Design principles for mobility

Sustainable Design Principles and Practices
For Vehicle Trip Reduction and Mobility Fee Credits
ACKNOWLEDGMENTS

The study team would like to extend a sincere thanks to the City of Jacksonville Planning and Development Staff whose diligence and desire to create a better system for the City directly contributed to making this effort a reality:

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FOREWORD

The sweeping, statewide Growth Management changes enacted during the 2011 Legislative session has provided an air of uncertainty with respect to the State's role in future comprehensive planning and oversight. Despite this situation, a proverbial "Let cities be cities" mantra has emerged as the new framework and potentially offers an opportunity for local governments to be progressive and visionary in their approach to planning and development. The City of Jacksonville's adopted 2030 Mobility Plan is ahead of this curve and establishes a new paradigm for infrastructure planning, design, and implementation with a multimodal emphasis. This Plan identifies future transportation infrastructure needs, and uses a simple fee structure based on vehicle miles traveled to fund prioritized improvements throughout designated mobility zones. Unlike the previous concurrency management system, the Mobility Plan is the first effort to truly link the impacts of development to capital expenditures. Perhaps most significantly, this new approach also creates a system that is supportive of a more predictable, decision-making environment—one of the most significant variables that can make development firms uneasy about investment.

This Guide has been developed by the City of Jacksonville Planning and Development Department with a twofold purpose: (1); to document the various approaches to adjusting trip generation based on design principles, and (2); to provide examples of how the approach chosen by the City can be utilized to maximize trip reduction adjustments for a variety of development typologies. Such trip adjustments are designed to function as an incentive instrument to encourage infill development opportunities and create a built environment supportive of transportation mode choice.

Beyond representing a mere "carrot" to mobility fee reduction, there is tremendous long-term value in encouraging sustainable development opportunities for the City of Jacksonville—development which encompasses real choice in mobility and housing, provides a stronger sense of identity and character, discourages sprawl, and ultimately restores vitality to the places that are important to residents. On behalf of the Planning and Development Department, we hope you find this Guide useful to support and reward desired development outcomes.

Sincerely,

William Killingsworth, Director

“If we can develop and design streets so that they are wonderful, fulfilling places to be — community-building places, attractive for all people — then we will have successfully designed about one-third of the city directly and will have had an immense impact on the rest.”—Allan Jacobs, Great Streets
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From Concurrency Management to Mobility Planning

The City of Jacksonville’s recent and ongoing mobility planning efforts, both in response to Florida’s Senate Bill 360 and the many shortcomings of the City’s existing Fair Share system, establishes a new, comprehensive framework for transportation planning and concurrency management practices. While transportation concurrency as a policy was designed to ensure that development would ostensibly pay for itself, the system has had the effect of running contrary to many of the goals and objectives of comprehensive planning and growth management principles. Many of these unintended consequences consist of the following:

- singular focus on PM peak hour level of service for vehicular traffic only
- disregard to relationship and significance of other modes
- failure to recognize the fundamental link between supply and demand in travel behavior
- encouragement of sprawl and unsustainable development patterns
- disincentive for infill or redevelopment activities
- unfair and unpredictable mitigation (Fair Share/proportionate share) costs

Conventional concurrency practices ignore fundamental supply and demand principles in transportation and travel behavior.
The City’s Fair Share procedures for transportation funding have long been reflective of these inefficiencies and inequities. Amidst the backdrop of increasingly narrow sources of revenue and antiquated gas tax financing mechanisms, the adopted 2030 Mobility Plan:

→ Provides innovative approaches and long-term solutions to more effectively address the nexus between transportation and land use decisions. This includes the flexibility to support and fund multimodal improvements associated with future travel demand and provide an incentive for quality growth and development.

→ Works in concert with the complementary fee system to reduce leap-frog development, better deal with potential cross-jurisdictional transportation impacts, and provide equity in terms of local stakeholders sharing in the costs, processes, and impacts of transportation decisions—with the ultimate goal being a unified transportation system that promotes compact, mixed use, and energy-efficient development.

While the fee alone won’t achieve the goal of funding all of the City’s transportation needs, it represents a more equitable and predictable approach addressing the needs of transit users, bicyclists, and pedestrians that have largely been ignored under the existing Fair Share concurrency system, which focuses mainly on the automobile.

The City’s Mobility Plan specifically incorporates a number of strategies that are designed to link urban form, transportation and the multimodal environment. The fee system will enable new development to proceed following the payment of a vehicle-miles traveled (VMT)-based assessment that will be collected to fund prioritized multimodal improvements throughout designated “mobility zones” in the City. A key component of the formula includes trip adjustment parameters. These are designed to provide a credit structure to the mobility fee to reward or incentivize quality growth and development. The adjustments directly translate into a percent reduction applied to a project’s calculated daily trip generation. This is designed to encourage mixed-use as well as infill and redevelopment opportunities, enhancing the multimodal network by incorporating livable and sustainable design elements.
ITE Trip Generation Limitations

Fundamental to this consideration for a trip reduction mechanism, is the recognition of the shortcomings associated with a universal application of Institute of Transportation Engineers (ITE) trip generation and internal capture procedures for project trip estimation. While a valuable resource for traffic impact assessments, the majority of sites that are surveyed for the purpose of developing the range of per unit rates and linear equations for trip estimation (Trip Generation, 8th Edition, 2008) are based primarily on suburban locations. These sites typically reflect individual, segregated uses whose trips are by private vehicle and whose origins and destinations generally lie outside of the development. In addition, most of these sites are characterized by having little or no transit service, nearby pedestrian amenities, or travel demand management (TDM) programs to reduce dependency on private automobile travel. Most of the marketing of these sites is tied to the availability of free and abundant parking.

For mixed-use projects, ITE's current procedure for estimating internal capture, or the proportion of trips that remain within the development, provides a downward adjustment to the preliminary estimate of external trip generation. These reductions, however, also have many shortcomings:

→ The method is based upon look-up tables from a “limited number of multi-use sites in Florida” (specifically three sites analyzed by the Florida Department of Transportation, Trip Generation Handbook, 2004, p. 130). The accuracy of such a forecast is dependent upon how closely the site being analyzed corresponds to the characteristics of the three sites developed for the look-up tables.
→ The land-use types in these tables are also limited to three uses—residential, retail, and office—thus the traffic reducing impacts of other mixed uses cannot be assessed.
→ The scale of development is also overlooked. In other words, a large site with many trip productions and attractions is more likely to produce larger internal capture than a small site, but the look-up tables don’t provide higher percentages to account for this distinction.

→ The land use and transportation context of development is also disregarded. This means that a project or site with well-integrated and diverse uses, served by transit, would not be appropriately accounted for in the procedure.

The ITE manual recognizes these limitations, and accordingly, advises that users modify rates at particular sites that do exhibit the above characteristics. The desire, however, for standardization, substantial documented evidence, and general conservatism, results in a widespread reliance on the prescribed, suburban-oriented methodology. Without another mechanism or alternative methodology to appropriately account for use mix, density, location, and multimodal features, trip estimates will continue to be overstated leading to higher exactions and/or negotiated payments than should be the case. This approach will also continue to discourage desirable projects within designated infill areas and other targeted locations.

Current Research

The above shortcomings have represented the foundation of a body of literature and research on travel activity and trip generation associated with mixed use development. In 2010, the US EPA conducted research on 239 mixed-use developments in Seattle, Portland, Sacramento, Houston, Atlanta and Boston. The household surveys revealed statistically meaningful relationships between site characteristics and the amount of vehicle travel generated. These mixed-use sites were found to reduce traffic impacts (above and beyond what is typically estimated using conventional ITE internal capture look up tables) relative to single-use suburban development. This is due to the diverse on-site
activities that capture a large share of trips internally. In addition, the siting of development within walkable areas with good transit access, and central, efficient locations helps reduce trip lengths.

Additionally, other jurisdictions, particularly in California, have begun to implement new trip reduction elements tied to the benefits of density, mix of use, and design in development. Some of these include the URBEMIS model with operational measures specifically developed to address California air quality standards, San Diego Area Government’s Smart Growth Toolbox, and a variety of specific vehicle trip reduction and transportation demand management programs implemented around the Country. These efforts represent logical and tested references for Jacksonville in order to provide an incentive system for desired development. The documentation and selection of such practices and principles will, more importantly, help guide decision-makers and planners of mixed use projects on the appropriate package of design features likely to minimize traffic generation, GHG emissions, and produce a standard, replicable analysis technique to quantify the impacts of new mixed use development proposals.

“Unless developers are rewarded for the trip reducing impacts of well designed and location-efficient mixed-use projects, the market incentive to build such projects with relatively small ecological footprints is substantially removed.” –Mark Feldman, Evidence on Mixed Use Trip Generation—Local Validation of the National Survey

While it would be naive to suggest that this credit system would be the sole determining factor in the development decision-making process, Jacksonville can no longer afford a regulatory environment that discourages creating sustainable, mixed use places. This Guide will explore in greater detail principles and best practices associated with reducing vehicular travel demand and enhancing multimodal mobility, ultimately ensuring that mixed use development in desired locations will be rewarded.

Implementing Other Planning Efforts
The City of Jacksonville has a tradition of planning excellence in long-range, district and neighborhood planning initiatives. Many of these great efforts, however, have resulted too often in “plans of intent” with implementation efforts stymied because of little political and/or economic will. The recently adopted 2030 Mobility Plan provides a unique opportunity to implement the collective visions and objectives articulated in the City’s Planning District and Neighborhood Action Plans. Over the course of the past decade, the City has developed a series of local plans focused on generating everything from community revitalization and reinvestment to enhancing mobility and housing choices.

