses do not preclude transit riders, and so should be distinguished from transit-negating uses, which not only do not contribute riders to the transit system, but – as a result of their location and physical attributes -- actively prevent potential riders from boarding. The Princeton Junction rail station on NJT's Northeast Corridor line provides a perfect example: a West Windsor/Plainsboro school bus depot, an electrical sub-station and a leaf composting facility all occupy considerable land within close walking distance to the 3d highest passenger train station in NJ. Clearly these uses are not only not contributing riders, they are

by their very location discouraging riders. The land use decisions that resulted in this particular land use pattern do not reflect a recognition of the value added by the proximity to high capacity transit.

## Transit-Oriented Development (TOD)

Transit-oriented development (TOD) generally refers to mixed-use, higher-density, pedestrian friendly areas that are functionally and physically oriented to public transportation. TODs emulate the 19th and early 20th century trolley and rail communities, some of which were built by the transit provider as speculative real estate investments. (Examples of historic TOD's in New Jersey include Dunellen and Fanwood, on NJT's Raritan Valley line).

Most documented TOD activity in the US has centered around rail facilities, whether heavy rail or light rail. However, there is growing interest in Bus Rapid Transit (BRT)-oriented TODs.

There are many benefits associated with TOD including social, economic, and environmental ones. TODs reduce local reliance on automobiles by providing alternative options for trips: transit, walking and biking. This reduces pollution, and can also help alleviate traffic and congestion problems by reducing the amount of automobiles on the road.

By improving access to transit and enhanced mobility to its users, TODs increase the ridership and the revenues associated with them. People within a 1/4 mile of a transit station are twice as likely not to own a car, compared to the average US household; they are 5-6 times (and in some places, up to 11 times) more likely to commute by transit than those who are further away; and they generate 50% less vehicular trips. Ready access to transit gives residents the option to not own a car, making the housing options they provide more affordable.

Increased pedestrian traffic attracts more activity for local businesses, improving the local economy and tax revenue for municipalities. With a mix-of-uses that generates activity throughout the day and evening, these neighborhoods feel safer and more secure. Developers and investors recognize the benefits and value of TODs and as a result bring investment to an area and revitalize old neighborhoods making them more livable and a greater asset to the community as a whole. The higher densities, mixed-use and transit rich environments provided by TODs are not for everyone. TOD residents are self-selected, meaning they deliberately chose to be there. Typical TOD residents include both younger and older households, and tend to be smaller

and have fewer school-age children than the average household. TOD residents also have fewer cars, drive less and use far more transit than the average household.

TODs also increasingly attract employers, particularly in the more, creative, dynamic and innovative sectors of the economy. A recent survey indicates that access to transit is very important to 70% of new economy companies.

While TODs perform better than non-TODs with respect to a wide range of transportation indicators (VMT, rates of auto ownership, affordability, etc), they do not all perform equally. Understanding how a TOD performs is helpful in establishing appropriate policies for the future. The Center for Transit Oriented Development has developed a TOD typology using household VMT and land use mix (residential / employment). The TOD typology distinguishes 15 TOD types. The typology builds on a predictive model developed by the Center for Neighborhood Technology that simulates household travel behavior and estimates VMT for households living in different TOD station area types. The model uses neighborhood level (Census block group) data to explore the relationship between three dependent variables (auto ownership, auto use and transit use) and

nine independent variables (household income, household size, commuters per household, journey to work time, household density, block size, transit access and job access.

## **Traffic Calming**

Traffic calming is an approach to the geometric design of the circulation system that recognizes that higher motor vehicle speed is not always desirable and, indeed, is inappropriate in many circumstances. Conventional school traffic engineering supersized street pavement widths and used inappropriately high design speeds even in local neighborhoods, thereby encouraging drivers to circulate at higher speeds. Traffic calming seeks to accomplish the reverse -- encourage drivers to slow down and use greater caution -- by providing them with visual queues and physical constraints. Traffic calming has been largely accepted by the traffic engineering community, including the FHWA and all the mainstream professional organizations and has become part of the standard traffic engineering toolbox.

The standard traffic calming toolbox includes the following devices:

- Speed hump – a raised portion of the roadway with a parabolic cross-section.
- Speed table – a raised horizontal section of

the street, often treated with a textured pavement and/or a different color, usually located at intersections or areas with heavy pedestrian traffic.

- Raised crosswalk – similar to a street table but limited to the pedestrian crosswalk.
- Bulbout – a portion of the sidewalk that widens towards the cartway, often equivalent to the width of a parking lane and usually located at intersections. Bulbouts are often used in association with raised crosswalks.
- Neckdown – a portion of the cartway that has been deliberately narrowed, often located along a Main Street or at the approach to a busy pedestrian intersection. It is often used with a bulbout.
- Median strip – a planted, often curbed section separating two lanes of vehicular traffic and used to narrow an existing cartway.
- Roundabout – a circular or elliptical intersection control device where the vehicles moving in the roundabout have the right-of-way over approaching vehicles.

Traffic calming is not appropriate everywhere and should not be used for the wrong reasons. It should not be used to try to replicate the cul-de-sac system in an integrated street network, by closing down certain streets just because the residents would like less traffic. Everyone would like less traffic in their neighborhood, but the key is dispersion, not limiting travel options. Traffic calming is also not appropriate in areas with high volumes of traffic and higher speeds. The intention is not to create driver frustration but to re-establish a better balance between motor vehicles and other modes. NJDOT is not likely to consider traffic calming features for streets with a posted speed limit of 40 MPH or above.

### *TODs in New Jersey*

*Rail transit in NJ has attracted a number of widely publicized TOD redevelopment projects in communities such as South Orange, Morristown, Rahway and Metuchen. In all of these cases, traditional downtowns were revitalized with new redevelopment projects that replaced obsolete uses with new, transit-oriented ones.*

*In NJ, the catalytic effects of new transit service on land use are best observed along the Hudson-Bergen Light Rail Line (HBLRT), which has sparked considerable TOD redevelopment around station areas. A recent study by the Voorhees Transportation Center indicates that between the year 2000, when it opened, and 2008 over 10,000 housing units, with an estimated sales value in excess of \$5 billion, had been built or were under construction. This redevelopment activity reflects both the proximity to the powerful Manhattan market and the willingness of local communities to capitalize on transit by permitting higher density development.*

*NJT's RiverLine, which runs between Camden and Trenton, while exceeding ridership expectations, has so far had only a modest impact on redevelopment activity, in large measure because the municipalities along the line have not created appropriately supportive land use frameworks and have not rezoned station areas for higher densities and appropriate uses.*

*There are also a number of well-publicized examples in NJ of privately proposed TODs that have failed to obtain entitlement, due to local resistance to new development. There is skepticism at the local level regarding the demographic impacts these projects will have, in particular with respect to the number of public school-age children. Although the empirical studies are conclusive they have so far not been persuasive to local officials focused on burgeoning public school budgets.*

“Skinny streets” is a related concept that has become increasingly popular in the Pacific Northwest. The skinny streets movement advocates street “diets” wherever appropriate, that is to say a reduction in cartway width. In some cases, cartways are just wide enough for two vehicles moving in the opposite direction to cross at slow speed. In other cases, it is not wide enough for two vehicles to cross, thereby requiring one to pull into an available parking space or on to the shoulder to let the other vehicle by. Skinny streets are mostly applied in residential neighborhoods with relatively low volumes of traffic (less than 5,000 AADT) and residential densities below 15 units/acre.

### **Shared space**

The concept of “shared space” is a different way of viewing and managing the public right-of-way. It is gaining popularity in Europe and elsewhere, although it has so far met with limited success in the US. It has similarities with the complete streets concept described previously. Shared space proposes that pedestrians, bicycles and motor vehicles can co-exist and share a right-of-way and that this type of arrangement is actually safer than creating dedicated rights-of-way for different modes as we mostly do today, with sidewalks for pedestrians, bike paths for bicycles and curbed streets for motor

vehicles. The basic idea is that motor vehicles will move more slowly and generally behave with greater respect towards vulnerable pedestrians and others if they do not have a dedicated right-of-way. Shared space advocates also question the need for, and efficacy of, the complex array of visual cues favored by conventional traffic engineering, in the form of pavement striping, dedicated infrastructure and multiple vertical signs that, in their opinion, unnecessarily clutter the streetscape, disfigure places and overburden motorists, pedestrians and other users with needless information and overly prescriptive rules. Pilot projects and experimental shared space interventions in the UK and in several European countries have shown promising results.

### **Green Streets**

Green streets represent a relatively new approach to street design that combine traffic calming and skinny street features with sustainable landscape and stormwater management practices. In a green street, the paved cartway is reduced to a minimum in order to both calm traffic and reduce impervious surface. Excess pavement is removed and converted to planting areas. The pedestrian realm is designed to include landscaped beds planted with hardy native species that capture stormwater, replen-

ish the water table and reduce stormwater runoff. Porous pavement is used in areas with low volumes of vehicular and pedestrian traffic. Green streets provide an enhanced pedestrian experience, increase property values, reduce stormwater run-off and function as small-scale but potentially pervasive urban carbon sinks.

Both New York City and Portland, Oregon have highly competitive and acclaimed Green Streets programs. Neighborhoods have to actively compete for public funds to remove blacktop and create rain gardens.

### **Motor Vehicle Parking**

Parking can be one of the most contentious aspects of circulation planning and indeed of any type of local planning. Dramatically insufficient parking can be detrimental to a community’s economy and quality of life, but so can excess parking. Striking the appropriate balance is not easy, and may require constant course adjustments as people’s driving habits change or changes in the economic cycle influence people’s driving behavior.

In many parts of NJ parking is ample and provided free of charge, and the cost of building (\$5,000 per surface space) and maintaining it (\$400 per space/year) are either borne by the developer, the property owner, the tenant or the

municipality. These costs are not negligible and are passed on to the users and consumers in the form of higher taxes and higher rents. The true costs of the environmental impacts of parking – such as urban heat island effect, increased stormwater run-off, water quality degradation and others – are also borne by the community. These externalities are rarely quantified but are certainly not insignificant.

The prevailing system of requiring each individual use to provide its own parking is extraordinarily inefficient and extravagantly expensive. It creates a parking infrastructure that is poorly utilized and highly redundant. Parking is a supportive use, yet it consumes vast amounts of land. Structured parking, which is far more efficient in terms of land consumption, is very expensive (\$20,000 to \$25,000 a space) and not financially justifiable in many situations. Underground parking is even more expensive, and not always feasible.

If a community views parking as public infrastructure, than it should assume a leadership role in providing it, similar to water and sewer. This approach is especially suited for downtown and mixed-use center conditions. The community should develop a centralized parking strategy and provide parking in large blocks

shared by multiple users. The parking can be public or private. The important thing is that it is shared. Developers of individual sites can be assessed a reasonable contribution in lieu of providing their required parking on site. These contributions can then be used to build, manage and operate the centralized parking facilities.

### **Parking Standards**

A parking space may vary between 8.5 x 16 feet for compact cars to 10 x 20 feet for a generic vehicle. Most practitioners use a 9 x 18 foot module for surface parking, and a slightly smaller module for parking decks. Standard curb-side parking is 7 feet wide. Each parking space in a typical lot consumes 270 square feet, including its portion of the aisle.

Parking needs are typically calculated based on the anticipated demand generated by each individual land uses. National studies (conducted for the Institute of Transportation Engineers and published in *Parking Generation*) compiled information from large samples and quantified average parking requirements for different types of land use, ie 3.5 spaces per 1,000 square feet of gross floor area for generic office space in buildings under 25,000 square feet.

Clearly, parking demand factors based on national samples that do not distinguish between

different land use conditions or the availability of transit are problematic and may vastly over-estimate (and in some cases, under-estimate) the actual need for parking. Parking professionals quickly recognized the need to adjust these generic parking rates to better match local conditions. The industry-recommended parking ratios have also changed over time, reflecting changes in the economy, life-style and other changes.

Unfortunately, most local parking ordinances in NJ are still based on ITE's deeply flawed national numbers, leaving developers to comply or ask for variances and often resulting in wasted investment and over supply. Many municipal officials seem deeply skeptical of new data and prefer to rely on the national studies. Few NJ municipalities take the trouble to adjust local parking requirements to actual conditions, or to keep them up-to-date with industry norms.

There are however reliable, empirically-based parking studies – both nationally, and for NJ -- developed for specific land use conditions, such as estimating actual parking demand in transit-oriented development. These studies indicate dramatically lower parking demand – up to 50% less than if calculated using ITE parking generation numbers, which simply mirrors the fact that these households have dramatically lower auto-ownership rates. NJ municipalities looking to

enact enlightened parking policies are encouraged to draw from this body of knowledge and apply it locally.

## Shared Parking

Parking specialists agree that shared parking is by far the most efficient way to provide a service that should be viewed as part of a community's infrastructure. Because different land uses have different demand cycles and schedules for when parking is needed, a shared parking approach maximizes the parking investment by more efficiently using the number of available spaces. Shared parking approaches were first developed for shopping centers and have now been extended to mixed-use projects and many downtown locations. While they may present certain management challenges in distinguishing between dedicated private parking (for example, for the residential component) and public parking (for retail or entertainment) in a single parking facility, these management issues are well understood and can be competently addressed.

Conventional parking calculations are cumulative. Each use generates a given demand, based on a multiplier. Total parking demand is seen as the sum of the demand from the individual uses. Shared parking approaches then apply reduction factors, based on the different peak demand times for the different uses. For exam-

ple, peak demand for housing is at night, but for offices it is during the week-day. Other uses, like churches, have peak demands on week-ends. By calibrating different peak demands, shared parking makes each parking space serve multiple uses and work much more efficiently.

Depending upon the actual circumstances, the reduction factor may reach 1/3.

If a community views parking as public infrastructure, then it should assume a leadership role in providing it, similar to water and sewer. This approach is especially suited for downtown and mixed-use center conditions. The community should develop a centralized parking strategy and provide parking in large blocs shared by multiple users. The parking can be public or private. The important thing is that it is shared. Developers of individual sites can be assessed a reasonable contribution in lieu of providing their required parking on site. These contributions can then be used to build, manage and operate the centralized parking facilities.

## Parking Strategies in New Jersey

Some NJ municipalities have become leaders in parking, with sophisticated and innovative parking strategies. In addition to providing centralized parking, some communities have

implemented car-sharing and other programs designed to reduce the need to own a car and therefore reduce the need for parking.

- Jersey City has arguably the lowest parking requirements in the state. Existing buildings that are rehabbed have no parking requirements and most uses in the downtown areas have parking requirements which are only a small fraction (75% less) of the comparable suburban requirement. This allows Jersey City to achieve considerable density on small footprints, have a lively street life and fully exploit its transit infrastructure.
- The City of Hoboken similarly has much lower than average parking requirements, and a provision allowing parking to be provided off-site, in municipal or private parking decks. It has also pioneered an innovative parking permit cash-out program, coupled with a bold car-sharing initiative (“corner cars”) and a community shuttle (“the Hop”). Hoboken residents that surrender their curbside parking permits receive a package of financial incentives and products, including a free bicycle helmet, discounts on the corner car program and others valued at over \$500. Corner cars are rentals parked in reserved on-street spaces conveniently located around the city. Members reserve a car on-line or over the phone for 1 hour or a whole week. The

local shuttle bus (the Hop) circulates within 2 blocks of every resident. The combination of scarce and expensive parking, convenient transit and easy car rental is a very sophisticated policy designed to encourage Hoboken residents to shift to other modes of transportation.