The integrated set of Guiding Principles from the most recent Vision Plans establishes a foundation for the development of specific design parameters for a mobility credit system. Major themes reinforce capitalizing on each community’s uniqueness, promoting mixed-use and infill development, providing a variety of transportation choices and encouraging economic growth, while enhancing and preserving open space. The principles and example applications will reflect a variety of place types and targeted enhancement areas identified with an eye on linking the potential fees generated by new development to mobility improvements recommended in these plans, in addition to those prioritized in the 2030 Mobility Plan. This approach is intended to create a system that can fund and support mobility throughout the City—especially in the context of long-term community objectives identified in the area Vision Plans.
Placemaking
This section will explore in detail the principles and discrete elements that collectively work together to reduce vehicular traffic generation and enhance overall mobility. First consider the following scenarios:

1. There’s a new neighborhood store near your home within walking distance. Although a few short blocks away, a long continuous dead-end street prohibits direct access. The alternative solution involves leaving the neighborhood and traversing along the adjacent arterial roadway with no sidewalks en route to make the experience safe and enjoyable. The solution is to drive to the store.

2. You’ve spent a great portion of your summer day chauffeuring your kids from school to sports practice, and then you’re picking up your elderly aunt for her doctor’s appointment. Wouldn’t it be nice if your children could walk to school by themselves and not worry about speeding motorists? Your aunt would also like to get around by herself, but she walks slowly and wouldn’t dare take a chance with impatient drivers on those wide streets.

3. The old train station used to be the real heart of downtown. As it exists today, it’s completely deteriorated and lifeless. While there is a place to sit and wait for the local bus, the experience leaves much to be desired. The adjacent storefronts have closed and trains are no more. It’s no wonder that people actually prefer to drive.

4. The neighborhood shopping district certainly isn’t what it used to be. While the new mall has grown into a bustling place, it lacks the interesting mix of people, walkability, and the commercial and community activities and character that defined your neighborhood main street. On the other hand, the last time you visited the old “main street” it was fairly bleak, especially after being widened to accommodate faster traffic and the main retailer displaced by the larger one at the mall. The intimacy and accessibility that made people like to go there are gone, and so is the sense of place.

These represent a microcosm of what many of us have become accustomed to experiencing in our everyday lives and commutes, and have come to define much of our City’s landscape. The City’s adopted Vision Plans clearly indicate a preference for an alternative approach to development and reinvestment, one that preserves and enhances existing neighborhoods and commercial centers, provides multimodal connectivity options, and improves quality of life. Much of this begins with a simple rethinking of our streets as public spaces for the ebb and flow of people and not exclusively automobiles. In many respects, simply looking to our past can provide our City with lessons on how to create lasting and valuable communities that are multimodal by nature. Whether it’s Riverside-Avondale, San Marco, and Springfield in our own backyard, or Savannah,
Charleston, or Nantucket by design, the collective and integrated elements of all these places has been reinforcing multimodal travel and mobility for over a century.

The previous scenarios also emphasize the importance of *placemaking* as it contributes to enhancing mobility. This concept is both a process and a philosophy. While it generally refers to the act of designing spaces, and in particular public spaces, that attract people because of their interesting qualities, it’s also a reflection of a community’s needs and desires about places in their lives and the potential experiences and inspiration these places offer. When thinking about what makes such places special, and in particular the important elements that contribute to the sense of place, it often comes down to form and design. In this respect, the pattern and assembly of streets, block sizes and distance, and the configuration and placement of buildings play an essential role in the outcome and quality of the transportation and mobility environment.

While a major emphasis of the City’s Mobility planning efforts is to be able to fund multimodal improvements, it is perhaps even more critical to ensure that these improvements are supported by form and design elements that will sustainably support their use. It’s quite remarkable to consider the uncomplicated, historical lessons in city-building and urban design of our American Forefathers in terms of offering great insight into how to achieve such results, even in the context of improving contemporary suburban development. Approaching development and redevelopment with a placemaking philosophy will serve to increase the likelihood that projects will be located and designed in a manner which maximizes both long term community planning goals and individual financial incentives.

*This historical Savannah map from 1818 (above) and present day, historic Riverside (right) in Jacksonville illustrates the simple assembly of streets and blocks and public squares that fundamentally contribute to pedestrian, bicycle, and transit utilization.*
Alternative Methods
Recognizing the importance of placemaking and urban design, additional mixed-use and transit-oriented development, infill and new location-efficient development (collectively referred to as Smart Growth), many jurisdictions and planning agencies across the country have begun to employ new methods to encourage these activities. While traditional tax abatements and subsidies will continue to be utilized as a financial means to attract development to urban centers and other desirable locations, a number of jurisdictions have also begun to adopt alternative methods to more accurately assess the impacts of this type of development. As discussed in the first section, current ITE-based trip generation and parking supply guidelines are based on conventional suburban development, which tend to overestimate the vehicular trip impacts of Smart Growth sites and do not generally account for the distinction between truly urban, walkable, and transit-friendly mixed-use projects and more auto-centric, suburban, development. In many locations that require impact fees or exactions tied to adequate public facilities requirements (such as transportation concurrency in Florida), this would likely impose a larger cost burden on both developers and local governments to provide more roadway and parking capacity associated with these types of projects than is necessary. Recognizing this issue, other jurisdictions are exploring the use of new tools and methods, within the development approval process. These approaches are designed to allow for an adjustment in the number of trips and/or provide additional credits specifically tied to projects that are urban or infill in nature, support complementary mixes of uses, provide safe bicycle and pedestrian access, and present real connections to transit modes. The resulting cost savings also presents a greater opportunity to reduce the impacts to potential homebuyers and renters.

Supporting Studies and Best Practices
While there is variation in terms of how the trip estimation and/or credits may be calculated or applied, the basis for most of the practices proposed in this document reflect what are known as the “D” variables, originally coined by Cervero and Kockelman (1997) as often overlooked indices of travel demand and mode choice. The three original “Ds” are density, diversity, and design. Since then, others have been added as relevant indicators including, destinations (in terms of accessibility), distances (such as to transit), demographics (concentration of employees and households within walking distance), and development scale. These are representative of the underlying framework for the select variables in the California-based URBEMIS model among other approaches discussed in this section. In the context of urban, mixed-used development projects, travel can generally be conceived as a series of choices dependent upon the extent of these “D” variables—such that a particular site’s densities, form, and/or enhanced accessibility will largely influence the probability that a traveler will remain within a development or travel outside or to walk, bike, or use transit. In summary, these major characteristics include:

→ Density: More people and jobs per acre (and/or greater jobs/housing balance) is often a fundamental planning objective of Smart Growth. This is effective at reducing VMT and increasing the mode share, especially when integrated with increased mix of uses, accessibility, and good urban design. Density also promotes infill and redevelopment, minimizing Greenfield, and exurban development.

→ Diversity: The degree of use mix is often an indicator of the jobs/housing balance, as well as the variety of retail and non-retail employment within

What is Location Efficiency?
While the concept of energy efficiency is a familiar term, locations can be efficient too. Compact neighborhoods with walkable streets, access to transit, and a wide variety of stores and services have high location efficiency. They require less time, money, and greenhouse gas emissions for residents to meet their everyday travel requirements.

The savings have been shown to add up for households and communities. Transportation costs can range from 15% of household income in location efficient neighborhoods to over 30% in inefficient locations. Greenhouse gas emissions fluctuate too, depending on household reliance on costly, carbon-intensive automobile travel. (Center for Neighborhood Technology)
walking/bicycling distance or a short driving distance. The mixing of residential and non-residential uses tends to reduce vehicle trips and VMT, and increases the likelihood of mobility choice.

→ **Design**: Development that is designed at the scale of the pedestrian will tend to be more compact and interconnected, including increased street network density and sidewalk completeness, inviting public plazas and spaces, and minimized off-street parking or parking directed to the street or rear of buildings. This increases the safety, convenience, and comfort of the pedestrian environment, yielding a walkable, urban form that is also correlated to reduced vehicle travel and VMT.

→ **Destination Accessibility**: Infill and redevelopment is by nature location-efficient development, encouraging the creation of new, vibrant activity centers near existing transportation nodes and support infrastructure, providing greater accessibility to other population and activity centers. This serves to reduce travel time and VMT, and also increases the ability to directly connect via transit.

→ **Transit Proximity**: A simple characteristic that considers the number of people and jobs within ½ mile of transit stops. If paired properly with the preceding “D’s”, this would serve to increase the number of people choosing to walk or bike to the transit service and minimize driving and parking.

**CITY OF PORTLAND, OREGON**

Collectively and cumulatively, the “D” factors have been shown to play a significant role in both trip reduction and local parking requirements in a number of locations. In the City of Portland Oregon, for example:

→ Trips are reduced an additional 5% at mixed use developments with at least 24 dwelling units per gross acre and 15% or more of the floor area devoted to commercial or light industrial uses

→ Trips are reduced 2% if 41-60% of buildings in a zone are oriented toward the street.

→ Trips are reduced 5% if 60-100% of buildings in a zone are oriented toward the street.

→ Trips are reduced 3% if the Pedestrian Environmental Factor\(^1\) (an index that indicates the quality of walking conditions in urban areas) equals 9 to 12.

→ Trips are reduced 1% if it is adjacent to bicycle path and secure bicycle storage is provided.

→ In a central business district, trips are reduced 40%, plus 12% if the Pedestrian Environmental Factor is 9 to 11, and 14% if Pedestrian Environmental Factor is 12.

**IMPACTS OF NEW URBANISM AND TOD**

A 2003 study by the National Resources Defense Council examined the impacts of Smart Growth principles and “D” variables on two Nashville area New Urbanist neighborhoods. Compared with other nearby neighborhoods, the two communities, with modestly higher density, use mix, and connectivity, yielded 25 percent less per capita VMT. The results of the study suggested that the combination of better transportation accessibility and a modest increase in land-use density can produce measurable benefits even when both sites are generally automobile-oriented and suburban in character.

\(^{1}\) A component of Portland, OR’s “Making the Land Use, Transportation, Air Quality Connection (LUTRAQ)” demonstration project in 1996 to develop methodologies for creating alternative suburban land use patterns and design standards and evaluating their impacts on automobile dependency and mobility, the Pedestrian Environmental Factor (PEF) represents a composite measure of “pedestrian friendliness” scoring parameters such as sidewalk continuity, ease of crossings, local street characteristics, and topography using a range of 4-12 (4 being the lowest and 12 being the highest) in order to improve accuracy of several transportation submodels in Portland.
A similar 2005 study of a North Carolina neighborhood found that residents generated 22 percent fewer automobile trips and took three times as many walking trips than residents of an otherwise similar neighborhood, even when controlling for demographic factors and travel preferences.

In addition, a 2008 report by the Transit Cooperative Research Program (TCRP) examining actual mixed-use, transit-oriented development (TOD) sites in metropolitan Philadelphia, Washington, Portland, and San Francisco determined that, on average, car trips were reduced by 49 percent in the morning peak period and 48 percent in the evening peak, compared to what would be expected from the standard ITE estimates typically used by municipalities.

Much of the supporting research and case studies indicated that neighborhoods with favorable density, mix, street design, and regional accessibility features typically have 20 to 40 percent fewer vehicles and vehicle trips than otherwise comparable, automobile-dependent communities.

PREVIOUS TRAVEL BEHAVIOR RESEARCH

An extensive body of literature exists on trip generation and the effects of land use and urban form on travel behavior. Much of the current research reflects the growing national interest in building data that expands upon the existing ITE trip generation rates to account for mixed-use and location efficient development within a multi-modal context. Previous research, such as that by Crane (1996), Levinson and Wynn (1963), and Cervero and Kockelman (1996, 1997, and 2002), provides a substantial assessment of the linkage between urban form and density and travel outcomes. The significance, in particular, of population and employment densities as predictors of travel behavior is nearly indisputable and perhaps the strongest predictor compared to all other built environment attributes.

A study of 28 California communities using the 1990 Census information suggested that doubling neighborhood density resulted in a 25% reduction in the number of cars and VMT per household. Studies have also found that land use mix and street patterns exert tremendous influence upon travel behavior. One study conducted in 1996 of 44 of the largest metropolitan areas in the U.S. found that having grocery stores and other consumer services within 300 feet of one’s residence tended to encourage commuting by mass transit, walking and bicycling. While another series of studies by Kulash, et.al. (1990) and Mcnally and Ryan (1992) strongly suggest that traditional grid circulation patterns with well-connected and continuous sidewalks support less driving and have been shown to reduce VMT by as much as 57 percent compared with VMT in looped cul-de-sacs and other similarly-designed street networks.

<table>
<thead>
<tr>
<th>Minimum FAR</th>
<th>Mixed Use</th>
<th>Commercial Near Bus</th>
<th>Commercial Near Station</th>
<th>Mixed Use Near Bus</th>
<th>Mixed Use Near LRT</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Minimum</td>
<td>----</td>
<td>1.0%</td>
<td>2.0%</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>0.5</td>
<td>1.9%</td>
<td>1.9%</td>
<td>2.9%</td>
<td>2.7%</td>
<td>3.9%</td>
</tr>
<tr>
<td>0.75</td>
<td>2.4%</td>
<td>2.4%</td>
<td>3.7%</td>
<td>3.4%</td>
<td>4.9%</td>
</tr>
<tr>
<td>1.0</td>
<td>3.0%</td>
<td>3.0%</td>
<td>5.0%</td>
<td>4.3%</td>
<td>6.7%</td>
</tr>
<tr>
<td>1.25</td>
<td>3.6%</td>
<td>3.6%</td>
<td>6.7%</td>
<td>5.1%</td>
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<tr>
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<td>6.0%</td>
<td>11.9%</td>
</tr>
<tr>
<td>1.75</td>
<td>5.0%</td>
<td>5.0%</td>
<td>11.6%</td>
<td>7.1%</td>
<td>15.5%</td>
</tr>
<tr>
<td>2.0</td>
<td>7.0%</td>
<td>7.0%</td>
<td>15.0%</td>
<td>10.0%</td>
<td>20.0%</td>
</tr>
</tbody>
</table>

FAR=floor area ratio, or ratio of floor space to land area; LRT=light rail transit. “Mixed Use”, in this case, means commercial, restaurants, office and light industry with 30 percent or more floor area devoted to residential. “Near Bus” or “Near LRT” means location within one-quarter mile of a bus corridor or LRT station.
Portland State University is currently conducting research in order to specifically “account for how the built environment (both land use and transportation) influences travel behavior including number of trips, trip length, mode choice, and determine trip rates that reflect the entire activity spectrum of different development/place typologies.” This important effort is designed to explore the impact of different development types on the transportation system for three primary purposes:

1. To avoid over supplying the transportation and infrastructure system for the surrounding land uses;
2. Prioritized strategies and investment options to encourage more compact, mixed-use areas with more transportation choices and
3. Avoid creating regulatory and/or financial barriers to compact form as envisioned by local, regional and statewide plans.

Parking and Transportation Demand Management (TDM) Considerations

Parking pricing strategies also have an effect upon vehicle trips. Shifting from free to cost-recovery parking (prices that actually reflect the cost of providing parking facilities) typically reduces automobile commuting 10 to 30 percent (Comsis Corporation, 1993). Shifting from free parking to a $6 daily fee in Downtown Portland was shown to reduce automobile commutes 21 percent. The elasticity of vehicle trips with respect to parking price is typically found to be -0.1 to -0.3. This means that a 10 percent parking fee increase reduces vehicle use by 1 to 3 percent (Litman, 2006). In a survey of automobile commuters in 1998 (Kuppam, et. al) nearly 35 percent stated that they would consider shifting to another mode if required to pay daily parking fees of $1 to $3 in suburban locations and $3 to $8 in urban locations. The following tables illustrate the typical reductions in automobile commute trips that result from various parking fees in various geographic locations.

<table>
<thead>
<tr>
<th>Worksite Setting</th>
<th>$1.35</th>
<th>$2.70</th>
<th>$4.00</th>
<th>$5.40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Density Suburb</td>
<td>6.5%</td>
<td>15.1%</td>
<td>25.3%</td>
<td>36.1%</td>
</tr>
<tr>
<td>Activity Center</td>
<td>12.3%</td>
<td>25.1%</td>
<td>37.0%</td>
<td>46.8%</td>
</tr>
<tr>
<td>Regional central business district/corridor</td>
<td>17.5%</td>
<td>31.8%</td>
<td>42.6%</td>
<td>50.0%</td>
</tr>
</tbody>
</table>

Vehicle Trips Reduced by Daily Parking Fees in Various Locations (2005)

Of course the effects of pricing on parking and trip reduction are dependent upon the particular situation and context including price structure, quality of parking and alternative modes provided at the location, demographics, and enforcement. Furthermore subsidized or underpriced parking is a market distortion that violates basic principles of economic efficiency, which require that consumers should be able to decide whether or not to purchase a particular good, and that prices reflect full marginal costs. Paying for parking facilities indirectly is unfair and inefficient because it fails to reward consumers who reduce the parking costs they impose.

Transportation Demand Management (TDM) policies and programs, which encourage more efficient travel behavior, can be implemented as an alternative to road and parking facility capacity expansion. Examples of these strategies include, but are not limited to, such measures as: ridesharing, flexible work hours and telecommuting, tolling and congestion pricing, and enhanced bicycle and transit-supportive facilities. TDM affects land use indirectly, by reducing the need to increase road and parking facility capacity, providing incentives to businesses and consumers to favor more accessible, compact development with improved mobility choices. Other management programs, such as commute trip reduction programs (formal programs that give commuters resources and incentives to reduce their automobile trips), can also reduce affected automobile trips by 10 to 30 percent compared with what would otherwise occur. According to Litman (2006) “Smart Growth, in and of itself, can be considered the land use component of TDM, and TDM can be considered the transportation component of Smart Growth.”
Parking Management Options

Parking “cash out” programs provide commuters who would typically be offered subsidized parking at their workplace the cash equivalent of the “free” parking space, encouraging employees to use alternative transportation or transit. The program was enacted as law in California (§43845), applicable only to employers with 50 or more employees in non-attainment air quality basins, after studies showed that cash allowances in lieu of parking subsidies increased alternative means of travel improving air quality and reducing congestion.

“Unbundling” is another tool that allows the price of a parking space, typically included as part of the monthly lease of an apartment or condominium purchase, to be separated from the cost of the unit. This allows the developer to construct fewer parking spaces associated with residential units and increases affordability. Moreover, the option provides potential buyers or renters the economic choice of purchasing a parking space or not, especially if they do not own a car and use alternative transportation.

In North Brunswick, NJ, in an effort to reduce commute traffic along congested routes during peak hours, the town adopted a mandatory program whereby businesses with more than 50 employees would be required to promote ridesharing, park and ride usage, and offer preferential parking for participants. The program is annually monitored through employer-sponsored travel surveys and includes a $500 per month fine for non-compliance.

King County, WA, through its “Commute Partnerships Program”, enacted as state law in 1996, developed partnerships with nearly 425 employers in the area to reduce single occupancy vehicle trips. The County shares employers’ initial contribution to fund such measures as subsidies for transit, vanpooling, carpooling, and bicycling and walking. The program has resulted in a 40 percent reduction in drive-alone commuting at the participating work locations.
The following matrix provides a useful summary of the most effective principles and methods that influence both mobility outcomes and population health, in terms of promotion of walking and/or bicycling.