- The Montclair Parking Authority has developed an aggressive downtown and commuter parking policy. The Authority manages a substantial number of parking spaces in parking decks and on-street.
- Metuchen allows developers in the downtown area to lease parking permits from the Metuchen Parking Authority, in lieu of providing them on-site.
- Other municipalities have adopted similar policies, whereby new development is exempt from providing on-site parking if it can demonstrate that parking can be provided within a reasonable walking distance from the site.

In general, cities with parking authorities, parking commissions or parking utilities have more sophisticated parking policies, with an emphasis on the downtown areas. The NJ Parking Institute is the industry group that represents these organizations.

## **Green Parking Strategies**

“Green” parking refers to a set of strategies that seek to mitigate and improve the environmental performance of both surface parking lots and structured parking, by minimizing the amount of impervious surfaces, mitigating heat islands, including water quality measures, increasing vegetation, and encouraging green transportation and renewable energy sources. Many cities, including Philadelphia, have adopted green parking strategies.

## **Bicycle Parking**

While every municipality in NJ has comprehensive parking requirements for motor vehicles, few have bicycle parking requirements. By default, and in the absence of adequate bicycle parking facilities, bicyclists must resort to chaining their bikes to trees, lamp posts, benches, railings or other appurtenances. Adequate and appropriate bicycle parking is an important pre-requisite to further encouraging widespread bicycle use. And while the literature on bicycle parking is not nearly as extensive as that for vehicular parking, there is a growing set of examples and models from around the country that interested NJ communities can draw from.

Bicycle parking standards are considerably simpler than those for cars. For example,

Cambridge, Massachusetts requires 0.5 bicycle parking spaces or lockers for every multi-family dwelling unit. For all other uses the requirement is 1 bicycle space for every 10 automobile parking spaces. It is important to note however there is a danger in defining bicycle parking as a ratio of car parking, since in higher density areas car parking may be deliberately restricted.

Communities considering a bicycle parking ordinance must carefully consider the types of users likely to need the bicycle parking and adjust their standards accordingly. Uses such as libraries, educational institutions and other civic buildings that are likely to attract large numbers of bicycle patrons should have a more generous supply of bicycle parking. Indeed, providing ample bicycle parking but scant car parking is a public statement of priorities and a clear indication to patrons of the institution’s values.

Cambridge also requires that each bicycle parking space dedicate a 6 feet by two feet footprint, and consist of a stable frame permanently anchored to a foundation so the bicycle can be secured and will not tip over. If car parking is provided in a parking deck, bicycle parking must also be included. And bicycle parking

must be located near the entrance of the building and be secure.

Like car parking, there are a number of considerations affecting bicycle parking. Key is the amount of time the bike is expected to stay parked. At locations such as transit stations, employment centers and housing, where bikes may remain parked all day, overnight or for longer periods of time, covered storage areas or bike lockers are preferable. Bike parking at restaurants, libraries or stores is likely to be more short term and should be located in close proximity to the building entrance.

The bicycle parking ordinance proposed in Montclair distinguishes between “class 1” bicycle parking (lockers) and “class 2” (stands and racks) and would require both: 10 to 20% in lockers, and the rest in stands, depending upon the specific land use. All land use types, with the exception of single-family or two-family residential, would have a bicycle parking obligation. The number of parking spaces is defined as a base (ie 2 spaces) plus a given percentage (ie 35%) of that use’s vehicular parking requirement.

## Scenic Roads and Byways

The NJDOT Scenic Roads and Byways program recognizes segments of the state highway system, and the corridors they run through, that are considered outstanding in terms of their scenic, natural, recreational, cultural, historic or archaeological character. The corridors must be deemed to have a unifying theme, as opposed to a series of perhaps interesting, but disparate, features.

NJDOT requires a sponsor – a local, state or federal government agency, or a private party -- to apply for designation under this program. The sponsor must convene all the interested parties and submit an application. If approved, they then have five years to prepare a Scenic Byways Corridor Management Plan.

### *Examples of green parking strategies include:*

- *Porous pavements on cartways and parking areas*
- *Solar arrays above parking areas*
- *Bio-retention in surface parking areas and green roofs on parking structures*
- *Premium parking for car sharing programs*
- *Bicycle parking*
- *Electric car charging stations*

Designation does not provide direct access to funding. Instead, NJDOT offers special signs, recognition, planning and marketing, and technical assistance. A state-designated scenic byway may apply for funding under the federal scenic byways program.

## Maintenance and Upkeep – Strategies and Best Management Practices

Municipalities are responsible for maintaining streets and other public rights-of-way in a state of good repair. Municipal engineering departments develop a long range maintenance and upkeep plan for local roads, and execute a portion of it every year according to funding availability and local priorities.

Some streets may require minor surface repairs; other may require complete repaving; while others still may require reconstruction, in which the bituminous surface is removed and a new foundation is rebuilt. If a street is reconstructed, it is standard good practice to combine these more structural interventions with other necessary maintenance activities, such as sidewalk reconstruction; water, stormwater or sanitary sewer replacement; street tree plantings, and so forth. There is no better time to fix

drainage issues or replace aging infrastructure than when a street is being rebuilt.

Municipalities are also responsible for caring for and maintaining the urban forest (street trees) planted in the public right-of-way, as well as other landscaping. A strategy adopted by some municipalities is to seek a patron or patrons to “adopt” a portion of a road and, either through direct contributions or in-kind services, assume responsibility for the maintenance, upkeep and beautification of the area. In downtown or mixed-use areas, this role might be assumed by a Business Improvement District, local employer or the local Chamber of Commerce. This strategy can also be applied to neighborhoods, where individual homeowners, civic groups or homeowner associations take responsibility for cleaning, planting and maintaining local landscaped areas, sometimes with the assistance of the public works department. This is a good way to reduce the public costs of maintenance and to give residents and users a direct stake in improving and looking after these facilities.

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*Eric Dumbaugh and Robert Rae – Safe Urban Form: Revisiting the Relationship Between Community Design and Traffic Safety.*

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*Reid Ewing et al – Growing Cooler: The Evidence on Urban Development and Climate Change. Urban Land Institute, 2008.*

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*Todd Litman – Evaluating Public Transportation Health Benefits. Victoria Transport Policy Institute, 2010.*

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*Transportation Research Board, TCRP Report 93 – Travel Matters: Mitigating Climate Change with Sustainable Surface Transportation. 2003.*

*Transportation Research Board, TCRP Report 128 – Effects of TOD on Housing, Parking, and Travel. 2008.*

*Transportation Research Board – NCHRP Report 616: Multimodal Level of Service Analysis for Urban Streets. 2008.*

*Transportation Research Board, TCRP Report 100 – Transit Capacity and Quality of Service Manual. 2003.*

## **Chapter Four: The Regional Context**

### **Working Within Regional Transportation Systems**

Transportation is both local and regional in nature. Rail lines, expressways and major arterials, regional bus lines and ferry services run through multiple municipalities and at times across state or national boundaries. For these public investments to function best, common approaches and strategies are often required, such that local land use policies and regional investments in transportation infrastructure are mutually reinforcing.

## Chapter Four: The Regional Context

**L**ocal conditions – whether pertaining to the economy, transportation, transit, infrastructure, travel demand or natural systems – are always part of larger patterns of sub-regional and regional systems. Decisions made locally, if not individually then certainly cumulatively, will influence how regional systems perform. These impacts on larger systems need to be taken into consideration when making responsible local land use and transportation policy decisions. In order to make positive impacts on a regional transportation system, one approach is to define the regional system in question, identify and mobilize the affected counties and municipalities, and coalesce these local governments around a set of regional goals, objectives and targets to enhance and optimize the regional system. Land use and transportation policy decisions should be made accordingly and planning should always keep regional networks in mind.

An easy to grasp application of this approach involves regional rail. For the considerable public investment (capital and operating) dedicated to a regional rail line, it is critical to maximize ridership. Perhaps the best way to achieve greater ridership is to support transit-

oriented development in appropriate locations. Yet many municipalities resist higher densities around train stations, for fear of additional school age children or other parochial considerations. As a result, increased ridership and the benefits of the public investment are not appropriately maximized. While some municipalities along that rail line might be supportive and willing to put the appropriate zoning in place, they may not benefit from increased levels of service which may only be feasible if all municipalities cooperate and coordinate.

New Jersey's transportation agencies have sought to educate local officials on the rationale behind certain transportation proposals involving their communities, and to engage them in the decision-making process. This approach has had limited success.

Access to regional transportation systems, particularly high capacity roads, can be a double-edge sword: it provides the local population with easy access to the regional network, but it also provides easy access for others into the municipality, which can mean significant amounts of outside traffic. This is a necessary cost for communities hosting regional shopping centers, large concentrations of office parks, regional hospitals, regional entertainment facil-

ities and others that seek to locate in places with high levels of regional accessibility. Regional transit facilities do not create these types of issues.

### **Regional Transportation Facilities and Local Circulation Planning**

Any municipality that either hosts a regional transportation facility, is traversed by one or is near one should consider its impacts when developing a local circulation plan.

Proximity to large volume expressways, limited access highways or even state highways has long been reflected in local planning, which recognizes that increased accessibility translates into increased real estate value. Local plans typically zone land around highway interchanges (in the case of limited access highways) or along the highway frontage for a variety of commercial uses, such as warehouse and distribution centers along NJ Turnpike exits, regional shopping malls, large employment centers and so forth. Sadly, the same principle has not systematically been applied at the local level to areas around rail stations or along express bus corridors.

Both the local circulation plan element, and the land use plan element should acknowledge and recognize the presence of these facilities, understand how they work, identify any problems or un-realized potentials and develop strategies to make them work better. It is recommended that this be done in partnership with the entities with jurisdiction over these facilities, such as NJDOT, NJ Transit, the NJ Turnpike Authority, or others, including counties with respect to county highways.

Understanding how these facilities function locally involves data collection and analysis. The entities that manage these regional transportation facilities usually have relatively good data on traffic volumes, ridership numbers, travel patterns, etc. It is critical that the local circulation plan contain an analysis of how these facilities function, what the local impacts are and what can be done to mitigate possible shortcomings and improve their performance.

For example, local circulation can have a significant impact on access to a regional facility, whether it is a rail station or a highway interchange. Regional transportation facilities attract users from throughout the region, not just local users. As a result, there are always trade-offs between unfettered access to it and local

### *Transit Corridors*

*The Center for Transit Oriented Development has developed a typology of transit corridors that may help municipalities better understand their current, and potentially future role, within a regional transit system. The Center distinguishes between three types of transit corridors:*

- *Destination Corridor – A corridor with multiple, diversified activity centers, where transit provides opportunities for short haul commuting between major and minor hubs. Ridership is more level throughout the day and peak loads less extreme.*
- *Commuter Corridor – A corridor with one major activity center and numerous predominantly residential areas. These corridors tend to have heavy peak flows and lower ridership during off-peak times.*
- *District Circulator – A transit system that facilitates movement within a downtown or a commercial, medical or educational center and provides access to one or both of the other corridor types.*

*In practice, corridors may assume more than one function and therefore include aspects of more than one of these three prototypes. The Northeast Corridor in New Jersey exhibits some features of a destination corridor with Trenton, New Brunswick and Newark constituting intermediate destinations, primarily (although not exclusively) as employment centers; and some features of the commuter corridor, with Manhattan as the prime destination. The Newark subway is perhaps a possible candidate for the role of district circulator.*

*Understanding the role which a particular municipality or station area plays in terms of these corridors, and their function as part of the larger regional transit system, can be helpful to strategic thinking about enhanced roles that may be available and viable in the future. This can help clarify the most appropriate set of local land use strategies – defining, for example, the preferred types of uses and their mix -- that can best leverage the transit advantage and benefit both the local community and the region.]*

concerns about traffic, congestion, parking and so forth. These issues should be worked out with the regional transportation entities, the users and the local community, and should be addressed in the local circulation plan.

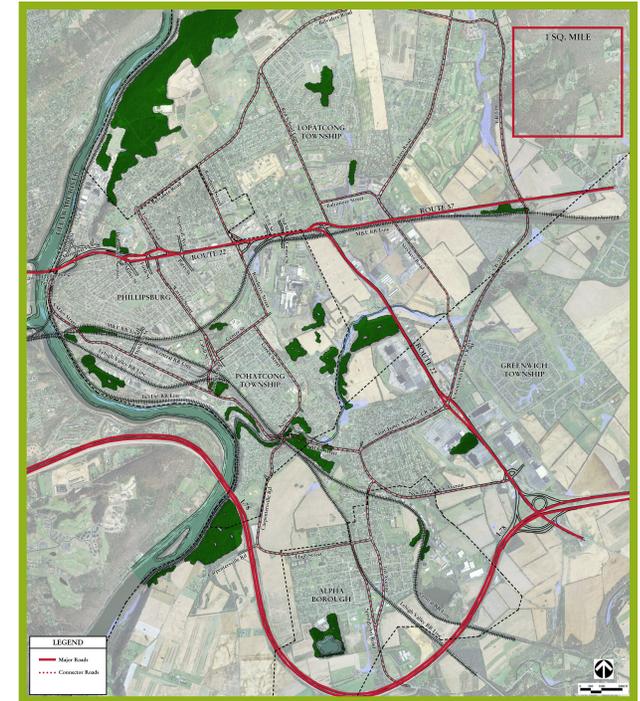
While regional transportation facilities have a regional, and therefore greater-than-local importance, their interests should not be allowed to completely over-ride local concerns. Communities that host regional transportation facilities frequently complain that they must deal with the negative externalities (added traffic, air pollution, etc) generated by these facilities, with little to show in terms of benefits. These frustrations are not without a basis, and there are unfortunately many examples where bad decisions have been made in the name of the regional facility and at the expense of the local community. The local circulation planning process should seek to find smart and effective solutions to mitigate existing problems and to capture the un-realized potential of these facilities. This may involve land use changes, changes to the local circulation system, changes in parking management strategies, or others, depending upon the circumstances. Local communities also sometimes try to restrict access to these facilities, particularly transit, usually by limiting access to parking. The idea is to

discourage out-of-town users from using these facilities, and thereby minimize local traffic and give local residents a competitive advantage. This undermines the overall performance of the regional system, and therefore ultimately is not in the best interest of the local community. Regional transit needs all the riders it can get, so restricting access to potential out-of-town riders is ultimately self-defeating, as it will prevent the transit agency from improving service. Better ways to address the externalities associated with out-of-town users that do not involve restricting access can be found.

### Through Traffic and Local Traffic

One important aspect in assessing the local impacts of regional highways and major arterials lies in determining the distribution between local traffic and regional (or through) traffic, that is, the extent to which the traffic generated by these facilities is local or regional. There is often considerable confusion surrounding this issue, with local communities convinced that much of the traffic is not local.