**Design and Programmatic Factors Influencing Travel Outcomes**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Definition</th>
<th>Travel Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>People or jobs per unit of land area (acre or hectare).</td>
<td>Increased density tends to reduce per capita vehicle travel. Each 10% increase in urban densities typically reduces per capita VMT by 2-3%.</td>
</tr>
<tr>
<td>Diversity or Mix</td>
<td>Degree that related land uses (housing, commercial, institutional) are truly mixed. Not to be confused with &quot;multi-use&quot;, this would refer to the extent that complimentary land uses are contained in the same building.</td>
<td>Increased land use mix tends to reduce per capita vehicle travel, and increases use of alternative modes, particularly walking for errands. Neighborhoods with good land use mix typically have 5-15% lower vehicle-miles.</td>
</tr>
<tr>
<td>Regional Accessibility (&quot;Destinations&quot;)</td>
<td>Location of development relative to regional urban center.</td>
<td>Improved accessibility reduces per capita vehicle mileage. Residents of more central neighborhoods typically drive 10-30% fewer vehicle-miles than residents of more dispersed, urban fringe locations.</td>
</tr>
<tr>
<td>Centeredness</td>
<td>Portion of commercial, employment and other activities in major activity centers.</td>
<td>Increased centeredness increases use of alternative commute modes. Typically 20-50% of commuters to major commercial centers drive alone, compared with 80-90% of commuters to dispersed locations.</td>
</tr>
<tr>
<td>Connectivity</td>
<td>Degree that walkways and roads are connected and allow direct travel between destinations.</td>
<td>Improved roadway connectivity can reduce vehicle mileage, and improved walkway connectivity tends to increase walking and cycling.</td>
</tr>
<tr>
<td>Roadway design and management</td>
<td>Scale, design and management of streets.</td>
<td>More multi-modal street design and management increases use of alternative modes. Traffic calming tends to reduce vehicle travel and increase walking and cycling.</td>
</tr>
<tr>
<td>Walking and Cycling environment</td>
<td>Quantity and quality of sidewalks, crosswalks, paths and bike lanes, and the level of pedestrian security.</td>
<td>Improved walking and cycling conditions increases non-motorized travel and can reduce automobile travel, particularly if implemented with land use mix, transit improvements, and incentives to reduce driving.</td>
</tr>
<tr>
<td>Transit quality and accessibility</td>
<td>Quality of transit service and degree to which destinations are transit accessible.</td>
<td>Improved transit service quality increases transit ridership and can reduce automobile trips, particularly for urban commuting.</td>
</tr>
<tr>
<td>Parking supply and management</td>
<td>Number of parking spaces per building unit or acre, and how parking is managed.</td>
<td>Reduced parking supply, increased parking pricing and increased application of other parking management strategies can significantly reduce per capita vehicle travel. Cost-recovery parking pricing (charging motorists directly for the cost of providing parking) typically reduces automobile trips by 10-30%.</td>
</tr>
<tr>
<td>Site design</td>
<td>The layout and design of buildings and parking facilities.</td>
<td>More multi-modal site design can reduce automobile trips, particularly if implemented with improved transit services.</td>
</tr>
<tr>
<td>Mobility Management</td>
<td>Various programs and strategies that encourage more efficient travel patterns.</td>
<td>Mobility management policies and programs can significantly reduce vehicle travel by affected trips. Vehicle travel reductions of 10-30% are common.</td>
</tr>
</tbody>
</table>

*Litman, 2006*
CALTRANS TRIP GENERATION RATE STUDY

In 2009, the California Department of Transportation (CALTRANS) conducted a two-phase research project to establish a database of empirical trip generation studies for various types of infill development, to standardize data collection and analysis methodology, and to coordinate the findings with the Institute of Transportation Engineers (ITE) for a future publication. Field surveys were conducted at a number of urban infill sites in California in order to develop rates and a database for common infill land use categories to supplement the existing ITE trip generation data.

The preliminary data collected from 27 sites; including those in San Francisco, Berkeley, Oakland, Los Angeles, Santa Monica, Pasadena, and San Diego, indicate that the observed trip rates were generally lower when compared to established ITE rates. Although some individual buildings were equal or higher than the established ITE rates, the weighted average observed rates of the residential sites was 27 to 28 percent lower than the ITE rates. For the non-residential sites, the weighted average of the observed rates was 26 to 50 percent less.

While the data collection efforts were postponed in early 2009 as a result of the impacts of the economic downturn on the validity of the trip generation data, the study does begin to formally establish the beginnings of an urban infill trip generation database that could be used in lieu of conventional, suburban rates. More research will be needed to test additional locations in order to confirm and establish potential rates for wider use.

US EPA STUDY & MIXED-USE METHOD (MXD)

A recent national study conducted by the US Environment Protection Agency, in response to the limited offerings of the current ITE Trip Generation Handbook, developed a new methodology to more accurately predict the traffic impact of mixed-use developments. This study evaluated household travel surveys from 239 mixed-use developments in Seattle, Portland, Sacramento, Houston, Atlanta, and Boston. Each of the sites varied in population and employment densities, land use mix, presence or absence of transit, and location within a particular region.

The study found statistical relationships between site development characteristics and the amount of vehicle travel generated based on the use of Hierarchical Linear Modeling (HLM). More importantly, the model produces an equation that more accurately predicts the amount of driving that a development will create and corrects the deficiencies of outmoded, suburban-based equations.

This model, called MXD (for “mixed-use development”), is specifically designed to predict the probabilities of travel choices which can result in the reduction of external vehicle trips to and from a mixed-use development. In this study, each of the seven “D” variables (as described previously) was tested for their ability to predict the travel characteristics of mixed use sites, including models for the choice of internal destinations, choice of walking or bicycling, and choice of transit. The model-generated probabilities were combined with the “raw” ITE rates to predict a “net” number of trips made to and from the particular mixed-use site by private vehicle. The results indicate a very strong correlation between the impacts of the “D” variables and the reduction in private vehicle trips. More importantly, the results were also validated in 22 additional sites in Florida and California by comparing with field traffic counts.
SAN DIEGO ASSOCIATION OF GOVERNMENTS (SANDAG)

In 2010, the metropolitan planning organization for the surrounding San Diego region (SANDAG) adopted the MXD methodology and guidelines as an update to the previous San Diego Traffic Generators Manual. Its report Trip Generation for Smart Growth: Planning Tools for the San Diego Region provided guidelines to local jurisdictions regarding the adjustments of trip generation rates and parking demand associated with Smart Growth developments. The method is also under review by the Institute of Transportation Engineers for wider adoption, and is undergoing evaluation by panels of experts and practitioners in California as part of a study to assess its acceptability for use in development reviews required under state law. The SANDAG Smart Growth Concept Map provides place type thresholds (including specific sites known as Smart Growth Opportunity Areas, or SGOAs) with minimum residential, employment, and transit service targets, and applies the MXD method to 57 specific SGOAs as a means to ground-truth the model in the San Diego region. Based on the results of the analysis, it was shown that the method estimated and observed an average vehicle trip reduction of 24 percent relative to the standard approach and ranged as high as 47 percent in Downtown San Diego.

The study is also accompanied by an interactive spreadsheet tool applying the MXD method to assist users in calculating trip reduction rates at specific sites or larger planning areas in California. It is made available to local jurisdictions if they choose to utilize it as part of the development approval process. The spreadsheet can be fully completed by the user inputting their own data, or data can be provided by the SANDAG Service Bureau for a fee. The data needed to perform the trip adjustments are all examples of one or more of the “Ds” that are known to influence travel behavior. This data includes:

The scatter plot above compares the predicted trips of the MXD model to actual observed trips of 22 sites in California and Florida, with the dashed line representing a perfect prediction. The relatively small scatter indicates that the model does an accurate job of predicting net external trips, accounting for the “D” characteristics.
Site-Specific Information:

- Land Area (of project site in acres)
- Number of Intersections
- Is Transit (Bus or Rail) Present Within the Site?
- Number of Dwelling Units or Population (separated by single family, multi-family)
- Retail KSF or Employment (separated as specifically as possible)
- Office KSF or Employment (non-medical and medical if possible)
- Industrial KSF or Employment (light industrial, manufacturing, or warehouse if possible)
- Hotel, Motel, Movie Theater (rooms, rooms, and screens)
- School (by number of students for University, High School, Middle School, or Elementary)
- Miscellaneous Trips (any special generators or anticipated trips not captured above)

Surrounding Area Variables (assumptions can be developed via a GIS database or travel demand model if necessary):

- Is the site in a CBD or TOD? (Central Business District or Transit-Oriented Development)
- Employment: Local (within one mile of the project, but not including the project)
- Employment: Regional (within a 30 minute transit trip including the project)

Information Attainable From Census or Other National Data Sources (but site-specific is always better if available):

- Average Vehicles Owned Per Dwelling Unit
- Average Household Size (by dwelling type is best)
- Jobs per KSF (retail, office, light industrial, manufacturing, warehousing, misc. uses)
- Jobs per Unit (hotel room, movie screen, student)
- Trip Purpose Splits (home-based and non-home-based splits per land use type and time period)
- Average Trip Lengths (external trips from home-based and non-home-based trips. Not needed to compute vehicle trip reduction, but can be used to estimate VMT as a secondary result.)
In 2005, Nelson/Nygaard Consulting Associates developed a mitigation component of a model developed for California air quality control districts to calculate the expected air quality impact of development proposals. Recognizing the limitations of relying solely on the published ITE trip generation rates for estimating traffic associated with higher density, mixed-use development, the URBEMIS tool enables trip adjustments to the standard ITE rates—functioning as a ‘plug-in’ to standard traffic study methodology.