The reality is that much of the traffic on regional highway or major arterials is often local, because these facilities provide convenient connections and may offer a higher level of convenience and service than local streets,



*This map highlights the highway and major arterial circulation system for a 5-town section of Warren County traversed by Route 22. The limited number of major arterials, the absence of local connectors and the dispersed land use pattern concentrates traffic in a few failing intersections.*

even for relatively short, local trips. If too many local trips find their way onto the regional network, they create congestion and undermine the level of service for longer trips. The appropriate solution – rather than seeking to widen the regional highway or major arterial – may be to provide more direct local connecting streets, that will provide viable alternatives for local trips. As discussed in the previous chapter, a greater connectivity in local street networks can make local collector streets

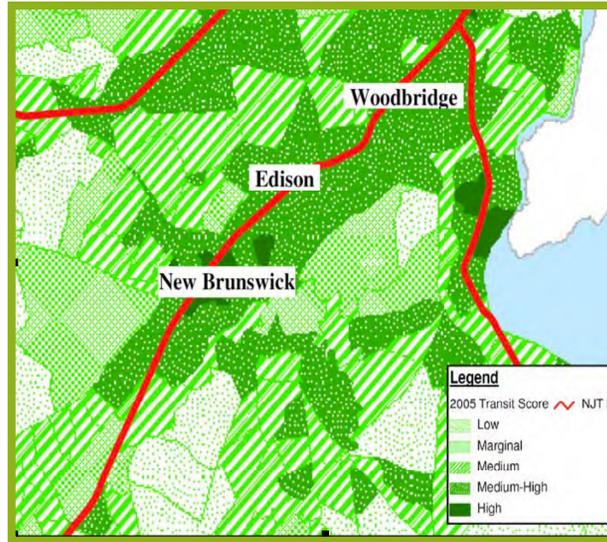
attractive alternatives to regional highways or major arterials for medium-distance trips, thereby reducing the pressure on the regional facilities.

When these questions come up, a simple origin-destination (O/D) survey, conducted by the entity with jurisdiction over the highway, will clarify who exactly is using the road and for what purpose. This information will then inform any subsequent decision-making on the subject. An analysis of the local circulation network will identify missing links or deficient links that may be causing drivers to use the regional network for local trips.

### The Transit Score – a Tool for Evaluating the Impacts on Transit of Local Land Use Decisions

The “Transit Score” is a tool developed by NJ Transit that allows county and municipal planners to do an “order-of-magnitude” screening of the viability of different transit service options.

Areas with a higher Transit Score can potentially support a greater range of transit services,



*This map of a section of the North East Corridor illustrates the transit scores of the communities in the corridor. Higher density areas score higher while communities with less density score lower.*

from commuter rail to various types of bus services. Conversely, areas with a lower Transit Score are likely to find it difficult to justify frequent transit service.

It is important to point out that the Transit Score measures the potential for various types of transit service in a given area. It assesses the characteristics of a place to see if they are likely to encourage transit usage. It is not a measure of whether or not transit service will be provided.

The Transit Score is a numerical index based on the composite average of three factors that influence the potential for transit ridership,

both existing and projected. A Transit Score is estimated for each of the 1,950 Census Tracts in New Jersey. This provides a common statewide unit of geography to estimate and compare the Transit Score. Transit Scores are based on the most recent Census data, forecasts based on MPO projections, and future zoning yields to calculate the “planned” score for each of three factors:

1. Population Density
2. Employment Density
3. Zero Car Household Density

### The Transit Score equation is as follows:

$$\text{Transit score} = [0.41 * (\text{Population/acre})] + [0.09 * (\text{Jobs/acre})] + [0.74 * (\text{Zero car households/acre})]$$

There are three types of Transit Scores: (1) based on existing conditions; (2) based on regional population and employment projections; and (3) based on a municipality’s future land use plan and the residential and employment densities it permits. This last one is called the “planned” Transit Score. If a community is making land use decisions that will increase

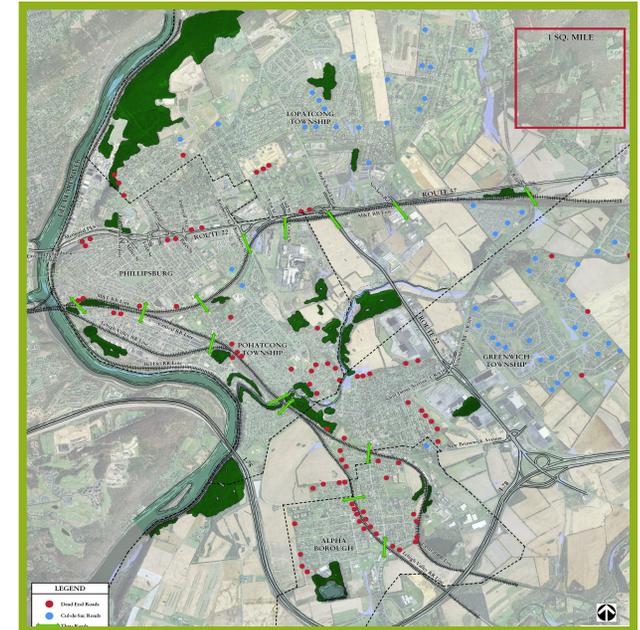
densities in appropriate locations and increase support for multimodal circulation, and thus enhance the viability of transit, the transit score will increase. If a community is not making these decisions the transit score will remain unchanged or go down.

All transit scores are classified into one of five categories. These five categories represent ranges based on observed land use characteristics and actual transit service patterns.

- Low (0 to 0.6) – Represents 15% of New Jersey's population and 15% of the state's employment base on 72% of the state's land area.
- Marginal (0.6 to 1.0) – Represents 6.5 % of the population and 9.5% of the employment on 7% of the land area.
- Medium (1.0 to 2.5) – Represents 24% of the population and 29% of the employment on 12.5% of the land area.
- Medium-High (2.5 to 7.5) – Represents 31% of the population and 29.5% of the employment on 7% of the land area.
- High >7.5 – Represents 23.5% of the population and 17% of the employment on 1.5% of the land area.

The Transit Score indicates the relative likelihood and potential for different types of transit usage in a given geographic area. Higher score areas can accommodate a greater range of types (modes) of transit service. The Transit Score is used to identify where the following three different types of transit investments may be appropriate, subject to available resources, provided certain criteria and conditions are met:

- **Fixed Guideway Transit (rail and light rail)** - New transit lines, extensions of existing lines, and the potential reactivation of historic stations along existing lines where service plans allow. Fixed guideway transit requires significant capital investment, and must meet certain minimum criteria, primarily related to having at least part of the line/service in an area with a "HIGH" Transit Score and a minimum number of jobs in a dense, mixed-use center.
- **Bus Service Potential** – Types of bus service, with a range of minimum span of service throughout the day and average daily frequency of bus service.



*This map for the same 5-town section of Warren County highlights the number of dead-ends -- discontinuities in the local circulation system: cul-de-sacs (blue dots) and physical barriers, such as railroads or canals (red dots). This is an indicator of a circulation system with severe lack of connectivity.*

- **Intermodal/Access to Transit** - Transit services providing access to other forms of transit and facilitating intermodal or multimodal service. Based on the Transit Score, peak period ridership, and other factors, minimum guidelines are outlined for park rides, shuttle buses and other intermodal facilities such as parking structures and terminals.

Municipalities should examine nearby and adjacent towns to understand the existing transit network (see above). Part of the use of the Transit Score is to examine how a municipality can better leverage or integrate with the existing rail, light rail and bus system.

Because the Transit Score connects land use information to transit service feasibility, it is useful for scenario planning exercises. For this reason, the Office of Smart Growth has included the Transit Score as one of the tools that municipalities should consider using when they seek Plan Endorsement from the State Planning Commission.

#### *Additional Reading*

*A Guide to the Transit Score –  
PlanSmart NJ, 2011*

*Creating a Regional Transit Score  
Protocol – DVRPC, 2007*

*Transit Corridors and TODs: Connecting  
the Dots – Center for Transit Oriented  
Development, 2010*

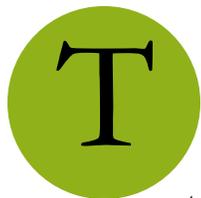
*Smart Growth Transportation Guidelines –  
ITE 2003*

*Smart Transportation Guidebook –  
NJDOT /PennDot 2008*

## **Chapter Five: The Sustainable Circulation Planning Process**

This chapter describes the steps in the process leading to development and adoption of a comprehensive, multi-modal, sustainable circulation plan element for a municipal master plan.

## Chapter Five: The Sustainable Circulation Planning Process



The circulation plan element is a local transportation plan that becomes a part – an element – of the local master plan. In current planning practice, the term “circulation” is used

because of the conventional focus on the circulation of motor vehicles on a network of roads. Non-motorized vehicles can also be said to circulate along streets or bike paths; pedestrians along sidewalks and trails; and passenger rail transit on tracks.

The term “element” reflects that the document, which could be considered a plan in itself, is a sub-section of the overall master plan. Municipalities are not required by law to have a circulation plan element. But many municipalities would benefit from having one, because it gives them a place to specify how land development and redevelopment should be coordinated with the transportation and circulation systems needed to support it.

It has always been the intent of the MLUL that the various elements of the master plan be integrated with the land use element, however this has not often been the case. And only recently have other modes of travel – walking, biking and transit – been given serious consideration

in circulation elements. Because the vast majority of trips in New Jersey are made by private motor vehicle, circulation elements have been traditionally focused on the automobile and the road network. The neglect of other modes of travel has made it harder for them to pick up a larger portion of trips. In New Jersey, only in places like Hoboken or Jersey City do pedestrian and transit trips reach mode shares comparable to those found in European cities.

But even as planners stop neglecting other modes and begin to integrate more effectively both transportation and land use planning, it is unlikely that any other mode will surpass the private motor vehicle in its dominance of the transportation system any time soon.

The circulation element needs to consider safety, mobility, access, and inter-modal connectivity. For roads, this means setting standards for the design of the road network, standards for access and parking, ways to accommodate trucks, bicycles, pedestrians and manage stormwater, ice, leaf and snow removal.

The circulation element should contain cross-sections and design standards for different types of streets and other rights-of-ways -- such as the width, number of lanes, space between

driveways and other access points, and whether or not sidewalks or street trees are expected – consistent with NJ state regulations (RSIS) or some local adaptation thereof. Different standards should reflect the character and type of the community, whether it is primarily urban, suburban or rural. Standards may also differ depending on the functional classification of the street, such as major arterial, collector or local access street. This is a practice drawn from federal and state transportation planning which, as previously mentioned, is reflected in the MLUL, but needs to be very carefully evaluated at the local level, since it is entirely motor vehicle driven and does not adequately reflect the land use context. It is recommended that municipalities develop their own functional classification, by adapting one of the off-the-shelf classifications readily available.

The circulation plan element is intended to be responsive to the objectives of the Master Plan, while at the same time addressing existing problems. As such, the circulation plan element needs to go well beyond the private motor vehicle and road network. It must describe the existing conditions in both land use and all modes of transportation, identify issues and set standards for future performance. The gap between present conditions and the desired

future can only be bridged by the actions and strategies outlined in the circulation element.

The cumulative impact of many municipalities' separate land use and transportation decisions within a corridor or commutershed affects the overall performance of the region's transportation system. In order to make positive changes over time, local governments must work within a framework provided by a shared vision for the future of the region and coordinate their actions with those of other decision-makers in the region.

## The Local Circulation Planning Process

The local circulation planning process should include the following steps:

1. Define desired scope of local circulation plan element.
2. Identify key stakeholders.
3. Define public engagement and participation process.
4. Identify the community's role in the region.
5. Inventory and survey background conditions.
6. Identify major trip generators and attractors.
7. Identify and characterize major conflicts.
8. Identify underserved populations and places.



9. Define goals and objectives based on community aspirations and technical assessment.
10. Develop strategies for addressing major conflicts and reaching underserved populations and places.
11. Develop implementation strategies.
12. Identify funding sources.
13. Develop project priorities and phasing plan.
14. Adopt circulation plan element and amend other relevant local planning and regulatory documents.
15. Incorporate recommendations of local circulation plan element into the capital improvement plan, as needed.

### Each of these steps is discussed in greater detail below.

#### Define Scope

Whether the circulation plan element is being developed by the local planning board on a volunteer basis, or with the assistance of a team of professionals, it is important to start by defining the scope of work. This may be a function of the budget available, if there is a budget, or of the amount of pro-bono work which it is rea-

sonable to expect volunteers to do.

Defining the scope will involve making choices, as it is often not possible to tackle all aspects of local circulation at once. Should parking be included? Should goods movement and commercial deliveries be included? Different communities have different needs and hot spots, so scoping the most urgent needs and matching this with either a budget for consultants or a workload for volunteers is critical.

It is also usually a good idea to have informal conversations with a few key stakeholders to find out some preliminary concerns and unmet needs, as they will help define the scope.

If a community is using professionals to develop its circulation plan, it can use their expertise, once selected, to more fully define the actual scope of work.

#### Identify Key Stakeholders

One of the first tasks in developing a local circulation plan is identifying the key stakeholders -- those in the community that have the most at stake and that need to be involved in the process and convinced to provide their support.

There are many interested parties in local circulation planning, including residents who move

around the community doing their daily chores, businesses receiving deliveries, employers that rely on their labor force to show up on time, children on their way to and from school and many others. Everyone benefits from a smooth and efficient circulation system that minimizes delays and disruptions and reduces travel times. Yet different stakeholders may have conflicting priorities and different ideas about how the circulation system should be used. Identifying the key stakeholders, understanding their interests and concerns and engaging them in the circulation planning process is an important ingredient for achieving a successful circulation plan.

In addition to the general population, all of the uses and activities that constitute the major trip generators in a community are key stakeholders (see below).

It is important to understand how the different stakeholders interact and use the circulation system throughout the day and throughout the year. Different activities have different schedules during the day, the week and the year and therefore place loads on the circulation system that vary accordingly.

### **Public Engagement And Participation Process**

The process leading to development of a local circulation plan element should not rely exclusively on the public hearings required by the MLUL. Instead, it is recommended that the municipality engage in a robust public participation process that uses a range of public participation options and formats available, including a steering committee that includes the key stakeholders; one-on-one interviews; focus groups; surveys; and facilitated workshops.

The public participation process should be complemented by a media strategy that uses a variety of means to get the word out and collect input, including the local print, radio and local access cable TV media; a dedicated website or portion of a website where presentations and other project information can be posted and where interested parties can communicate with the project team; and potentially focused outreach efforts targeted at specific audiences, such as school children and their parents, large employers and their employees, downtown businesses and shoppers, transit riders, frequent walkers and bicyclists, and others.

Like any other planning effort, circulation planning will rely on public support to be accepted



*Welcoming, high quality public spaces are an economic and social asset to the community, in addition to encouraging pedestrian and bicycle activity and a more healthy lifestyle.*

and endure. It is not simply a technical exercise that follows an engineering recipe. It involves trade-offs, choices and priorities. As such, working with the appropriate constituencies and developing strong public support are key to a successful effort.

### **Identify The Community's Role In The Region**

Communities are part of larger regional and sub-regional systems and play different roles depending upon their characteristics. Some are feeder communities, with a predominantly residential base. Others are employment centers, with a daytime population many times larger than the nighttime population.

The State Development and Redevelopment Plan's hierarchy of centers – urban centers, regional centers, towns, villages and hamlets –

offers one typology that seeks to capture this. NJ Transit's typology of rail station types provides a framework based on transit service.

One indicator relevant to this analysis is the jobs/housing ratio, that is the ratio between the number of jobs and the number of housing units in the community. Communities with a jobs/housing ratio lower than 1.0 export labor to other places; communities with a ratio larger than 1.0 import labor. Some communities in New Jersey have jobs/housing ratios greater than 10, which means they are important



*Temporary street closures allow for parades, concerts and many other special community events.*

regional centers. Clearly we do not expect everyone who lives in a community to also work there. But highly unbalanced jobs/housing ratios make that possibility more remote.

Understanding the community's role in the region is critical to understanding how it functions in many ways, including in terms of circulation and transportation. It may also hold important clues for under-explored but potentially valuable ways in which the community may evolve towards a more sustainable future.

For example, a community that functions as a large employment center and consequently suffers large traffic flows in the morning and evening peak hours might consider a land use strategy that seeks to increase the amount of housing appropriate and affordable for its job market. A workforce housing strategy – while not technically what one might expect to find in a circulation plan – might nevertheless be the appropriate response for certain circulation issues. In this case, the circulation planning process might seek a solution through changes in the local land use planning framework.

### **Inventory And Survey Background Conditions**

This is the data gathering portion of the circula-

tion plan. It involves compiling all the available information on transportation and circulation in and around the community, an inventory of physical facilities, and an assessment of how they are used and for what purpose.

The inventory and survey of existing conditions provides the factual basis for the circulation planning work. Some municipalities may have the transportation infrastructure already compiled as GIS layers; others may need to do this. Information on physical facilities, traffic counts on major roads, transit ridership and other may exist at the county engineering department, NJDOT, NJ Transit, relevant MPO or in other locations.

There is usually a considerable amount of information in the local planning department generated by development applications which frequently include traffic studies and other transportation information. This information should be compiled and analyzed.

Major employers often have detailed information on where their employees live, how they get to work and at what times. Major institutions (hospitals, universities, colleges, etc) similarly monitor the flow of patrons, staff, visitors and deliveries. The transportation coordinator

for the local schools can provide information on how many kids arrive by bus, are dropped off by their parents or walk/bike. A local survey (on-line, by direct mail or print media) is often an inexpensive way to reach the population and supplement the more institutional sources of information.

While a full-scale origin/destination (O/D) study may be too costly for most small and medium municipalities, it should be possible to cobble together enough information from outside sources, Census data and direct inquiries – along with direct observations -- to allow the circulation planners to gain a fairly accurate and complete picture of how circulation works in the community. If there are glaring and potentially critical gaps in the data, these can be remedied through limited and targeted field work.

### **Identify Major Trip Generators**

Major trip generators and attractors are land uses and activities located in the community that generate the highest number of trips, whether by car, on foot or otherwise. This would include large industrial and commercial employers; large institutional uses, such as colleges and universities, public and private schools, and hospitals; major passenger trans-

portation facilities, such as rail stations, major bus depots or airports; large freight distribution facilities; postal distribution centers; sports and entertainment facilities; and libraries, performing arts centers and cultural arts centers to name a few. Large housing developments, downtowns and major shopping centers are examples of other types of uses or places that generate significant numbers of trips.

Major trip generators should be mapped and the flows between them, and between them and the outside world should be mapped and characterized.



*Outdoor display of retail merchandise is often frowned upon in local ordinances. But if the sidewalks are wide enough, high quality outdoor displays make the streetscape more lively, lush and humane.*

### **Identify and Characterize Major Conflicts and Insufficiencies**

The major conflicts and defficiencies should flow from a detailed analysis of the major trip generators and of the profile of the existing transportation infrastructure, as well as from intelligence gathered in the field and from stakeholder interviews and community input.

Are there critical missing links in the sidewalk system linking residential neighborhoods to schools or to the downtown? Are there gaps in transit service that prevent it from being a practical transportation option for certain populations or for certain destinations? Is a particular intersection so overwhelmed that it negatively impacts the vehicular flow through the entire downtown? Is there a speeding problem on local neighborhood streets? Is there untapped potential in the local transit system?

These are the types of questions that the circulation planning process should answer. Once the issue has been flagged and documented, and is deemed appropriate for the circulation plan to address, then the planners can be creative and look for appropriate solutions. This may mean looking at past precedents and best practices, from the community or elsewhere; looking at case studies; conferring with the

transportation agencies; and conferring with the stakeholders.

### **Identify Underserved Populations and Places**

The local circulation planning process should identify local populations that are underserved from a transportation perspective. This might include low income communities with low rates of vehicular ownership and poor access to transit, middle and high school students with poor access to bicycle facilities and transit, older adults with poor access to transit and others.

The circulation planning process should also identify underserved places, that is places that are hard to get to on foot, by bicycle, by transit and occasionally by car.

The purpose of this analysis will be to determine what kinds of opportunities and destinations are not available, or poorly available for transportation-deprived populations: potential job markets for minority communities, potential learning or recreational sites for students, or potential volunteer activities, health care services or other destinations for the elderly and mobility impaired, to name a few examples.

Once these gaps in the opportunities offered by the current circulation and transportation sys-

tems are identified, documented and quantified, the plan can begin to develop strategies to address them.

### **Define Goals And Objectives Based On Community Aspirations And Technical Assessment**

Defining goals and objectives is a critical step in the planning process, since it establishes the bar which the community wishes to reach. This process should be informed by a technical assessment that brings a measure of fiscal reality and practical considerations to bear, such that the goals and objectives are achievable and realistic and expectations are not set too high.

Goals and objective are essentially political decisions informed by technical considerations. As such, they should emerge from the public process and represent the community's vision and consensus regarding both what it considers desirable and achievable.

### **Define Strategies To Address Major Conflicts and Reach Underserved Populations And Places**

This is the guts of the circulation planning process and the step where the community must grapple with the really hard issues. There are no formulas or templates for how to tackle



*Shared right-of-ways routinely accommodate motor vehicles, street cars, pedestrians, bicycles and other forms of transportation.*

this. The community, through the public process, must identify its core values and aspirations and translate these into operational policies. It must determine how far it is willing to go to push for those things it sees as most important. The professionals can offer advice and technical solutions but ultimately the choices have to be made locally and the community has to be comfortable with what it chooses, because the community will have to live with it. Overly ambitious proposals risk losing momentum and public confidence, while un-ambitious proposals will not capture people's imaginations and get them fired up.

### **Develop Implementation Strategies**

Implementation is where the rubber hits the road. Without appropriate implementation strategies no plan will reach fruition, no matter how smart or compelling its proposals.

Implementation requires change, and change is frequently difficult. Implementation also requires leadership and perseverance. And it may require public education, and changing people's perceptions or expectations.

A simple way to make the implementation process more clear and transparent is to create an itemized list of actions that need to occur and assign them to the appropriate people or entities required to carry them out. So, for example, the planning board takes the lead in amending the master plan by adopting the new circulation plan, but the governing body will need to take the lead with respect to any needed changes to the official map, local regulations or capital improvement plan to make these consistent with the circulation plan. The engineering staff might be required to pursue certain actions with NJDOT. And the community development staff might need to work on grant applications.

This matrix of tasks and responsible parties makes it clear who is responsible for doing what in terms of implementation. It should have a rough timetable attached to it, so people know what is expected from them and how soon. And there needs to be a project manager who keeps track of all the moving parts, man-

ages the schedule and identifies the need for course corrections, should that occur.

### **Identify Funding Sources**

Identifying funding sources is obviously a key step towards implementation. A discussion of potential funding sources appears earlier in this handbook.

It is not necessary (or perhaps even possible) for the circulation plan element to provide a detailed analysis of all possible funding sources, and which source might fund which project. Given the vagaries of public sector grant funding, it is hard to reliably plan with respect to outside funding. Perhaps the best approach is to identify the most likely sources of funding for the different projects and project categories. The municipality then needs to assign to someone the responsibility of pursuing this funding, as it becomes available. This requires awareness of the different grant programs, grant cycles, special opportunities and so forth. This work can be done either by a knowledgeable staff person, a very dedicated volunteer or an outside grant writer.

### **Define Project Priorities and Phasing Plan**

The circulation plan's proposals should be itemized, prioritized and staged. Some propos-

als can be implemented at the same time, others must be implemented sequentially.

Distinguishing between the two and assigning priorities is the purpose of this section. Short-term actions can be expedited, while medium- and long-term actions are expected to take longer. Setting priorities should be part of the public process, and it should recognize the opportunistic nature of many grant programs, which may mean that funding for some lower priority projects may become available sooner than for higher priority projects.

### **Adopt Plan and Amend Other Relevant Documents**

Local adoption by the Planning Board of the circulation plan element needs to follow the requirements of the MLUL regarding master plan amendments NJS 40:55D -13. The adoption takes place at a duly noticed public meeting. The draft document needs to be filed with the planning board secretary at least 10 days before the public hearing and available for public consultation. It must also be filed with the county. To the extent that it contains provisions or recommendations that might be of interest to adjacent communities, it is good form to notice those as well. And making it available on the municipal website is an easy way to make it more widely accessible.

It is appropriate for the planning board and/or its consultants to provide, at the public hearing, an overview of the planning process, major findings and major proposals. The board should entertain questions from the public and should not hurry the process. Like any other master plan element, it is better to provide as much time as necessary to answer all the questions and discuss all the issues.

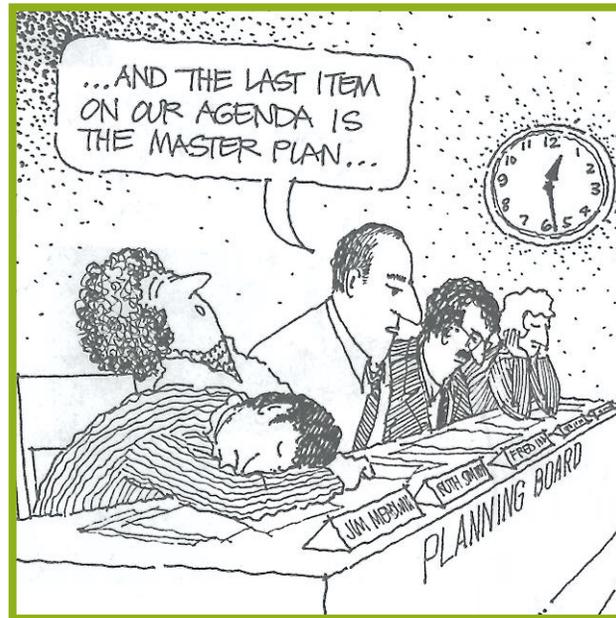
The planning board should also entertain amendments to other master elements as may be deemed necessary for consistency with the circulation plan element. These would follow a process similar to the one outlined above.

Potential amendments to the land development regulations, zoning, official map or other municipal regulatory documents, for consistency with the circulation plan element, should be referred to the governing body for action.

#### **Amend Capital Improvement Plan**

Physical improvements proposed in the circulation plan element should be included in the municipal capital improvement plan and coordinated with other compatible projects. For example, sidewalk reconstruction or new sidewalk construction would occur ideally as part of a larger street resurfacing or reconstruction

project; and new trails in a park might occur as part of a broader park enhancement project. Wherever possible, the municipality should look for efficiencies and economies of scale in implementing the projects contained in the circulation plan.



#### ***Additional Reading:***

*Patrick Condon – Design Charrettes for Sustainable Communities. Island Press 2008*

*Bill Lennertz and Aarin Lutzenhiser – The Charrette Handbook: The Essential Guide*

*Accelerated, Collaborative Community Planning. American Planning Association, 2006*

*Preston Schiller, Eric Brun and Jeffrey Kenworthy – An Introduction to Sustainable Transportation: Policy, Planning and Implementation. Earthscan, 2010*

## **Chapter Six: The Sustainable Circulation Plan Element**

In this section we describe the contents of a sustainable circulation plan element.

Not all sections will be applicable everywhere, given the great diversity among New Jersey municipalities and the very different conditions found on the ground. Municipalities will need to tailor their circulation plan elements to their own set of conditions and circumstances, values and priorities.

## Chapter Six: The Sustainable Circulation Plan Element

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### he Circulation Element -- Statement of Purpose

The Statement of Purpose of the circulation plan element

identifies the current transportation issues (as perceived locally), circulation concerns/barriers, and land-use related issues, while at the same time highlighting the desired future, so as to be able to adequately handle both current issues and those that might be anticipated as a result of population and employment growth, changes in life-styles and preferences, changes in transportation technologies and changes in land use. The difference between these two scenarios is described as the “gap”. The gap represents the disparities between existing conditions and the desired future. Once the gap is defined, it allows the municipality to be strategic and optimize transportation and land use decisions to move from current conditions to the desired future, and to make those decisions operational. The gap will be the guiding principle throughout the circulation planning effort to maintain focus on the desired future.

### Travel Trends And Regional Assessment

This section will generally describe the municipality, current population and employment characteristics, land use and travel patterns.

This section will also describe and take into account the regional system and what stake and possible obligation the municipality has within its region. For example, if the municipality is a regional hub, what reasonable obligation should it incur (relative to its neighbors) to provide the appropriate planning and land use ordinances needed to achieve local greenhouse gas (GhG) reduction targets?

The following are suggested components to the Travel Trends and Regional Assessment section:

- Demographic Trends – *U.S. Census*
- Vehicle Ownership – *U.S. Census*
- Work locations for employed residents – *U.S. Census, local survey*
- Residential locations of employees – *U.S. Census, local employers*
- Commute related travel trends by travel mode – *U.S. Census*
- Trends in travel time to work – *U.S. Census*
- Commute related travel mode and other data in comparison to state-wide data – *U.S. Census*

- Community survey of current conditions and future needs – *local survey*
- Regional and local origins and destinations – composite
- Regional road network – *NJDOT, county engineering, MPO*
- Regional transit system – *NJ Transit, county transit, TMA*
- Local Transit Score Map – *NJ Transit*
- Needs Assessment – identify system deficiencies, gaps in service and problem areas for all modes of travel

### Land Use Patterns to Optimize Multimodal Circulation

Adopting center-based land-use practices can focus new growth and development around activity centers and yield a variety of benefits. The following are ways to achieve center-based development.

#### Infill and Compact Development

Infill and compact development are two land-use practices that can be utilized to realize the full potential of centers. Infill development is the practice of developing those lots and vacant spaces that have been bypassed and underutilized in areas that are otherwise developed, such as brownfields, greyfields, and abandoned industrial sites. Infill development can be an

important element of redevelopment and revitalization. Compact development, as the name suggests, is a land use pattern where buildings are located more closely together for increased density. Both aim at deriving the maximum potential from the land by increasing density and locating more people near existing services.

Infill development is most appropriate in the urban and suburban settings where there are lots that are currently underutilized, yet to be developed, or sites that are abandoned. Current and potential infill development areas should be identified with an infill development program. Setting up an infill development program that identifies potential areas for infill development is a good first step in encouraging infill development.

An effective infill development program will create an inventory of all infill parcels. These lots include those that have vacant and abandoned buildings, are underutilized as determined by comparing existing use with nearby properties, and those properties that are poorly maintained or whose public facilities might be deteriorated. Examples include brownfields, underutilized surface parking lots, and underperforming shopping centers and strip malls.

These parcels should be compiled into a list of potential infill development sites within the municipality. Community input should be solicited and visioning sessions should be conducted to determine what types of infill development is preferred and desirable.

Areas that will support transit service are those sites in TOD areas, near transit hubs, or within close proximity to transit. Deteriorating shopping malls and strip malls are ideal for infill development, and a change from single-use to compact, mixed-use can transform them into vibrant town centers. Development of infill sites located near a commercial corridor or downtown have the greatest potential for optimizing these centers.

Highest densities and intensities of uses should be located closest to transit centers, town centers, commercial corridors, and community facilities. These tactics will optimize both the transit centers and town centers by focusing growth on these already established services while also providing more people with the option of traveling without the use or need of an automobile. Another potential location for compact development for towns that lack infill sites are in their high growth areas. Utilizing compact development in suburban areas and



*Special accommodations for bicycles on trains allow riders for each places that are served by transit but not within walking distance of the transit stop.*

integrating mixed-use can be an effective method of supporting small town centers.