Through a joint effort between the state’s air quality control districts and Department of Transportation examining all of the data influencing trip generation, a series of formulas were adopted which provide vehicle trip reductions and related emissions outputs based on key locational, design, and programmatic factors (the majority of which represent the universal “D” variables). Most importantly, this model provides an opportunity for jurisdictions to “reward” those developments that are located close to transit service, incorporate higher density and use mix, walking and bicycling features, affordable housing, parking management and pricing, transit service discounts, and other TDM programs. The inclusion of such measures, collectively, can provide significant reductions relative to the base ITE trip generation estimates.

### URBEMIS Trip Reduction Components

<table>
<thead>
<tr>
<th>Physical Measures</th>
<th>Residential (1)</th>
<th>Non-Residential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Residential Density</td>
<td>Up to 55%</td>
<td>N/A</td>
</tr>
<tr>
<td>Mix of Uses</td>
<td>Up to 9%</td>
<td>Up to 9%</td>
</tr>
<tr>
<td>Local-Serving Retail</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Transit Service</td>
<td>Up to 15%</td>
<td>Up to 15%</td>
</tr>
<tr>
<td>Pedestrian/Bicycle Friendliness</td>
<td>Up to 9%</td>
<td>Up to 9%</td>
</tr>
<tr>
<td>Physical Measures subtotal</td>
<td>Up to 90%</td>
<td>Up to 35%</td>
</tr>
</tbody>
</table>

#### Demand Management and Similar Measures (require specific commitments through development agreement)

| Demand Management subtotal (4)                         | Up to 7.75%     | Up to 31.65%    |

Notes:
1. For residential uses, the percentage reductions shown apply to the ITE average trip generation rate for single-family detached housing. For other residential land use types, some level of these mitigation measures is implicit in ITE average trip generation rates, and the percentage reduction will be lower.
2. Only if greater than sum of other trip reduction measures.
3. Not additive with other trip reduction measures.
4. Excluding credits for parking supply and telecommuting, which have no limits.
The trip reduction measures represent operational mitigation components of the larger URBEMIS model, which can be used to calculate expected air quality impacts nationwide. The model is currently in widespread use by air quality districts and other planning agencies in California and other states. While the URBEMIS software package includes the ability to also provide construction and area source emissions data, the operational mitigation components and related equations can be included as a separate worksheet directly linked with a jurisdiction’s standard trip generation and internal capture spreadsheet. The key factors for trip reduction capture the environmental setting, or the character of the surrounding neighborhood, and those measures added by the proposed development.

The recommended area of analysis includes a ½ mile radius surrounding the project or the entire project area, whichever is larger. The analysis is suitable for a variety of locations and development typologies ranging from smaller, infill projects to larger, multi-use projects. The following table summarizes the available URBEMIS mitigation measures and possible trip reduction percentages for both residential and non-residential sites. The key “D” characteristics include net residential density, diversity or mix of uses, level of transit service and bicycle and pedestrian friendliness. In addition, the presence of local serving retail (“destinations”) is also important as it represents a determining factor in the choice to drive off site or walk or bike or use transit for services and accounts for the overall jobs-population balance.

**Physical Measures**
As mentioned, high net residential density provides one of the strongest correlations with reduced automobile use. The density formula provides the greatest weight among each of the physical variables in terms of trip reduction. Projects with higher household densities are provided a greater trip reduction percentage than those with lower densities.

The mix of uses/local serving retail components are designed to capture the possible availability of services within a ½ mile walking distance of the site, based upon an ideal jobs-housing balance of 1.5 jobs per household.

An index of transit service is also calculated via a formula that is designed to capture the amount (frequency and service span) and quality of transit service (speed) factors which generally predict the degree of ridership. While a greater weight is given to rail or dedicated shuttle service modes within ½ mile of a site, the frequency of bus service within ¼ mile of the site is also included.

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**“Ideal” Land Use Mixing**
Conventional zoning practices and the dependency on automobile travel have contributed to the largely segregated activities within the urban realm. The blend of non-residential and residential uses locates trip attractions within a more comfortable walking distance of homes and is an almost necessary precondition for walkability and active, pedestrian streets. “People are also more likely to walk when there are specific and nearby places to go,” as Christopher Alexander puts it in his seminal work, “A Pattern Language”.

There are many views on what makes an “ideal” land use mix. As a general rule the following breakdown is a good starting point and has been shown to be particularly supportive of transit and TOD development:

- **Housing:** 20-60%
- **Commercial/Offices:** 30-70%
- **Public/Open Space:** 5-15%
Finally, the bicycle/pedestrian service index is based upon three important variables including: intersection density (a measure of street connectivity), sidewalk completeness, and bicycle network completeness. Trip deductions of up to 9 percent are available with this measure assuming an intersection density of 1,300 legs per square mile (roughly a dense grid network with four way intersections every 300 feet). While other factors such as motor vehicle volumes and speed, roadway widths, urban design, and the extent of separation between pedestrians and vehicles are also significant factors, the inputs required for such would overcomplicate data collection and may dramatically change following development or occupancy.

The URBEMIS tool provides maximum possible values for each of the physical design measures. To achieve the maximum reduction, for example, a development would typically need to be constructed at 160 units per acre, include the maximum level of transit service, the best possible use mix and local-serving retail, and have a bicycle/pedestrian factor equivalent to complete sidewalk and bicycle lane coverage within a compact grid of blocks no longer than 300 feet per side. This would result in an 81 percent reduction from the average single-family home trip rate. While the spreadsheet formulas associated with the design and density variables enable a possible 90 percent reduction, such an outcome would only be possible with densities nearing 380 units per acre, three times the average density of San Francisco’s Chinatown, for example.

**Density Considerations**

In some cases, the residential densities of particular projects being evaluated may be so low that the URBEMIS-based spreadsheet model will result in a negative trip reduction percentage. In such instances, it is advisable to adjust the trip adjustment calculation to zero out the result if negative so that trips are not added to a project’s net daily external trip estimation. The customary internal capture, pass-by, and/or diverted link adjustments may still be applied to such projects, but would not receive any of the trip credits as a result of the physical design and density measures.

Recognizing the impact of density on trip reduction outcomes, proposed residential projects in suburban and rural areas that typically represent low density, single-family subdivisions with segregated outparcels of commercial/retail are likely to receive little if any credits. In such scenarios, projects should consider clustering their development plans around neighborhood commercial centers and providing additional open space or conservation easements. This could enable projects on large tracts of land which are preserving vast portions of property to open space to have this acreage removed from the density calculation. This would greatly increase the opportunity for design credits. For example if a project that consists of 5,000 acres proposes to incorporate higher density, mixed use villages over only 2,500 acres, with the remaining as dedicated open space, this amount should be removed from the units/acre denominator.
The above left concept illustrates conventional suburban design on a large, greenfield site. By contrast, the use of creative development and clustering of the same number of units and non-residential square footage on the same site can result in greater internal trip capture while also preserving community character and valuable open space. (Courtesy of Randall Arendt’s “Rural By Design—Maintaining Small Town Character”)
Other Demand Management or Similar Measures
The tool also permits additional, discretionary trip reduction measures such as the inclusion of affordable housing, the amount of free/priced parking, availability of transit passes, or other transportation demand management programs. As discussed previously, parking pricing can exert a tremendous influence on vehicle trips (in many cases yielding 10 to 30 percent reductions) depending on the amount charged. Parking cash out and “unbundled” parking programs are other effective tools that can encourage transit use and expand mobility options. These can also minimize the amount of land area that would otherwise be devoted to parking based on typical ratio requirements. The only valid and measurable way, however, for these to be included as variables within the scope of a trip reduction program would be to adopt some sort of legally-binding development agreement with a jurisdiction at least prior to issuance of Certificate of Occupancy (COA). Since TDM is fundamentally programmatic and relies largely on voluntary participation, a binding agreement would serve to guarantee that such measures would be implemented by the developer.

Selected Approach
The City of Jacksonville’s 2030 Mobility Plan references the use of a “trip reduction adjustment procedure” as a means to reduce a development’s mobility fee, provided the development meets specific design and location criteria to support both alternative transportation use and reduced vehicle miles traveled. The transportation element of the City’s Comprehensive Plan also includes specific policies that support trip reduction assessments, particularly the establishment of non-motorized transportation and transit-based networks throughout the City as well as pedestrian-oriented design elements as per the Downtown Master Plan.

The basic principles of the mobility fee and supporting credit/adjustment system are designed to support a variety of transportation modes; reduce VMT and generated vehicle emissions; promote compact and interconnected land development form; and improve the health and quality of life for the City’s residents.

As discussed, the fee system also provides a unique opportunity for the City to implement the mobility-related Guiding Principles established by the adopted Vision Plans, while encouraging developers to capitalize on the benefits of infill and redevelopment at specific locations identified in the Plans.

The URBEMIS model captures the most effective design principles which have been shown to influence mobility choices, but is also flexible enough so as to not circumvent the City’s established trip generation and internal capture methodologies. Rather the tool adds depth to the City's procedures, providing a “super internal capture” element to the final trip estimation that would more objectively account for the effects of the surrounding neighborhood and proposed development characteristics.

The City’s mobility fee approach is designed to capture the relationship between location and VMT. Part of this framework includes the establishment of Development Areas (as shown in the following “Mobility Fee Development Areas” Map) with corresponding average trip lengths. There are five Development Areas which represent the general spectrum of the built environment of the City from higher densities in the Downtown core to the lower density outer suburban and rural areas towards the edge of the City’s limits. The average VMT of each development area is shown on the following:

<table>
<thead>
<tr>
<th>Development Area</th>
<th>Average Trip Lengths (VMT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Downtown Development Area</td>
<td>9.09</td>
</tr>
<tr>
<td>2) Urban Priority Area</td>
<td>9.24</td>
</tr>
<tr>
<td>3) Urban Development Area</td>
<td>9.46</td>
</tr>
<tr>
<td>4) Suburban Development Area</td>
<td>10.28</td>
</tr>
<tr>
<td>5) Rural Development Area</td>
<td>12.27</td>
</tr>
</tbody>
</table>
A fixed, City-wide cost per VMT has been established as a part of the fee formula. This cost was determined based upon the calculated growth of VMT between 2010 and 2030 as a denominator of the estimated City-wide transportation and mobility infrastructure project needs identified in the Mobility Plan. Based upon the current estimate of transportation projects, this cost is $24.31.