### **Policy Suggestions and Best Practices**

Setting guidelines and regulations, developing incentives, and marketing infill sites are key strategies for a successful infill program. Creating overlay zones to identify different areas and types of infill development is another effective strategy. Municipalities should incorporate infill into their master plan in order to make it a priority. Guidelines for these different areas should be established to guarantee a town achieves its goals and objectives. Guidelines and standards should regulate the design, scale and density of infill projects while providing flexibility for developers. Municipalities should also make sure that current regulations allow for higher densities within certain areas so as to capitalize on compact development. Allowing for mixed-use development in order to locate

housing near jobs and other services will also help create more diverse, successful neighborhoods through infill and compact development.

Developers need to be made aware of infill development opportunities. Maintaining an up-to-date list of infill sites and making it publicly accessible is a good way to convey this information to interested developers. Providing incentives to developers for infill development can also be essential. Incentives can include a streamlined application process for infill development, reduced parking requirements, density bonuses, subsidized infrastructure upgrades, lowered impact fees and property tax abatements.

### **Land-Use Mix to Optimize Non-Vehicular And Transit Modes For Short Trips**

Mixed-use development is characterized by more than one use in a single building, development or neighborhood. An example is a five-story building with shops and stores on the first floor, offices on the second floor and apartments on the fourth and fifth floor. Another example is a residential block with a deli on one corner and a doctor's office on the other corner.

The objective of mixed-use development is to increase housing opportunities within walking distance of shops, jobs, offices, restaurants, entertainment and cultural centers. By increasing opportunities for pedestrian activity, municipalities reduce reliance on automobiles, reduce traffic congestion and pollution, boost the local economy and improve safety and security.

### **Current And Potential Transit-Oriented Development (TOD) Areas**

Encouraging TOD has benefits for nearly every municipality, yet it is important to identify where it is most likely to succeed before pursuing it. Ideally, TOD areas are located near a transit hub, where there is a mass transit access point to either rail or bus. As mentioned earlier, they should also be high-density, compact, mixed-use, and walkable. These are all important factors that must be considered in identifying TOD areas.

Appropriate candidates for TOD possess all of the aforementioned characteristics such as a good mixture of residential, office, retail and civic uses as well as an adequate network for non-vehicular transportation. Most importantly, however, these areas should be located within a 1/4 - 1/2 mile of a current transit hub, or about

a 5 to 15 minute walk. The density and intensity of use should be greatest near the transit hub and gradually decline as it moves away from it.

The following describes areas in different regional settings that are appropriate for TOD zoning.

- Urban, high density centers at the heart of industry, commerce and culture. They possess a large portion of a region's jobs but also have retail and cultural facilities, housing within walking distance, and a reliable, efficient public transportation system nearby.
- Regional centers with jobs, hotels, and services in addition to housing densities that support bus services and an environment that encourages walking and biking. It is important to consider the regional context so as not to compete with, and potentially undermine others nearby. These centers should also be near rail stations and major highway intersections to help improve their accessibility and convenience.
- Small towns with compact centers that provide retail, recreation, a variety of housing options, and community facilities. These towns serve nearby neighborhoods and thus

walking and biking should be viable. They should have a bus transfer as well.

Potential TOD areas are those that are able and most likely to include all of the characteristics of a TOD as mentioned earlier. Since TOD areas need a transit hub to succeed, only those areas that surround current or potential transit hubs should be considered. However, not all transit hubs are suitable for TOD. Only areas surrounding current or potential transit hubs that either have those features previously discussed (compact, high-density, mixed-use, walkability) or have the prospect of realizing them should be considered.

Higher densities and compact form are pre-requisites in the areas surrounding transit hubs. These are vital for the success of a TOD and to ensure an adequate number of potential riders. Once these areas are identified, policies and regulations that help foster TOD should be implemented.

Local communities should revise codes and ordinances to promote infill and direct new development towards appropriate locations and at suitable densities to support transit. TOD Overlay Districts should be designated near transit hubs and residential and commercial centers.

## **Resolve Local Zoning Conflicts With TOD**

For TODs to be possible and to work effectively, local zoning will need to support this type of development and allow the appropriate densities, accessibility and mix of uses.

### **Key TOD Factors**

- Regional Assessment – take into account the regional need and the ability to help satisfy that need.
- Promote density that supports the regional need.
- Adopt land use policies that support development.
- Compact development patterns.
- Mixed-uses.
- Make it a “Great Place”.
- Pedestrian-scale design.
- Easy pedestrian connections.
- Parking management.
- State and local policies and incentives to support TOD.

### **Possible Incentives:**

- Expedited development applications.
- Reduced total parking requirements.
- More lenient roadway –congestion standards.
- Permitting higher densities and land coverage ratios – density bonuses.

- Centralized parking strategy.
- Adaptable reuse of historic buildings and rail stations into multimodal centers.
- Successful demonstration projects.
- Live Where You Work program.

People should be able to easily and conveniently walk or bike, particularly to the transit station. This means providing safe street conditions and adequate amenities, such as sidewalks, bike lanes, and places to lock bikes at the station; a mix of pedestrian friendly uses and activities within walking distance of the transit station; high density walk-ability and a good mix of uses.

## **Transit, Bicycle, Pedestrian and Roadway Networks**

Multimodal Circulation Elements consider the regional attributes and impacts of transportation alternatives and choices on air quality and other factors affecting quality of life. Many circulation plans address key smart growth characteristics such as connectivity, accessibility, mobility and multi-modal travel options. A Circulation Plan is most flexible and best meets smart growth objectives when it includes multiple modes of travel serving major trip generators. Transferability between or among modes should also be provided.

## **Transit - Identify Current And Potential Transit Hubs**

Transit hubs provide people in the surrounding area with alternative transportation options to regional and community destinations, reducing VMT while providing direct access to activity centers. Transit hubs also promote economic activity. As a result, they provide favorable attributes for center-based development in which supporting compact, mixed-use development will foster growth in both jobs and economic activity.

### **Current Transit Hubs**

- Transit hubs are places such as regional train stations, areas that provide access to transit service and facilitate intermodal or multi-modal service such as bus/rail transfer centers, shuttle bus to light rail, and park-and-ride areas. These hubs are able to handle a high volume of traffic and have regular service that offers access to regional destinations. Identifying existing and potential transit hubs is vital to developing a program that encourages sustainable development patterns that promote mode-shift to other forms of transportation than the automobile.

### **Potential Transit Hubs**

- Potential transit hubs need both accessibility and ridership levels in order to be successful. Areas with good walkability / bikability and higher densities are good candidates for potential transit hubs. High densities, and to a lesser extent, high intensities, ensure that a transit hub has an adequate number of potential users while walkability and bikability allow those potential riders to access the transit hub.
- Types of transit and the level of service that is supported by a given density can vary with a wide range of factors. In general however, as density increases, the number of households owning a car declines while the number of trips traveled by walking and biking increases. A summary of various findings that predict type of transit and level of service by density is summarized in the table on next page.

In general, when population density exceeds 10,000 people per square mile there is a dramatic increase in transit use. Fifteen (15) or more dwelling units per acre support a high level of transit service, as can 20 million square feet or more of commercial space. One study



*This bicycle and pedestrian bridge over Route 1 reconnected two segments of the Delaware & Raritan Canal towpath, therefore re-establishing the integrity of this regional bicycle and pedestrian facility in this area.*

found that a population density of about 250 people (either living or employed) per acre was needed for rapid transit while about 620 people per acre was needed for a transit modal split of 50/50.

A detailed analysis is necessary for each town. The feasibility and success of transit hubs is determined by a multitude of variables. One particular tool that can help a municipality assess the potential level of transit service of an area is the Transit Score mentioned earlier, which can calculate existing, projected, or planned transit scores given population density, employment density, and zero-car household density. Therefore, accurate prediction of each of these is fundamental to determining possible transit hubs.

Guide	Transit Service	Population/mi <sup>2</sup>	Dwelling Units/Acre	Employee/Acre	Non-Residential Floor Space in million ft <sup>2</sup>
NJ Transit	Supports Rail or other high capacity service		15-24+	150+	
	Supports local bus service		7+	40+	
	Supports cars, carpools, vanpools		1-6+	2+	
Smart Growth Transportation Guidelines	Bus Service	Minimum Service (1 bus/hour)	4-6+		5-8
		Intermediate Service (1 bus/30 mins.)	7-8+		8-20
	Urban Rail-5 mins. peak headway		9		15-20
NJDOT	Bus Service per direction per day	Frequent-120	10,000	15.0	20
		Intermediate-40	5,000	7.0	10
		Minimum-20	3,000-4,000	4-5.0	5

Furthermore, these densities are a function of the type of land use, as is the land-use intensity. As a result, the amount of trips that a certain type of land-use produces must be considered as well, keeping in mind that places such as regional shopping centers, hospitals, colleges, universities, and business complexes will generate more trips than townhouses. Ultimately, areas with the former uses, a mix of services, and high density residential would be more suited for a transit hub as a wide variety of services in close range attracts many people and is conducive to walking.

Lastly, the importance of community visioning cannot be overstated. Though GIS maps can be analyzed and projections extrapolated, without citizen buy-in the project will not be a success. Community visioning sessions will give the municipality an opportunity to participate in decisions over how and how much their town will change, and bring to light issues or concerns. Integrating the community into the process from the beginning will dramatically increase the chances of success.

### **Transit Providers and Facilities**

Identify current and potential mode-shift locations, including appropriate “Park and Ride” locations. These locations should be mapped and appropriate physical improvements should be executed to promote easily comprehensible and safe transfers.

Develop strategies to better align transit routes, ensuring ease of transfers for two- or more seat rides. By better connecting intra- and inter-agency routes safely and efficiently, riders will be more willing and better able to make transit connections.

Identify areas where the transit agency or agencies should consider new service. Highlight communities underserved by transit and meet with potential agencies to explore providing new transit service that resolves the insufficient access to transit.

Provide safe and convenient access from transit stations or major stops to major employment and residential locations. Avoid physical barriers.

Provide direct routes to transit stops and stations from homes, retail and major employment centers.

### **Related Policies**

- Ensure efficient transit circulation, include transit agency to resolve current and potential conflicts.
- Encourage ridership on public transit systems through marketing and promotional efforts. Provide information to residents and employees on transit services available for both local and regional trips.
- Require new development to provide transit improvements where appropriate and feasible, including direct pedestrian access to transit stops, bus turnouts and shelters, and local streets with adequate width to accommodate buses.
- Require community care facilities and senior housing projects with more than 25 units to provide accessible transportation services for the convenience of residents.
- Provide railroad crossing protection devices
- Planned improvements - This should indicate areas where improvements are needed to pro-

- mote efficient and continuous circulation
- Map transit services, mode-shift locations, “Park and Ride” locations, areas of needed transit service and planned improvements.

### **Bicycle And Pedestrian Facilities** **Prioritize Planning for New ROWs for Non-Vehicular Transportation Modes**

Providing paths and methods for pedestrians and bikes to access local activity centers, regional destinations, and transit stations and stops is essential to not only optimizing circulation but also the harmony between supporting land-uses. In the past, Right-of-Ways (ROWs) for these non-vehicular modes of transportation have been overlooked. As a result, extra emphasis should be placed on ROWs for non-vehicular transportation and should be a planning priority that is no longer ignored. These ROWs must be adequately developed to be accessible, direct and convenient, in addition to safe and attractive in order to assure that they are optimized. The best and most effective way to achieve these goals is to implement a Pedestrian and Bicycle Circulation Plan that assesses current conditions, creates a plan that outlines improvements based on those assessments, and designs methods of implementing the proposed changes.

### **Develop a Pedestrian/Bicycle Circulation Plan**

Developing and implementing a Pedestrian and Bicycle Circulation Plan helps promote an environment that is safe, convenient, and attractive for citizens to walk and bike helping reduce auto-dependency in addition to promoting community. A Pedestrian/Bicycle Circulation Plan identifies routes for such use and outlines improvements in the bicycle and pedestrian infrastructure. Routes that are included are streets, walkways, and trails that connect neighborhoods, transit stops and stations, community centers, recreational areas, and commercial and business districts. A good plan will incorporate a proposed network of routes, design guidelines for these routes, propose general policies to improve biking and walking conditions throughout town, and recommendations for enforcement and education.

### **Assess Current Conditions**

The first step in creating a Pedestrian and Bicycle Circulation Plan is an assessment of current conditions. This is vital to the process because it helps create a comprehensive picture of pedestrian and bicyclist access and safety in your municipality. Assessing the current conditions is a multidimensional process focused on the pedestrian and bicyclist.

Developing standards and guidelines for “walkability” and “bike-ability” is an important prerequisite. Relevant criteria include accessibility, safety, length and aesthetics. These standards can also be referred to by other planning documents. Turn these standards and guidelines into a checklist and solicit volunteers to conduct surveys on the existing street conditions.

Engage citizens in an outreach process in order to determine areas of concern amongst the community as well as other stakeholders including special interest groups such as seniors, those with disabilities, and businesses. Collect data on pedestrian/bicycle vehicle conflicts, walking and biking rates, and the number of connections to transit and where they are. After the assessment, develop a summary of constraints and opportunities as a guide for the rest of the planning process.

### **Create Pedestrian/Bicycle Route Network**

After the initial assessment, surveys and data should be analyzed in order to create a Pedestrian/Bicycle Route Network. This will be a long-term vision of a network that includes both on- and off-street routes that extend throughout the municipality and identifies those routes most in need of improvement

and routes whose improvements will have the largest impact.

Routes to be included in the Pedestrian/Bicycle Route Network should be selected with input from the community and local officials.

Generally, they should be routes that provide direct and convenient access to where residents what to go like: activity centers, employment centers, neighborhoods, schools, municipal/community centers, nature paths/parks and transit centers. Routes should be selected using the following techniques and criteria:

- in areas of high pedestrian and/or bicycle activity
- those that reinforce TOD, compact development, and mixed-use
- in areas with a history of pedestrian/bicycle and vehicle conflicts
- proximity to transit hubs, stations, and stops
- areas that complement existing and proposed pedestrian/bicycle pathways, lanes
- those that facilitate connections to bus stops and routes
- those that highlight natural features such as creeks, shorelines, and ridgeways (this also helps promote preservation and restoration of these areas)
- those that overcome barriers that separate

neighborhoods such as freeways, rivers, and railroads

- fill in gaps in pedestrian/bicycle corridors
- extend paths from cul-de-sacs to adjacent neighborhoods
- connections between adjacent blocks that lack street connections
- provide continuous capacity along pedestrian/bicycle paths
- those that facilitate direct and convenient access to transit stops from offices and commercial uses
- provides direct connection between activity centers
- connect parking lots, greenways, residential developments, and business and retail districts/developments

Also included in this Pedestrian/Bicycle Route Network should be a “Safe Routes to School” and “Safe Routes to Transit” section that identifies common walking routes to schools and transit. The goal of the street improvements for these areas will be to improve pedestrian/bicycle safety and access for children to and from school and to promote transportation alternatives.

Lastly, to ensure safety and attractiveness for pedestrians/bicycles, it is vital to enact design

guidelines that require standards for these pathways. The standards and guidelines address newly developed pedestrian/bicycle paths in addition to improvements on existing ones. The analysis of pedestrian/bicycle vehicle conflicts can help develop street standards to assure maximum safety for pedestrians and bicyclists. These standards might also be contingent upon adjacent land use as opposed to street classification which would allow for more flexibility in design. Elements likely to be included in this section include streetscape improvements, pedestrian/bicycle amenities, curb radii, bump-outs, traffic-calming techniques, and signage.

### **Other Suggested Policies and Guidelines**

In addition to a Pedestrian/Bicycle Circulation Plan there are numerous other policies and planning techniques that should be considered to optimize planning right-of-ways (ROWS) for non-vehicular transportation. The land use element of the Master Plan should encourage compact, mixed-use development in order to support the Pedestrian/Bicycle Circulation Plan. This can include zoning and design guidelines for pedestrian and bicycle oriented development. These guidelines might include things such as requirements for reduced setbacks and lot sizes, higher frequency of crossings, and more direct connections. If a com-

plete modification of zoning and design guidelines is not feasible or desirable, this can be done by identifying specific zones and corridors with an overlay map, such as a downtown or a TOD area, and focus on creating a pedestrian- and bicycle-based center. By defining particular pedestrian or bicycle zones in the land use element, a Circulation Element may then establish specific standards in these areas.

Other policies and guidelines that communities should utilize to develop a pedestrian/bike network and optimize their use are as follows:

- Where rail lines (including siding and spurs) are to be abandoned, first consideration should be given to acquiring the line for transportation and recreational uses, such as bikeways, footpaths, or public transit.
- Identify streets with underused travel lanes for potential traffic calming projects including restriping, lane reduction, and sidewalk widening.
- Take advantage of existing transportation infrastructure and capacity that is underutilized. For example, where possible and desirable, convert underused travel lanes to bicycle or pedestrian paths or amenities.
- Identify goals for investment in the infrastructure for pedestrians and bicycles.

- Require developers to submit an internal circulation plan as part of their site design including pedestrian/bicycle connections to public ROWs such as sidewalks as well as to nearby neighborhoods and centers.

#### **Utilize building design standards and zoning ordinances to:**

- Encourage mixed-use.
- Group building entrances to improve access.
- Connect entrances and exits to sidewalks.
- Promote street level activity.
- Develop small blocks.
- Include public walkways or trails in private developments.

#### **Potential Policies**

- Implement a system of signs that clearly mark and identify bicycle and pedestrian routes including trails.
- Provide local maps and directional signs at transit stations and stops to aid in pedestrian wayfinding.
- Encourage the development of pocket parks and plazas especially along the pedestrian and bicycle network.
- Implementing “pedestrian only” areas where there are large pedestrian volumes.
- To the maximum extent possible, make walkways accessible to people with physical disabilities.

- Integrate pedestrian and bicycle impact evaluation into traffic impact analysis including:
  - An inventory of existing bike/ped accommodations.
  - Existing and future levels of service.
  - Visibility triangles for pedestrians and bicyclists at corners.
  - Site circulation plans for pedestrians including to and from parking facilities.
  - Compatibility with existing plans and design guidelines.

Develop a pedestrian/bicycle route network that functions as well, or better than the street network for motorists.

## **Bicycle Network**

### **Bikeway Classifications**

- Class I (Bike Path) – Provides a completely separated right of way for the exclusive use of bicycles and pedestrians with cross flow minimized.
- Class II (Bike Lane) – Provides a striped lane for one-way bike travel on a street or highway.
- Class III (Bike Route) – Provides for shared use with pedestrian or motor vehicle traffic and is identified only with signage.

## **Safety**

- Ensure safe movements with design strategies.
- Identify HOT SPOTS (high accident-prone sites) to mitigate.
- Implement a Bicycle Master Plan as a comprehensive method for implementing bicycle circulation, safety, and facilities development.

## **Related Policies**

- Adopt bicycle parking requirements for current and future commercial, housing complexes and mixed use buildings.
- Ensure commonly used routes to destinations include bicycle lanes or parallel paths.
- Ensure bicycle parking facilities at strategic destinations and transit.

## **Planned improvements**

Indicate areas where improvements are needed to promote efficient and continuous circulation. Map bicycle network with planned improvements.

## **Pedestrian Network**

### **Walkway Classifications**

- Primary walkways – those segments that link major generators of pedestrian activity and carry the highest volume of pedestrian traffic.
- Secondary walkways – those segments that link secondary generators of pedestrian activity and carry moderate volumes of pedestrian traffic.



*Parking structures need not be oppressively ugly. A small investment in public art and landscaping, combined with appropriate façade treatments, can effectively mask what is otherwise a dead building.*

- Tertiary walkways – those segments that provide physical and visual continuity within the pedestrian network but carry a low volume of traffic. They are also used as recreational paths such as jogging trails or fitness courses.

## **Safety**

- Ensure safe movements with design strategies.
- Provide for the needs of all ages and abilities in the planning, design and operation.
- Consider roadway width and roadway design features such as islands, pedestrian refuges, pedestrian count-down signals, and other such mechanisms.
- Incorporate a “safe routes to school” program that aims to provide a network of safe, convenient, and comfortable pedestrian routes from residential areas to schools.

## **Related Policies**

- Foster walkable routes through streetscape improvements, continuous sidewalks on both sides of roads (where justified – at densities in excess of 2 dwelling units/acre), and encouraging pedestrian access wherever feasible.
- Ensure commonly used routes to destinations include sidewalks.
- Reduce barriers between transit stops and land uses to provide direct paths for pedestrians.

## **Planned Improvements**

Indicate areas where improvements are needed to promote efficient and continuous circulation. Map pedestrian network with planned improvements.

## **Street Network**

### **Street Types / Classifications**

Establish the appropriate street typology within the Circulation Element. Typical street classifications consist of Regional Arterials, Community Arterials, Community Collectors, Neighborhood Collectors and Local Streets.

- *Arterials* carry traffic between communities and connect communities to major intrastate and interstate highways.
- *Collectors* convey traffic between arterials and from lower-order streets to arterials.

They are the primary routes within residential and commercial areas.

- *Local streets* are of two types. *Sub-collectors* provide frontage for individual lots and carry small amounts of through-traffic between collectors of from access streets to collectors. *Access Streets* provide frontage for individual lots and carry only traffic with an origin or destination on the streets themselves.

Other street typologies exist and may be more appropriate for the community.

### **Characterize And Evaluate The Current Street Network**

Is the network a traditional grid, a modified grid, a conventional suburban street network, or a combination of several of these patterns?

Evaluate the network to measure internal connectivity, external connectivity and route directness.

- *Internal Connectivity*. Can be measured using Beta Index which is the number of street links divided by the number of nodes or link ends. The higher the ratio the better connectivity. Interconnected networks usually rate above 1.4 intersections per square mile.
- *External Connectivity*. All neighborhoods in the system are connected to the larger street

system at least every quarter mile.

- *Route Directness*. The ratio of the distance a pedestrian would walk between two points and the distance of a straight line between the same two points. A reasonably connected network falls within the 1.2 to 1.5 range. (Criterion Planners Engineers, October 2001, INDEX PlanBuilder Users Guide, Portland, OR)

For less efficient networks, map a road framework for further development of the network. Provide concept plans in the circulation element that prescribe future street locations that create an interconnected network or retrofit.

### **Align Zoning With Appropriate Access Management Provisions**

- Access control measures offer great potential to mitigate conflict and congestion, and for maintaining acceptable and safe traffic operating conditions along corridors. The location and design of access points along a road also has a significant impact on the safety and efficiency of pedestrian movements.
- Roads serve three basic purposes: to provide flow of traffic into and out of the community, to provide links among activities within the community, and to provide access for individual properties to the road network.

- Access can be controlled through the zoning ordinance. In establishing the use standards for the community, target large, intense uses that generate high traffic volumes to high-capacity roads. Similarly, land uses producing less traffic can be directed to smaller roads through zoning.
- The primary responsibility in control of access is to try to balance the rights of property owners for access with the need to protect community safety by eliminating or avoiding traffic hazards.
- The use of access management techniques can help preserve capacity.
- The State Highway Access Management Code (N.J.A.C. Title 16, Chapter 47) provides for the comprehensive regulation of access on New Jersey state roadways. The Code regulates the spacing between un-signalized access points and between traffic signals, as well as the type of access.
- The Access Management Code also offers the ability to prepare an access management plan for an entire stretch of state highway. The participants in creating a plan are the host municipality; the county, if a county roadway intersects the high segment; and NJDOT.
- Because NJDOT has complete authority over the design of driveways on state highways, New Jersey municipalities have little ability to influence access on these roads. However,



*Multipurpose trails are popular recreation facilities, but when they connect residential neighborhoods and employment centers they also become popular with commuters.*

through the subdivision and site plan approval process, municipalities can encourage developers of properties on state highways to investigate the use of frontage roads, cross access drives, and shared driveways. Incentives can be offered to developers that use the desired access management techniques. The zoning ordinance must respect the access management goals of NJDOT and the County.

### **Related Policies**

- Strive to maintain community- and context-appropriate Level of Service (LOS) standards.
- Give full consideration to bicycle and pedestrian facilities in the planning and development of transportation facilities.

- Ensure all travel modes on high activity roads while limiting conflicts.
- Mitigate “Hot Spots”.
- Incorporate a Trip Reduction program.
- Design streets in new developments in configurations that generally match and extend the grid pattern/network of existing streets.
- Adopt design standards for streets that ensure safety and mobility for pedestrian and non-motorized modes of transport.
- Maintain and update as needed roadway design standards to manage vehicle speeds and traffic volumes.
- Limit street right-of-way dimensions where necessary to maintain desired neighborhood character.
- Implement traffic calming measures to slow traffic on local and collector residential streets and prioritize these measures over congestion management.
- Promote ridesharing and cooperate with regional travel demand management programs to reduce peak-hour traffic congestion and help reduce regional vehicle miles traveled.
- Accommodate bus service and pedestrians seeking access to transit stops through the subdivision, site plan and capital improvement plan processes.

### **Planned improvements**

Indicate areas where improvements are needed to promote efficient and continuous circulation. Map the roadway network, functional classification, “Hot Spots” and planned improvements.

### **Parking**

- Provide short-term parking in high activity areas.
- Identify shared parking opportunities.
- Reduce parking requirements around transit hubs, in town centers and for mixed-use projects.
- Allow on-street parking to count towards meeting required parking obligations.
- Encourage use of parking fees, cash-outs, or “in lieu” of transit for employers near transit.

### **Goods Movement**

Describe current goods movement network -- freight rail and truck services.

- Identify freight terminals and intermodal facilities convenient to major transportation routes of all freight modes. Identify which are within activity centers and should be re-located away from areas likely to be congested to minimize the addition of excess truck traffic. Truck terminals should be convenient to the area being served. Intermodal facilities

should be located as close as possible to major highways, roads, airports, railroads and ports so they are easily accessible by all freight modes.

- Designate priority truck routes in corridors where high-volume truck traffic exist or is anticipated.
- Designate truck stop areas to accommodate the region's need.

#### **Related Policies**

- Provide priority truck access to major freight terminals and critical points in the freight transportation network.
- Separate commercial and passenger transportation in high activity/commercial centers.
- Institute traffic calming measures for trucks, as needed.
- Time-of-day. This designates the times of day that trucks may enter an area to make deliveries; select times that will minimize conflict with highest volumes of vehicular and pedestrian activity.
- Length-of-dwell-time. Limit the amount of time trucks may remain at the delivery site. Short dwell times keep loading docks accessible and reduce congestion in and around delivery areas.
- Require off-street loading docks for all commercial, industrial and institutional buildings

- over a certain size to reduce conflict.
- Require time-managed deliveries.
- Provide appropriate design standards for roads used primarily for freight movement.

#### **Planned Improvements**

Indicate areas where improvements are needed to promote efficient and continuous circulation. Map high-volume truck routes, freight terminals and critical points within the freight transportation network with planned improvements.

#### **Guiding Policies**

- Plan, develop, and maintain a comprehensive, coordinated transportation system to ensure the safe, efficient, and convenient movement of people and goods.
- Maintain and update road standards that provide for the design, construction, operation, and maintenance of roads based on a “complete streets” concept that enables safe, comfortable, and attractive access for pedestrians, bicyclists, motorists, and transit users of all ages and abilities, in a form that is compatible with and complementary to adjacent land uses.
- Develop neighborhood streets that encourage walking, biking, and outdoor activity through sound engineering and urban design principles that limit potential speeding.

- Provide for safe and convenient pedestrian, bicycle, and transit circulation.
- Ensure the adequate provision of both on-street and off-street parking, taking into account the effect of parking management techniques on urban design, economic vitality, and walk-ability.
- Improve railroad crossings to minimize safety hazards and allow for additional capacity improvements.
- Explore instituting “Quiet Zones” in downtown or neighborhood areas.
- Provide efficient and direct circulation for local truck traffic, with minimal disruption to residential neighborhoods.
- Encourage reduction in vehicle miles traveled as part of a strategy to reduce greenhouse gas emissions.

#### **Implementing Policies**

- Ensure the zoning and land development regulations are consistent with the Master Plan's land use and circulation plan element.
- Develop regional collaborations with both neighboring municipalities and the county.
- Coordinate closely with the relevant MPO.
- Review new development proposals for consistency with the Circulation Element.
- Ensure consistency between the timing of new development and the provision of trans-

portation infrastructure needed to serve that development.

- Regularly monitor traffic volumes on local streets and, prior to issuance of building permits, ensure that there is a funded plan for the developer to provide all necessary transportation improvements at the appropriate phase of development so as to minimize transportation impacts.

#### *Additional Reading*

*Jersey City Master Plan - Circulation Plan. 2009*

*Seven American TODs: Good practices for urban design in Transit-Oriented Development projects- Journal of Transport and Land Use. 2008*

*Urban Design to Reduce Automobile Dependence, Opolis: An International Journal of Suburban and Metropolitan Studies. 2006*

*Pedestrian Information Center. 2009*

*Transportation Research Board Report 33: Transit-Friendly Streets: Design and Traffic Management Strategies to Support Livable Communities.*

## Case Studies

Concurrent with the grant to develop this guide to local circulation planning, the Office of Smart Growth awarded several towns with grants to develop their own circulation plan elements: Bridgewater, Dennis, Lodi, Newton, Metuchen and Plumsted (New Egypt). The scope of work and deliverable formats differed considerably, yet these present a snapshot of the state of local circulation planning in New Jersey today. The case studies are available as references to other municipalities interested in developing their own circulation plan elements.

All of the case study towns generally did a good job of documenting existing conditions as they affect all modes of transportation, including transit and goods movement. Various public engagement techniques were employed, such as workshops and on-line surveys. These techniques were used to supplement the technical data gathering.

All towns developed pedestrian and bicycle plans to address existing deficiencies. Bridgewater emphasized pedestrian and bicycle access to the local public schools. Lodi recommends adoption of a Complete Streets policy and trip reduction strategies. Several identified locations for traffic calming and way finding initiatives. Shared parking strategies are emphasized as well as the need to revisit obsolete parking requirements.

The importance of the circulation network is increasingly recognized, as is the need to fix missing links. Newton's plan advocates adoption of a connectivity requirement.

Transit is still generally neglected, in part because it plays little or no role in many of the case study towns. Bridgewater has a train station on the NJ Transit Raritan Valley line, yet its circulation plan has little to say about how to take advantage of this underutilized asset. Lodi's plan, on the other hand, advocates for a feasibility study of future rail passenger service on a local freight line, as well as a possible jitney service.

The links between land use and transportation are also generally under-explored. The Dennis circulation plan was linked to a broader zoning effort, and it goes further in establishing this link: it contains street regulating plans and proposed land use classifications. The Lodi plan offers some conceptual redevelopment schemes for targeted areas. And the Newton plan documents the town's efforts with redevelopment, and folds these into the circulation planning framework. But generally, these plans illustrate the profound divide that still exists between land use and transportation. Much more needs to be done to truly bring the two into alignment.