It is expected that every five years the Plan and component cost per VMT will be adjusted to reflect updated transportation improvement needs and costs and/or changes in VMT.

The base, quantitative formula, for the purposes of estimating a developer’s mobility fee for the transportation impacts generated by a proposed development, equals:

\[
\text{Mobility Fee Formula} = A \times B \times (C - \text{trip reduction adjustments})
\]

The following section “Application of Principles to Development Typologies” provides sample calculations for a number of development typologies.
The Credit Framework
In addition to the standard internal capture, pass-by, and/or diverted trips that are subtracted from a development’s gross daily trip estimation, the design-based variables of the URBEMIS model serve as the additional layer of possible trip reduction adjustments. An adjustment may also be credited to the gross daily trip estimation in order to account for the number of trips associated with an existing use. The City presently provides credit for the number of trips associated with existing or historic uses (such as previous uses located on vacant or abandoned sites) in the context of redevelopment.

In addition, a TDM credit can also be applied at the discretion of the City. This percentage reduction is contingent upon the proposed demand management program to be implemented by the developer.

Based upon the case study review provided in this section, a range of 5 to 30 percent is recommended, with the higher reductions based upon the combination of features such as priced parking, employee cash out options, and/or formal commute trip reduction programs established through a development agreement.

For example, if a developer proposed a new mixed-use project on an existing commercial strip or office location, the developer would be credited the amount of daily trips associated with the existing use. The developer would thereby only be subject to paying a fee associated with the trips that are above and beyond what the existing use generated. If the developer also proposes a formal commute trip reduction or other approved TDM option, a credit associated with such program will also be applied. In terms of the entitlement benefits of redevelopment, the combination of these credits along with the URBEMIS-based trip adjustments could result in a scenario under which no mobility fees are imposed to the developer. Section 3 tests a number of scenarios using these procedures to illustrate the potential costs associated with different development typologies and locations.

Notably, the average VMT of each development area within the fee formula represents a type of credit or incentive in and of itself. As such, proposed development that is within or in proximity to Urban and Downtown Areas that generates less VMT would potentially be assessed a reduced mobility fee.
(depending on the use) comparable to what might be assessed if located in the Suburban or Rural Areas (with higher VMT). This approach captures the intent of location efficiency, serving to reward development that is located in desirable locations with existing infrastructure.

As is the case with ensuring that potential TDM measures are fully implemented to receive trip reduction credits, a development agreement may also need to be drafted to provide surety with respect to adjustments associated with density and/or employment, for example. Such an agreement may include provisions for periodic site plan review or employment verification after issuance of Certificate of Occupancy (COA) to make certain that credits were applied appropriately.

### Mobility Credit Banking System

In particular cases of redevelopment, the combination of the number of vehicle trips associated with an existing or historical use, high internal capture, and the URBEMIS-based trip reduction and/or TDM credits may result in a net surplus of daily external trips. Such instances are more likely to occur with high density, mixed-use redevelopment proposed on sites that are currently generating an equal or higher number of vehicle trips, such as shopping centers or other auto-oriented uses. These results illustrate how the “D” variables of the URBEMIS model work to provide a greater amount of credits to such projects. The advantage in these cases is twofold:

One, it clearly provides a fiscal incentive to explore the right location for infill and redevelopment and two, it reinforces the City’s Vision Plan Guiding Principles and overall sound planning objectives. As such, the real potential for a market-based incentive to redevelopment could result.

It is clear that certain locations and development typologies will likely have greater opportunities than others for surplus outcomes. In this respect, development areas and mobility zones that are benefiting from catalyst redevelopment as a result surplus trip opportunities should not be able to transfer potential surplus trips to other zones for financial benefit. For example, this would avoid projects in remote Suburban or Rural Development areas which do not incorporate the appropriate design and density elements to benefit from surplus trips associated with projects and locations in other zones which do demonstrate recommended design practices in order to offset their mobility fee costs. This procedure will also better ensure that mobility fees generated in the area can be spent on capital improvement projects that are directly related to the impacts of the corresponding development activity and continue to further redevelopment incentives.

Chapter 655 of the City’s Ordinance Code, “Concurrency and Mobility Management System”, outlines the procedure for credits associated with trip reduction adjustments. For capital improvement project consistency and rational nexus purposes, any surplus trips shall be transferred only between projects within the same development area and same mobility zone. The potential transfer of these surplus trips to another project within the same development area and mobility zone will occur at the time a potential recipient project enters into a new Mobility Fee Contract. This contract memorializes an agreement between the City and landowner regarding the arrangement of credits and/or payment schedule for a phased development pattern.
Marketing and Monitoring Vehicle Trip Reduction

The City’s mobility fee and credit framework, as a replacement for the complex and often “unfair” fair-share concurrency system, offers a more transparent and easily understood methodology in the context of the entitlement process. More importantly, it provides a means to fund and support multimodal travel.

While it exists as one component of the overall concurrency system, (i.e. parks and recreation/water/sewer/schools, etc.) it presents the Planning and Development Department with a unique opportunity to begin to develop and market an overall Vehicle/Commute Trip Reduction Program. Such an initiative would work to encourage more efficient commute travel throughout the City, providing commuters resources and incentives to use alternative modes. The program would also directly support the mobility fee credit system, by encouraging awareness of walking, bicycling, transit use, and other TDM strategies that may indirectly encourage redevelopment activities.

In addition, recognizing that impact fees are often viewed negatively by the market as a regulatory barrier to development, actively promoting the benefits of such a program and the incentives available in a collaborative manner may reduce such negative perceptions and/or eliminate the adversarial environment that can characterize development approval processes. An important part of this strategy includes the development of partnerships, with public and private entities, to develop a range of tools and demonstrate leadership to foster buy-in.

The development of such programs that can be feasibly adopted by private businesses, such as telecommuting or parking management, will also provide the opportunity to establish additional mobility fee credits (i.e., Demand Management Measures). Specific strategies that warrant consideration through partnering with agencies and businesses include:

→ Dissemination and periodic updating of information on all available transit services to and from the worksite
→ Advertising, promoting and making available for purchase on the worksite any programs offered by transit authorities
→ Use of social media such as Facebook to promote and create awareness of program
→ Employer sponsored shuttle service to transit stops
→ Recommendations to individual employees of employee-specific travel options to reduce VMT
→ Incentives and assistance for bicycle commuting including secure parking facilities, shower/changing facilities, and education and training programs
→ Coordinating, facilitating and providing subsidies for employer-sponsored rideshare programs
→ Preferential parking for carpool and vanpool
→ Employer-paid transit/vanpool programs where the employer provides at least $30 per month, for example, in benefits or the full value of commuting costs
→ Expanding opportunities for alternative work schedules including telecommuting, compressed work weeks and/or flexible schedules to facilitate ridesharing
→ Elimination or reduction of parking subsidies for single-occupant vehicles
→ Parking “Cash Outs”
While formal adoption of such a program is not required, implementation of such would positively contribute to the City’s goals and objectives supporting a reduction in VMT and related emissions through the use of alternative transportation mobility options.

In recent years there has been an emphasis in performance-based planning for the purpose of demonstrating measurable outcomes of policy initiatives. The monitoring and evaluation of the mobility fee program represents a valuable and necessary step to ensure effective performance.

According to the adopted Mobility Plan, the Planning and Development Department will conduct review and analysis of the Plan every five years, assessing the impact of mobility-related strategies and multimodal improvements to ensure positive Plan outcomes. This includes, but is not limited to, reduced VMT, increased accessibility, the mitigation of multiple transportation deficiencies, and the promotion of sustainable development. Such review will assist in the establishment of priorities and ranking of projects while also supporting future land use element goals and objectives. The mobility fee credit system and related components provides the City with additional tools to effectively monitor the short and long-term influence of design and programmatic impacts on mobility, as well as the placemaking and the quality of life elements that are most important to a community.
Streets, Blocks and Buildings

While the previous practices and case studies provide substantial evidence linking design and density to reduced vehicle travel, it can really be simplified into those historic lessons of the past and starting with the streets! Central to placemaking, and particularly walkability, is the simple assembly of streets, blocks, and buildings. These elements of the urban environment are perhaps the most deterministic of real choice and experience of mobility—namely providing a safe and comfortable option to travel via foot, bicycle, and/or transit. In other words, how each of these are collectively scaled and configured will also determine the extent of both mobility support and credit maximization that results in a substantial mobility fee reduction.

The following section outlines many of the general principles of streets, blocks, and buildings (reinforcing the relationship between public and private spaces) that can work to increase development incentives and most importantly, the sense of place and quality of the built environment.

STREETS

Streets, in recent decades, have been designed as spaces to move through, rather than places to purposefully come to. The street should not be seen as a dividing line among communities, but rather places and passageways facilitating economic and social interactions, along with providing a means to travel. In this sense, the street can provide a better balance among users of all modes. As the “bones” of our communities, streets have the tremendous capacity to support development activity that is mixed, interconnected, and likewise supportive of enhanced mobility: Simple elements such as the patterns, hierarchy, configuration, and detail of streets often determine how walkable or bicycle-friendly a given place may be. A single street should be part of a larger street network that is well-connected and supports continuity of movement within the overall network to encourage concentrated activity centers and mixing of uses.