At least one case study points to inconsistencies in the state's regulatory framework. The Dennis plan – which calls for a Main Street treatment to Route 9 – runs afoul of the NJDOT Access Management Code prescriptions for this state highway. This issue is the subject of further study, but still un-resolved.

## **Chapter Seven: Tools and Strategies for Implementation**

In this section we look at the various tools and mechanisms which local governments in New Jersey have at their disposal to implement their circulation plans. Implementation is likely to require a variety of actions: some are legislative and regulatory, and can be accomplished internally by the municipality, provided there is consensus to carry them forward. Project specific implementation, on the other hand, requires funding for capital improvements, and obtaining the funding becomes a primary concern.

## Chapter Seven: Tools and Strategies for Implementation

**L**egislative, Regulatory and Administrative Actions  
Once adopted by the municipal planning board, the circulation plan element becomes an official part of the municipal master plan and, as such, the municipality's official policy with respect to transportation and circulation issues. Any proposed master plan roads or other rights-of-way, such as a proposed bikeway will go into effect, as previously described (see chapter 2).

If the circulation plan element calls for proposed new rights-of-way, it is prudent to follow it up with adoption of an official map, as previously discussed.

It is also imperative to back up those recommendations from the circulation plan element that are implemented through the subdivision and site plan review process with appropriate amendments to the municipality's land development regulations. The Planning Board and the Zoning Board cannot rely exclusively on the master plan's circulation element and enforce its recommendations in the absence of appropriate legislative provisions enacted through the land development regulations. So, for example, if the circulation plan element

calls for sidewalks with a minimum of 6 feet in width in a particular area, this standard must be reflected in the municipality's engineering standards and applicable land development regulations in order to be enforceable, and either be consistent with the RSIS in purely residential neighborhoods or have a special area standard designation from the Site Improvement Advisory Board.

Similarly, the land use part of the equation must be aligned with the circulation plan element recommendations. It is futile for the circulation plan element to express support for transit-oriented development, for example, if the land use plan element and the zoning do not back that up with appropriate zoning and appropriate densities in the appropriate locations. In the same vein, if the land development regulations do not establish bicycle parking requirements at appropriate locations, it is pointless for the circulation plan element to promote bicycling as a viable form of transportation.

One strategy for focusing attention on circulation issues is to create either a circulation sub-committee of the planning board, or a circulation advisory committee with volunteer members of the public.

- The circulation sub-committee of the planning board can dive in and tackle circulation issues in greater detail and devote the time needed to think these through, which may be difficult to do with the full board, due to its many other responsibilities and commitments. The circulation sub-committee can hold its own meetings, do the leg work, take testimony from the public and from interested stakeholders and then present recommendations, as needed, to the full board, for formal action.
- The circulation advisory committee, on the other hand, does not need to rely on appointed officials and can be entirely drawn from interested community members, and hopefully include transportation professionals who live in the community and are willing to donate their time and expertise for the benefit of the community at large. The circulation advisory committee will report back to the planning board and governing body, as needed. Some municipalities have also established more specialized advisory committees to deal with specific areas, such as bicycle and pedestrian issues, for example.

Leadership and coordination within and across municipal agencies is absolutely essential. If the community has a parking commission or



*The absence of adequate pedestrian facilities on many of our major arterials discourage many from walking and put in harm's way those that do.*

authority, it is critical that the parking-related policies of the circulation plan element be reflected in the policies and practices of the parking commission or authority. Similarly, if the community has a recreation committee, an open space advisory committee, an environmental commission, or a farmland preservation committee, it is essential that these bodies be informed and up-to-date with respect to the intentions and strategies of the circulation plan, in particular any proposed new trails on existing preserved open space, or on land proposed for conservation, either through acquisition or deed restriction. Circulation initiatives involving the school age population or Board of Education properties will require the buy-in of the School Board, and perhaps the parents and school children as well. The local police department, fire and other emergency units, traffic and safety officers and all relevant units of local government need to be informed about

the circulation plan's proposals and engaged in their implementation.

### **Funding Local Transportation Initiatives**

While some of the proposals contained in the circulation plan will come about as a result of private sector actions, for example as a result of developer contributions or transportation improvements required as part of site plan approval, many will require active public sector intervention in order to be implemented. There are a bewildering number of grant programs available for transportation projects through both federal and state agencies, as well as a variety of other sources. Since most municipalities do not have in-house capabilities to track, prepare and submit what are often complex grant applications, they must often rely on their engineering consultants or on professional grant writers to flag these opportunities and submit proposals.

Municipal planning boards are authorized under the MLUL to create a local capital improvement program (NJS 40:55D-29) at the request of the governing body. This program is for a minimum of six years and may include projects already underway as well as future projects, regardless of the sources of funding. It

should prioritize projects and provide a timeline for completion.

The capital improvement plan can be a comprehensive wish list of projects -- including transportation improvements -- for which the municipality does not necessarily have funding. It is a useful tool for the purposes of planning public and private investments, and it demonstrates to the outside world that the municipality has a plan of action that is consistent with its other planning documents. The plan can be funded through local appropriations or local bonding, as well as through third party contributions and grants.

Capital improvement plans are particularly valuable when pursuing grants or private sector contributions because they provide the donor with a clear picture of how the project for which the grant is sought fits coherently into the bigger picture, as opposed to an ad-hoc request.

One way for municipalities to capitalize and fund their capital improvement plan is through developer contributions. The MLUL allows municipalities to require developers, as a condition of site plan approval, to fund those on-site improvements, including transportation

improvements, considered necessary to adequately address the proposed project impacts.

Municipalities can also establish, by ordinance, regulations requiring developers, as part of site plan approval, to make financial contributions to pay for off-tract transportation and other infrastructure improvements (NJS 40:55D-42). This mechanism is critical in dealing with improvements that may not be fully justified by an individual development, but will be justified in light of the cumulative impacts of several developments. Based on its circulation plan and capital improvement program, the municipality must establish an equitable mechanism to calculate each developer's pro-rated share of each transportation project's cost. Instead of making the developer responsible for building the off-tract improvement, the municipality collects a fee, which is deposited in a trust fund. The fee is used to fund the improvement when it is justified.

Municipalities may also solicit from developers voluntary contributions to municipal escrow accounts dedicated to specific types of investments, including transportation improvements, if there is a rational nexus with the proposed project. Municipalities must be extremely cautious in the types of contributions they solicit,



*Speed tables and cross walks at intersections extend the pedestrian realm into the cartway and signal motorists to slow down.*

and must be careful to document the rational nexus between the proposed development project and the desired improvement.

In New Jersey local governments in rapidly growing areas can raise funding from private developers for transportation improvements by establishing Transportation Improvement Districts, either regionally or locally.

The Transportation Development District Act of 1989 (NJS 27:1c et seq) authorizes counties and municipalities to create Transportation Improvement Districts (TIDs) and levy impact fees on developers of projects within the designated TID for the purposes of funding off-tract transportation improvements. The impact fee is assessed on individual real estate development projects on a pro-rated basis and collected in accordance with an adopted plan. The lead agency is presumed to be the county, to reflect

a more regional scope. However, both the NJDOT and individual municipalities can also take the lead in the absence of a county lead. TIDs are not intended to raise funding to solve existing transportation shortcomings, only new transportation problems that would result from additional development; and they are intended to supplement, but not replace public investment in the transportation infrastructure.

TIDs have had limited acceptance at the local level because (a) New Jersey, with a few exceptions, is no longer a high growth state; (b) NJDOT rule requirements for TIDs place a high burden on local governments in terms of paperwork and due diligence; and (c) the front-end investment in assembling the traffic model required to equitably allocate the pro-rated share to individual projects can be quite expensive. Consequently, most municipalities prefer to let each individual developer shoulder the burden of the traffic studies for their particular project and tackle the impacts in a piece meal fashion, on a project by project basis.

### **Local Funding Entities**

Municipalities are able to fund all manner of transportation improvements through their general capital fund. However, in tight economic times it may be difficult for elected officials to

justify spending scarce public dollars on transportation improvements.

Local park departments often take the lead, either individually or in partnership with a not-for-profit organization, when it comes to building trails, paths and bike paths through preserved open space. These investments can be funded through the general budget, through private donations or both.

New Jersey also allows for the funding of transportation improvements through a variety of local entities, such as parking authorities, business improvement districts and urban enterprise zones. Obviously not every community has created these entities, even when eligible to do so, and it would not necessarily make sense to do so just for the purpose of funding transportation improvements. However, where these entities do exist, they can provide existing vehicles for infrastructure investments.

- Parking Authorities are authorized under NJS 40:11A-22. Their mission, as their name suggest, is to develop and manage the supply of municipal parking. However, parking authorities are authorized to undertake a broad range of activities related to parking, including building new streets and other circulation

infrastructure. Parking authorities generate their own revenue and, as such, can fund projects that are not part of the municipal budget.

- Business Improvement Districts are downtown management entities authorized under NJS 40:56-83. Their mission is to promote economic development within their designated district. Most BID's have traditionally focused on creating and supporting a vibrant downtown retail environment. However, BID's can also tackle other downtown issues,



*Providing adequate bicycle parking at key locations is a powerful sign of commitment to encouraging greater use of this neglected mode of transportation.*

such as façade renovation programs, parking and local circulation. While most BID's do not have the budget to handle capital projects, they can underwrite the soft costs of project development and apply for grants to fund capital projects.

- The Urban Enterprise Zone program is an economic development program created by the state in 1983. There are currently 32 zones in 37 municipalities. Sales tax revenues generated by businesses located in the designated UEZs are dedicated for use within the zones for economic development projects, which can include investments in infrastructure, such as roads and parking, as well as other circulation and transportation related capital investments. According to the NJDCA, where the program currently resides, more than 2,281 such projects have been approved at a value of \$774 million.

Metropolitan Planning Organizations (MPOs) – The three MPOs active in New Jersey act as a conduit for federal funding for both transportation planning projects and capital projects. The MPOs are required by federal law to develop 20-year Regional Transportation Plans, and update them on a regular basis (every three years). These plans are intended to provide the

basis and justification for all federally funded projects in the region. In order to qualify for this funding, a municipality must get its project approved and incorporated into the plan. The plan is fiscally-constrained and this process is highly competitive, so it can take years for even the most worthy projects to get funded. The plan is intended as a strategic document, so projects of regional significance are supposed to receive priority over projects of just local significance.

The technical assistance and transportation planning activities available through the MPOs is detailed in their Unified Planning Work Programs (UPWP). Municipalities seeking technical assistance or grant funding from the MPO for transportation planning must have their projects accepted and integrated into the respective UPWP, which is updated yearly.

Projects undertaken by the MPOs follow a sequential three-step process, known as the Project Development Work Program (PDWP): concept development (project scoping, public engagement), feasibility assessment (alternatives analysis and selection of preferred alternative), and preliminary design (preliminary engineering and environmental review).

Once a municipal transportation project has been accepted by the MPO, in order for it to get actually funded it must be included in the MPO's Transportation Improvement Program (TIP). At that point the project goes to final design and then out to bid for construction and execution.

Because northern New Jersey is a “non-attainment” area in terms of air quality, as defined by the USEPA, all projects included in the TIP must demonstrate a net positive impact on air quality and conform to the goals adopted in the State Implementation Plan, the state's air quality mitigation policy.

**State Funding** – There are a variety of sources for local grants and aid for municipally-sponsored transportation projects, however these vary over time, depending upon the state's fiscal capabilities. At present, many of these sources are depleted and programs sometimes change in emphasis, or are de-funded, so it is best to stay up to date and closely monitor state funding sources. Many of the funding programs – such as Local Aid, Local Aid to Centers, Transportation Enhancements, Transit Villages, Congestion Mitigation and Air Quality -- are administered through NJDOT. All are discretionary, but projects must satisfy eligibility requirements.



*Adequate bicycle parking at train stations extends the non-motorized catchment area for transit and reduces the need for car parking.*

Funding for certain local transportation projects can also be available through other state agencies – such as NJDCA (Small Cities, Community Development Block Grants) or the Casino Redevelopment Authority (CRDA).

**Congressional Appropriations** – In the past, some New Jersey municipalities have benefited from direct Congressional appropriations for local transportation projects, also known as “earmarks”. This regime is currently under renewed scrutiny and it is unclear what the future will bring.

## Conclusions

Finding funding for local transportation projects can be a very frustrating and time-consuming endeavor, particularly for the uninitiated. It requires perseverance, tenacity and a “don't take no for an answer” approach. But most of

all it requires leadership and total commitment, which is often hard to achieve for over-worked and under-staffed local officials.

In the absence of municipal professionals with experience in securing funding for transportation projects, local officials have nevertheless several options they can rely on. One is to find and mobilize knowledgeable residents who may be persuaded to do pro-bono work on behalf of the community. A second option is to engage a competent grant writer. While these professionals do not work for free, they can be extremely knowledgeable about the funding programs and the probability of receiving funding. They can help the municipality navigate the bewildering universe of public and private grant funding available, and provide strategic direction with respect to which programs to pursue.

In these trying fiscal times it is easy to get discouraged, because funding may seem so out of reach. But a compelling project that is part of a well thought out plan will have the support of those who stand to benefit and will appeal to those who are seeking to move forward a smart and sustainable planning agenda. Good projects are worth pursuing even in the most difficult times. Perhaps they need to be implemented in

phases, one step at a time. Maybe they move more slowly than we would like. But if we do not start the journey, we will never reach our destination.

#### *Additional Reading*

*Funding programs, funding levels and project selection criteria change frequently. As such, any source that seeks to compile this information will be quickly out of date. To gain the most up-to-date information regarding funding opportunities we recommend speaking with knowledgeable professionals and checking the public agency websites.*

## Annotated Literature Review: Traffic Calming, Transit Oriented Development, Pedestrian and Bicycle Plans

**Alta Planning + Design** (2005) Caltrans Pedestrian and Bicycle Facilities Technical Reference Guide: A Technical Reference and Technology Transfer Synthesis for Caltrans Planners and Engineers, California Department of Transportation. ([http://www.dot.ca.gov/hq/traffops/survey/pedestrian/TR\\_MAY0405.pdf](http://www.dot.ca.gov/hq/traffops/survey/pedestrian/TR_MAY0405.pdf))

This large manual was designed to help CalTrans staff implement measures to promote pedestrian and bicycle movement. Policies, planning approaches and specific techniques (such as Pedestrian Crossing Medians and Refuges, Mid-Block Crosswalks, Skewed Intersections, Bicycle Pavement Markings “Sharrows”, and Bicycle Boulevards) are covered by the manual.

**American Society of Civil Engineers and National Association of Home Builders** (1990) *Residential Streets* (Washington DC).

A guide for traffic engineers on the design of residential streets to control traffic, including many traffic calming strategies.

**Bailey, Linda** (2004) *Aging Americans: Stranded without Options* Surface Transportation Policy Project. With one in five Americans over 65 unable to drive, this report calls for the federal government to take a complete streets approach to transportation planning.

**Bracale, William, Abram Van Elswyk and Rodger Gutierrez** (2004) *Broadway Integration Plan*. <file://localhost/http://web.pdx.edu/~bertini/courses/454/Projects/2004/Montgomery.doc>.)

This monograph discusses alternatives to improve “cross-connectivity”. Proposes a blending of the Highway Capacity Manual pedestrian walkway level

of service and Calthorpe’s suggested density for a “lively pedestrian environment”.

**Burden, Dan** (2005) “*Ten Keys to Walkable/Livable Communities*”, Center for Livable Communities, Local Government Commission. ([http://www.lgc.org/freepub/community\\_design/articles/ten\\_keys/index.html](http://www.lgc.org/freepub/community_design/articles/ten_keys/index.html))

This brief article provides some criteria for designing pedestrian friendly environments e.g., pedestrians rarely have to walk more than 150 feet from their direct lines-of-travel to reach crossings and rarely wait more than 30 seconds to start their crossings.

**Burden, Dan and Peter Lagerway** (1999) *Road Diets Fixing the Big Roads*, Walkable Communities. (<http://www.walkable.org/assets/downloads/roaddiets.pdf>)

Discusses traffic calming projects on arterials with examples from many states.

**Burden, Dan** (2001) “*Building Communities With Transportation*”, Distinguished Lecture Presentation, January 8, 2001, Transportation Research Board, Washington, D. C. (<http://www.walkable.org/assets/downloads/trbpaper.pdf>)

Focuses on the early steps of returning towns and people to smart growth, sustainable, people-focused transportation and land use practices. Illustrates roadway conditions that affect walking, bicycling, traffic calming, transit access and street crossing.

**Calthorpe, Peter** (2002) “*The Urban Network: A Radical Proposal*,” Planning, American Planning Association.

This article proposes new street designs to create pedestrian friendly corridors.

**CMHC** (2008) *Taming the Flow — Better Traffic and Safer Neighbourhoods*, Ottawa, Canadian Mortgage and Housing Corporation. (<https://www03.cmhc-schl.gc.ca/b2c/b2c/init.do?language=en&shop=Z01EN&areaID=0000000143&productID=000000014300000030>)

This study looks at street layouts and plans needed to facilitate both walkability and the smooth flow of vehicular traffic. It highlights the Fused Grid model of street connectivity.

**Complete Streets** (2009). ([www.completestreets.org](http://www.completestreets.org)) This website supports a campaign to promote roadway designs that accommodate all users and support local planning objectives. The website has examples of designs for complete streets and ordinances for supporting them.

**Congress for the New Urbanism** (2009). ([www.cnu.org](http://www.cnu.org))

This website provides a number of presentations on context sensitive transportation and the transect as part of their transportation summits. Also, the CNU *Narrow Streets Database* ([www.sonic.net/abcaia/narrow.htm](http://www.sonic.net/abcaia/narrow.htm)) lists more flexible zoning codes for street design from a variety of communities.

**DEA & Associates** (1999) *Main Street...When a Highway Runs Through It*, Transportation and Growth Management Program, Oregon DOT and Dept. of Environmental Quality. (<http://egov.oregon.gov/LCD/TGM/publications.shtml>) This comprehensive manual provides information on identifying problems; possible solutions through

changes to Street Systems, Roadway Area Design, and Sidewalk Area Design; local revenue sources including grants and loans; as well as examples of successful projects.

**DKS Associates** (2002) *Vancouver Traffic Management Plan: Street Design to Serve Both Pedestrians and Drivers*, City of Vancouver, Washington. ([www.ci.vancouver.wa.us/transportation/ntmp/seindex.html](http://www.ci.vancouver.wa.us/transportation/ntmp/seindex.html))

The guidelines included in this manual focus on maintaining a safe and appealing pedestrian and traffic environment in a neighborhood street system using four strategies: street anatomy; traffic environment; neighborhood street design, and tools for improving the pedestrian environment.

**Dowling, Richard, et al** (2008) *Multimodal Level Of Service Analysis For Urban Streets*, NCHRP Report 616, Transportation Research Board. ([http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_w128.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_w128.pdf))

This very technical methodology provides for the estimation of a separate mean level of service for each of four modes of travel on the urban street: auto driver, bus passenger, bicyclist, and pedestrian.

**Ewing, Reid** (1999) *Traffic Calming: State of the Practice*, Federal Highway Administration and Institute of Traffic Engineers. ([www.ite.org/traffic/tcstate.htm#tcsop](http://www.ite.org/traffic/tcstate.htm#tcsop))

This monograph contains a toolbox of traffic calming measures, a discussion of legal authority and liability, and emergency response and other agency concerns and how to address them.

**Ewing, Reid, Steven Brown and Aaron Hoyt** (2005) "Traffic Calming Practice Revisited," ITE Journal, Vol. 75, No. 11 November 2005, pp. 22-28. (<http://www.ite.org/traffic/documents/IB05KA22.pdf>) An update on the 1999 report on traffic calming with results based on a survey of practices in twenty one jurisdictions.

**FHWA** (2009) *Traffic Calming Website*. ([www.fhwa.dot.gov/environment/tcalm/index.htm](http://www.fhwa.dot.gov/environment/tcalm/index.htm)) This Federal Highways Administration site provides a variety of examples of traffic calming planning.

**Florida Department of Transportation** (2001) *Multimodal Transportation Districts and Areawide Quality of Service Handbook*. (<http://www.dot.state.fl.us/planning/systems/sm/los/pdfs/MMTDQOS.pdf>)

Describes connectivity indices and other measures to assess the potential for areas likely to succeed as multi-modal districts.

**Freedman, Michael** (2005) "Restructuring the Strip" Places 17.2. ([http://www.ftscities.com/files/Restructuring\\_the\\_Strip\\_Places1702\\_0.pdf](http://www.ftscities.com/files/Restructuring_the_Strip_Places1702_0.pdf))

Describes alternatives to strip design such as Peter Calthorpe's design that splits the arterial thoroughfare around the retail center using a one-way couplet.

**Institute of Transportation Engineers** (2006) *Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities Washington DC*.

This manual is the gold standard for road design to accommodate bicycles, pedestrians, transit with cross sections and specifications for measures such as pedestrian refuges, medians, bike lanes, channelized turn lanes, etc.

**Jacobson, Justin and Ann Forsyth** (2008) "Seven American TODs: Good practices for urban design in Transit-Oriented Development projects" Journal of Transport and Land Use 1:2 (Fall) pp. 51-88. (<https://www.jtlu.org/index.php/jtlu/article/viewPDFInterstitial/67/34>)

This paper provides an in depth analysis of seven American TOD projects in terms of urban design and concludes with a discussion of "good practices" for future TOD projects focusing on development processes, place-making, and facilities.

**Kueper, Daniel A.** (2007) "Road Diet Treatment in Ocean City, NJ, USA," ITE Journal, Vol. 77, No. 2, February 2007, pp. 18-22. ([http://www.ite.org/meet-con/2007AM/Session\\_01\\_Daniel%20Kueper.pdf](http://www.ite.org/meet-con/2007AM/Session_01_Daniel%20Kueper.pdf)) Powerpoint presentation of changes made to streets in Ocean City, New Jersey and the results of those changes on traffic flow and pedestrian safety.

**Langdon, Philip** (2003) "How Traffic Calming And Context-Sensitive Design Can Improve Small Towns Bisected By State Routes" Planning, American Planning Association. Describes techniques for reclaiming a main street function for state highways through small towns in New Hampshire.

**Litman, Todd** (1999) *Traffic Calming Costs, Benefits and Equity Impacts*, Victoria Transportation Policy Institute ([www.vtpi.org/calming.pdf](http://www.vtpi.org/calming.pdf)). This report details various costs and benefits of traffic calming.

**Local Government Commission** (2009) ([www.lgc.org](http://www.lgc.org)) This website contains a variety of useful resources for neighborhood planning and traffic calming, including "Designing Safe Streets and Neighborhoods", "The Economic Benefits of Walkable Communities" and "Why People Don't Walk and What City Planners Can Do About It" fact sheets.

**Metropolitan Transportation Commission** (2006) *Routine Accommodation of Pedestrians and Bicyclists in the Bay Area*. Describes why accommodations are routinely included and why they are not as well as case studies of successful projects.

**Neighborhood Streets Project Stakeholders** (2000) *Neighborhood Street Design Guidelines An Oregon Guide for Reducing Street Widths*. (<http://egov.oregon.gov/LCD/docs/publications/neighborstreet.pdf>) A how to guidebook for municipalities to reduce street widths with chapters on including public participation in the process and very easy to read street cross section designs.

**Newman, Peter and Jeffrey Kenworthy** (2006) *“Urban Design to Reduce Automobile Dependence”*, *Opolis: An International Journal of Suburban and Metropolitan Studies*: Vol. 2: No. 1, Article 3. (<http://repositories.cdlib.org/cssd/opolis/vol2/iss1/art3>) Based on research in Australia, this article describes a “PedShed” with densities designed to replace a percentage of automobile dependence with pedestrian movement.

**City of Ottawa** (2004) *Area Traffic Management Guidelines (Draft); Appendices*, Department of Public Works and Services City of Ottawa. (<http://ottawa.ca/calendar/ottawa/citycouncil/trc/2004/10-20/ACS2004-TUP-TRF-0012%20Appendix%20A-H.pdf>)

Lays out four approaches to managing traffic to increase multi-modal movement: physical design, engineering, social design and environmental design.

**Pedestrian Information Center** (2009) ([www.walking-info.org](http://www.walking-info.org))

This website provides a wealth of technical information on pedestrian and bike planning (including walkability audits) with numerous links to bike and pedestrian masterplans as well as many visuals showing traffic calming initiatives.

**City of Portland** (2009) ([www.trans.ci.portland.or.us/Traffic\\_Management/trafficalming](http://www.trans.ci.portland.or.us/Traffic_Management/trafficalming))

Provides information and materials on Traffic Calming and pedestrian planning. The Traffic Calming Devices section provides design details. ([www.trans.ci.portland.or.us/TrafficCalming/devices/devices.htm](http://www.trans.ci.portland.or.us/TrafficCalming/devices/devices.htm))

**Public Technology Institute** (1998) *Slow Down You’re Going Too Fast, The Community Guide to Traffic Calming*. ([www.pti.org/index.php/ptiee1/inside/190](http://www.pti.org/index.php/ptiee1/inside/190)) Provides an unintimidating introduction to traffic calming.

**Ronkin, Michael** (2007) *“Road Diets: Designing Streets for Pedestrians and Bicycles”*, New Partners

for Smart Growth, Los Angeles. Detailed Powerpoint presentation with cross sections and visuals of how to restripe roads to make them more multi-modal without losing automobile capacity.

**Rosales, Jennifer** (2006) *Road Diet Handbook: Setting Trends for Livable Streets*, William Barclay Parsons Fellowship Monograph 20, Parsons Brinckerhoff. ([www.oregonite.org/2007D6/paper\\_review/D4\\_201\\_Rosales\\_paper.pdf](http://www.oregonite.org/2007D6/paper_review/D4_201_Rosales_paper.pdf))

Provides guidelines for evaluating potential candidates for road diets, and includes road designs and case studies.

#### **Sacramento Transportation and Air Quality Collaborative**

(2005) *Best Practices for Complete Streets*. Suggests standards for local collector and arterial streets for width, block length, connectivity, etc. as well as describing planning for transit and re-development in constrained right-of-ways.

**San Francisco Department of Public Health** (2006) *Neighborhood Physical Assessment Project*. ([http://www.sfpbes.org/publications/Transportation\\_publications/Tr\\_Neighborhood\\_Physical\\_Assessment\\_Survey.pdf](http://www.sfpbes.org/publications/Transportation_publications/Tr_Neighborhood_Physical_Assessment_Survey.pdf))

This article describes the design of an observational survey that identifies barriers and opportunities for walking in the physical environment. Three features are assessed: dimensions (e.g., sidewalk width vs number of roadway lanes), functionality (purpose of the feature), and aesthetics (e.g. presence of signage).

**Santa Clara Valley Transportation Authority** (2000) *Community Design and Transportation Best Practices*. This comprehensive document identifies design, transportation and regulatory standards that support and hinder best practices (e.g., rigid LOS standards that preclude higher density even if there is high transit use).

**Schaller Consulting** (2006) *Curbing Cars: Shopping, Parking and Pedestrian Space in SoHo*, Transportation Alternatives. ([www.transalt.org/campaigns/reclaim-](http://www.transalt.org/campaigns/reclaiming/soho_curbing_cars.pdf)

[ing/soho\\_curbing\\_cars.pdf](http://www.transalt.org/campaigns/reclaiming/soho_curbing_cars.pdf)) New York City ped/bike advocates website with varied campaigns including minimizing parking to allow for multi-modal use.

**City of Seattle** (1996) *Making Streets that Work*, City of Seattle. ([www.ci.seattle.wa.us/npo/tblis.htm](http://www.ci.seattle.wa.us/npo/tblis.htm)) Guidebook for residents on how to request various street improvements, including traffic calming.

**Stillings, Timothy and Ian Lockwood** (2001) *West Palm Beach Traffic Calming: The Second Generation*, Transportation Research Board Circular E-C019: Urban Street Symposium. ([www.nas.edu/trb/publications/ec019/ec019\\_i5.pdf](http://www.nas.edu/trb/publications/ec019/ec019_i5.pdf))

This article describes how traffic calming in West Palm Beach accomplished more than a reduction in speeds; it also promoted revitalization of downtown streets, hence the transition to a “second generation” of traffic calming.

**Stout, Thomas B., et al** (2006) *“Safety Impacts of ‘Road Diets’ in Iowa,”* ITE Journal, vo. 76, No. 12 December 2006, pp. 24–27. ([www.ite.org](http://www.ite.org)) Discusses findings in Iowa of greater safety that differed from previous studies in California.

**TAC** (1999) *Canadian Guide To Traffic Calming*, Transportation Association of Canada. ([www.tac-atc.ca](http://www.tac-atc.ca)) A comprehensive and technical guide to traffic calming for both transportation planners and engineers.

**Traffic Calming Website** (2009) (<http://mn-traffic-calming.org>) Prepared by the Minnesota Local Road Research Board, the website provides information on traffic calming planning and evaluation.

**Transportation for Livable Communities** (2009) ([www.tlcnetwork.org](http://www.tlcnetwork.org)) This website provides transportation and land use planning resources to create more livable communities.

**Transportation Research Board** *Report 33: Transit-Friendly Streets: Design and Traffic Management Strategies to Support Livable Communities.*

([http://onlinepubs.trb.org/Onlinepubs/tcrp/tcrp\\_rpt\\_33.pdf](http://onlinepubs.trb.org/Onlinepubs/tcrp/tcrp_rpt_33.pdf))

This monograph describes design and traffic management strategies for transit-friendly streets using five strategies: provide adequately sized sidewalks; provide amenities for pedestrians and transit riders; create priority lanes for transit vehicles; initiate traffic-calming measures for automobiles; and redesign intersections and modify signalization.

**Walkable Communities** (2009) ([www.walkable.org](http://www.walkable.org))

This website helps create people-oriented rather than car-oriented environments.

**Welch, Thomas** (2001) *The Conversion of Four-Lane Undivided Urban Roadways to Three-Lane Facilities*, Transportation Research Board Circular E-C019: Urban Street Symposium. ([www.trb.org](http://www.trb.org))

This monograph provides technical guidelines for reducing street widths and outlines financial benefits.

**Zegeer, Charles, et al** (2002) *Pedestrian Facilities User Guide: Providing Safety and Mobility*, Pedestrian and Bicycle Information Center Highway Safety Research Center, Federal Highway Administration, Publication FHWA-RD-01-102. (<http://www.walkinginfo.org/pdf/peduserguide/peduserguide.pdf>)

This guidebook describes designs for safe streets for pedestrian use.

**Zykofsky, Paul** (1999) "Why Build Near Transit?", Center for Livable Communities, Local Government Commission. ([http://www.lgc.org/freepub/community\\_design/articles/why\\_build\\_near\\_transit/index.html](http://www.lgc.org/freepub/community_design/articles/why_build_near_transit/index.html))

This brief article describes the economic and social benefits of transit-oriented development.