Streets are also generally classified according to the volumes of vehicles. This approach works against the creation of transit-supportive, walkable places because the resulting design of such facilities favors larger rights-of-way and higher speed limits. In this sense, the land use context should be determined first followed by street design in order to better accommodate all forms of mobility. Vertical elements, including buildings and landscaping and other elements influence the character and scale of streets, including the speed of traffic. Right-of-way widths should be proportionally related to the adjacent building heights and the numbers of lanes balance vehicle flow and pedestrian crossing considerations.

The above graphic illustrates contrasting approaches to connectivity and mobility support. The left scenario is generally not conducive to walking or bicycling, as one is forced to use the higher speed arterial to access school or shopping opportunities. The left also increases vehicular congestion on the arterial network as there are minimal access and egress points.

While the previous practices and case studies provide substantial evidence linking design and density to reduced vehicle travel, it can really be simplified into those historic lessons of the past and starting with the streets! Central to placemaking, and particularly walkability, is the simple assembly of streets, blocks, and buildings. These elements of the urban environment are perhaps the most deterministic of real choice and experience of mobility—namely providing a safe and comfortable option to travel via foot, bicycle, and/or transit. In other words, how each of these are collectively scaled and configured will also determine the extent of both mobility support and credit maximization that results in a substantial mobility fee reduction.

The following section outlines many of the general principles of streets, blocks, and buildings (reinforcing the relationship between public and private spaces) that can work to increase development incentives and most importantly, the sense of place and quality of the built environment.

STREETS

Streets, in recent decades, have been designed as spaces to move through, rather than places to purposefully come to. The street should not be seen as a dividing line among communities, but rather places and passageways facilitating economic and social interactions, along with providing a means to travel. In this sense, the street can provide a better balance among users of all modes. As the “bones” of our communities, streets have the tremendous capacity to support development activity that is mixed, interconnected, and likewise supportive of enhanced mobility: Simple elements such as the patterns, hierarchy, configuration, and detail of streets often determine how walkable or bicycle-friendly a given place may be. A single street should be part of a larger street network that is well-connected and supports continuity of movement within the overall network to encourage concentrated activity centers and mixing of uses.

Streets are also generally classified according to the volumes of vehicles. This approach works against the creation of transit-supportive, walkable places because the resulting design of such facilities favors larger rights-of-way and higher speed limits. In this sense, the land use context should be determined first followed by street design in order to better accommodate all forms of mobility. Vertical elements, including buildings and landscaping and other elements influence the character and scale of streets, including the speed of traffic. Right-of-way widths should be proportionally related to the adjacent building heights and the numbers of lanes balance vehicle flow and pedestrian crossing considerations.
Ultimately, to ensure that streets encourage multimodal use, some of the major guiding principles in design include:

- Minimized block radii to slow cars down at intersections and allow pedestrians to cross streets relatively quickly;
- Landscaped medians to reduce the apparent width of streets; (allow for pedestrian refuge)
- Two-way (versus one-way) streets that improve pedestrian crossing safety;
- Reduced lane widths to, for example, 10 or 11 feet;
- Street vehicle speeds that are compatible with adjacent uses, such as 25 to 30 mph (or better yet, establish design speeds equal to posted speeds);
- Removal of “free” right-turn lane slips, unless a refuge island is available;
- Properly designed curbs and sidewalks at intersections that accommodate the impaired;
- On-street parking to protect pedestrians from the actual and perceived danger of moving traffic;
- Conceiving the street corridor as a center of activity rather than a barrier to activities on either side
- Adoption of a Complete Streets or Context-Sensitive Design Policy

**BLOCKS**
The traditional block provides the nexus between the building fabric and the public realm of cities. Block size and configuration also plays a tremendous role in facilitating walkability and when designed at the appropriate scale, provides for a mutually beneficial relationship between people and vehicles within an urban space. The shorter the length of a block, (ideally 250 to 500 feet) the more pedestrian-friendly a place is generally. A grid of relatively short blocks also allows single buildings to easily reach the edges of blocks at a variety of densities and directs parking to be located away from the sidewalk to the street. City blocks also define the community’s fabric and character. A rectangular or square block can accommodate a variety of lot widths and depths, which influences the range of building types and densities. The longer and more irregular the block, the less likely that the building envelope will be close enough to the setback line to define any sense of enclosure which would serve to calm traffic and increase pedestrian and bicycle mobility. Finally, regularly planted trees along blocks establish the overall rhythm and scale of the street as well as that of the sidewalk. Landscaping attributes along blocks affect light, temperature, and views, which ultimately contribute to an individual’s experience of place—and whether walking is a comfortable and safe option.

**BUILDINGS**
Buildings fundamentally express the importance of our public shared institutions and improving the daily working and home life of a community. For all practical and symbolic purposes, they represent the permanent fixtures in the landscape and the city. A building’s configuration and placement on a lot and its relationship to other buildings and the street not only determines the character of a particular site or settlement, but also greatly influences the degree of balanced, safe, and comfortable mobility. While use, to a minor degree, plays a role in determining the nature of access and whether it is safe for walking or bicycling (i.e. a large, truck-dependent warehousing facility with direct connection to a major highway), this element has regrettably outweighed the importance of design and form. It has also been the driving force...
behind most zoning and land development regulations. This has resulted in fragmentation and disconnection of parts of a city or community from each other. By contrast, buildings designed and organized by reference to their type and not solely their function, employing common architectural features, will enable adaptive changes in use over time without compromising form and making them obsolete. **Density and form** of buildings should prioritize neighborhood and/or district context, emphasizing predictable and physical outcomes versus abstract standards and floor area ratios (FAR) which favor buildings as exclusive and singular objects.

There is also a mutual dependence between the built form and the landscape form. The relationship of buildings to the street and public realm is reciprocal. The extent of building frontage to the public realm emphasizes the character of streets and open spaces within a block and greatly influences the mode and volume of travel.

In the context of the City’s Mobility Plan and Fee system, how a developer approaches a particular site in light of these considerations can greatly influence both mobility and entitlement outcomes. For example, a developer may decide to redevelop an existing, underutilized, strip shopping center in an area of established neighborhoods served by well-connected sidewalks and transit service. A site plan proposal could replace much of the vacant existing parking lot with new street and block interventions to accommodate higher density, mixed-use buildings. The plan could also incorporate greater connectivity to adjacent centers and the neighborhood via multi-use paths; the numerous existing curb cuts along the adjacent arterial may be replaced by safer and efficient shared access points; the buildings may be designed to front the newly constructed blocks establishing a greater sense of arrival and enclosure. Each of these new design attributes can work to increase mobility, achieving desired community planning goals, and may substantially reduce transportation-related exactions.
The following series (Courtesy of Steve Price) shows the transition of an arterial roadway “tamed” by traffic calming techniques, including a “road diet,” (reduction or conversion of traffic lanes for safety and aesthetics) as well as other urban design strategies embodying the “Streets, Blocks, and Buildings” principles creating a more walkable, livable, mobility-friendly environment.

1. Existing Conditions

The existing automobile- driven “Main Street” is improved with public investments in sidewalk and access management improvements, raised medians, landscaping and lighting to calm traffic and begin to create enclosure and a sense of place.

2. Road “Diet” and Public Streetscape Enhancements

Private buildings and investment follow the public improvements with increased densities and diversity of uses oriented to the street. The improved street and block elements create a “come to” versus “move through” environment. This better supports a balanced mobility system that accommodates bicyclists, pedestrians, and vehicle traffic.

3. Additional Public/Private Investment and Vibrant Multimodal Environment
This example of before and after photos illustrates the transformation of an existing, underperforming shopping center, or “greyfield” location into a new, walkable, main street.

1. Existing Conditions

The existing auto-oriented shopping center is improved with a combination of mixed-use, multi-story redevelopment and landscaping, lighting, and on-street parking. The proposed “street intervention” within the existing parking lot establishes the framework from which to create the mobility-supportive environment.

2. New Infill Mixed-Use Development and Streetscaping on Existing Parking Lot

The initial improvements catalyze additional infill development along the adjacent blocks, with increased densities and diversity of uses oriented to the street. The replacement of the existing big box stores on the right with sidewalk-oriented mixed use development provides a great example of how a developer can also achieve additional density-based mobility fee credits.

3. Further Infill Development
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APPLICATION OF PRINCIPLES TO DEVELOPMENT TYPOLOGIES

Development Place Types and Locations

The previous section offered a range of approaches that have been shown to provide vehicle trip reductions. The physical design measures and corresponding equations within the URBEMIS model provides a user-friendly trip reduction framework that can easily be linked to the City of Jacksonville's current trip generation and internal capture methodologies. To illustrate the value of the system to the development community and local planning agencies, this section will explore a number of locations and place typologies throughout the City to determine the effects of the design variables and location-efficiencies (as measured by the average trip lengths per Development Areas) on vehicle trips and resulting mobility fees. Place typologies are a useful way to describe the scale and character of different development patterns, be they various forms of residential neighborhoods or shopping centers. Typologies can also be used to describe the scale and type of development at an even higher level such as the corridor or district. As it relates to mixed use development, typologies can provide a common language for decision-making in the context of development outcomes. This approach enables a wider audience to understand key development decision points related to idealized scenarios and real-life places within their community at the same time. The urban-to-rural transect has become a practical tool to illustrate planning and street design, recognizing that there may be a range of development scales, uses, and forms depending on the local and regional land use context and the transportation modes, service and accessibility.

In the context of the City's Development Areas, a basic range of place types that describe the general scale and character of the variety of development patterns within the City can be best categorized according to the following categories beginning on page 34. Recognizing that there is no "one size fits all" approach to

Portland’s TOD Station Area Typologies

Not all markets in a region, no matter how many cool looking plans have been created, are ready for more urban types of development. Portland's approach shows what types of investments are suitable for the different types of places that exist in their region. Every place is ready for some type of investment, but doing a specific plan for each one could be time consuming and result in lot of money spent needlessly. By mapping urban form and transit orientation against the market strength of a transit district, a typology of place and investment types emerges. The value of this plan is to show where investments should be targeted that will actually move the market in the right direction.

Courtesy of Reconnecting America: People, Places, Possibility.
→ **Metropolitan Centers (Downtown Development Area):** The Central Business District (CBD), or the region’s primary business, civic, commercial, and cultural centers, such as Downtown Jacksonville. These areas usually consist of mid to high-rise residential, office, and commercial buildings, with high levels of concentrated employment and numerous transportation services and/or hubs. The areas also draw heavily from throughout and beyond a particular region’s borders.

→ **Urban/Town Centers (Urban Priority/Urban Development Areas):** Characterized as a major, sub-regional business, civic, commercial, and cultural centers, such as Southpoint or the St. Johns Town Center, for example. Other potential, transit-oriented sites, such as large, older, underutilized shopping centers (i.e., Town and Country/Regency Square Shopping Malls) that could be redeveloped at a scale to accommodate greater intensities and regional demand may also be included. Building types represented often include low to mid-rise residential, office, and commercial. The areas typically have medium to high levels of professional and service employment that draws from both the immediate area and throughout the region. Like Metropolitan centers, such areas could support high frequency corridor and transit lines (such as Bus Rapid Transit or Commuter Rail Service) and related TOD development, but are typically served by high frequency local bus and shuttle service.

→ **Community/Neighborhood Centers (Urban/Suburban Development Areas):** Such areas are generally inclusive of low-rise residential, office, and commercial buildings. Housing and neighborhoods are generally within walking or biking distance to transit stops, typically served by local bus service. In Jacksonville, such areas are typically auto-oriented and include strip shopping centers with outparcels and/or smaller office and commercial employment that draws from nearby communities and neighborhoods. However, mixed-use sites such as Tapestry Park, which exhibit transit-supportive design features for new development, are also represented.

→ **Rural Villages (Rural Development Area):** These are communities typically located in the outer suburban or rural areas that consist of largely residential (single-family) and limited low-rise employment buildings that draw from nearby rural/suburban areas. They may have a concentrated local road network that supports a “main street” village, with increased density and mix of building types that could support local transit service. Such areas in Jacksonville may include the Dinsmore or Bayard areas or the ICI Rural Village Planned Unit Development.

→ **Special Use Centers (All Development Areas):** Generally consist of dedicated employment areas consisting of medical, educational, or industrial-based facilities, including a variety of low, mid, or high rise buildings. They are typically characterized by one type of non-residential land use that draws from throughout a region or sub-region. The Jacksonville International Airport and nearby distribution centers, University of North Florida, and Baptist Medical Center Complex, represent such place types.

Other typologies can be used to describe the range of development patterns at a smaller scale. This is designed to illustrate the assembly and form of particular uses such as single family neighborhoods or shopping centers within a particular area or district. Depending on the development area context there may be a variety of shopping types potentially represented where the design and user experience is reflective of the mobility context. For example, most of the conventional shopping centers in suburban areas are typically single-use, commercial strips with or without outparcels dominated by free and abundant parking. The design and accessibility of such uses mutually support the automobile as the main mode of transportation. Other modes such as walking or transit are possible, but not generally supported, given the lack of density, distances to other uses, and the infrastructure designed to support vehicle traffic.

Shopping place types such as the more urbanist Tapestry Park or Riverside Market Square Publix Plaza still support vehicle accessibility and parking but are designed at a more “human scale” with walkable and transit-oriented densities and greater mix of uses to create a balanced mobility environment. The graphics beginning on page 36 illustrates a range of shopping center typologies within Jacksonville from single-use, auto-oriented sites to more walkable locations and designs.
While placemaking is a vital part of enhancing mobility, keep in mind that not every place is a “Place”. In many districts and neighborhoods within the City it may be quite obvious to tell what building types and forms are appropriate, but there are other areas where it’s less clear what “form” is evident. Such areas may include large acreages of parcels in non-prime suburban locations, low density industrial zones, as well as environmentally-constrained redevelopment sites. Within many of these locations there is little or no surrounding context where an existing fabric is discernable and where a spectrum of future possible forms exists.

Key elements of city-building and placemaking, including a focus on streets, blocks, paths, edges, nodes, and districts, are quite valuable and also serve as a reminder that not every place within the City deserves equal attention. While the City could decide on and establish a preferred cafeteria of suitable building and place types for these fringe and or non-prime locations, it is not clear that it should. The best strategy may be to apply place type and form standards on those areas with the greatest potential for density, walkability, and transit-oriented development patterns.

Large big box retail and grocery stores can also be redesigned to fit a variety of place types to infuse local or neighborhood context elements and also support balanced mobility outcomes. The Congaree Vista District Publix in Columbia, SC (left), the Riverside Market Square Publix (middle) and the Downtown Orlando Publix (right) show that successful grocery stores can be designed uniquely to fit neighborhoods, with mix of uses, limited surface parking and buildings oriented to the street.
Conventional, single-use suburban strip center with parking oriented to front and vehicle access generally provided by one or two driveway openings off high speed arterial.

Larger community or subregional shopping "power center" with outparcels, dominated by free and abundant parking. While such sites are often within walking or biking distance to residential uses, the transportation environment and design speeds do not support the safe access of these modes.

Urbanist, mixed-use retail center newly constructed in suburban with angled on-street parking and directly adjacent to multi-family residential units in rear. Directly accessible, by walking or biking to regional employment center.
**Older, commercial district within comfortable and direct walking distance to established, single and multi-family residential neighborhood**

**Creative approach to conventional grocery store-anchored shopping center, employing variety of commercial uses adjacent to street and directly accessible to high density residential and transit options.**

**Downtown retail shopping place type, generally employing greatest amount of density and use mix.**
With respect to maximizing potential trip reduction credits, it is expected that the lower-density, single-use sites would receive the lowest percentage reduction in external vehicle trips. The proposed density of a particular site accounts for the greatest impact on the trip reduction outcome, followed by the use mix and the corresponding transit and bicycle and pedestrian environment. The individual test sites in this section represent both hypothetical locations and development pro formas in addition to actual sites that are in various stages of development. This exercise will illustrate the credit differences and corresponding mobility fees that could be expected in light of the influence of the “D” variables.

**Test Site 1:**

**Town and Country Shopping Center (Hypothetical Mixed-Use Redevelopment)**

Located in the Arlington area at 903 University Boulevard North, the Town and Country Shopping Center was constructed in 1953 as a multi-tenant shopping center. This shopping center currently has over 203,658 square feet of existing retail space on a 19.21 acre parcel. Currently there are three outparcels including a McDonald’s restaurant, a BP Gas Station and a Vystar ATM facility.

The property has direct frontage along University Boulevard, and access from the Arlington Expressway to the immediate south. According to available real estate information published in August of 2009, the shopping center is “located with easy access to more than 200,000 residents within 5 miles and has over 106,000 square feet of vacant space ready to lease with occupancy of 48%.”

The City of Jacksonville’s Vision Plan for Greater Arlington and Beaches prepared by Zyscovich Architects in 2009 has identified the Town and Country Shopping Center as a prime location for redevelopment. The Vision Plan identified the site as ideal for mixed use development, especially given the site’s proximity to established neighborhoods and Downtown. The site can provide convenient retail as well as entertainment for the residents as well as adjacent neighborhoods. The Vision for the redevelopment plan calls for a pedestrian-friendly environment that is connected to adjacent schools and neighborhoods. Along the back edge of the site a parking structure is envisioned to accommodate residents and visitors. A major transit hub serving the development along University Boulevard is also contemplated in the Vision Plan. The images to the left and right illustrate the existing footprint and how the site could be potentially redeveloped transforming an underutilized shopping center into a true urban gateway into the District.

The redevelopment plan illustrated for the existing Town and Country Shopping Center also strongly supports the the City’s Vision Plan Guiding Principles as specifically referenced in the Greater Arlington/Beaches Vision Plan.
Under the mobility fee scenario, the hypothetical redevelopment plan for Town and Country consists of 600 mid rise apartment units, 300,000 square feet of commercial retail, and 200,000 square feet of office park. (For all projects, this information is input into the City’s trip generation model which is then linked to the corresponding URBEMIS worksheet model). Based on the analysis, the proposed household density is approximately 30 units per acre. As discussed, this variable yields the greatest influence on trip reduction and as such provides a 36.9% trip adjustment.

As shown in the following mobility fee table, the combination of project use mix and the multimodal features within ½ mile of the Town and Country Shopping Center boundary provides an additional 13% credit, yielding a total design-based trip reduction adjustment of 50%. This percentage is applied to the 874 net external trips, inclusive of the existing trips associated with the existing 203K shopping center, and the internal capture, pass-by, and diverted link trips deductions. This results in 437 trips that would be eligible for the mobility fee. In addition, the site may be eligible for a TDM credit, implemented through a development agreement, which would provide an additional trip reduction.

Applying the $24.31 cost per VMT and the average trip length of 9.24 miles due to the project’s urban priority development area location, the estimated fee is $98,116. For the scale of the development, this is a marked decrease in what would have been paid under the City’s current Fair Share scenario. Even after applying the existing use trip credit, the estimated gross Fair Share assessment is $1,385,661 as a result of the need to mitigate the two failing links of University Boulevard (from the Arlington Expressway north to Arlington Road) and the Mathews Bridge Expressway (from University Boulevard to the Haines Street Expressway). This example highlights the strong influence of the design based principles and the local area land use and transportation context on reducing trips at a high density development. More importantly, it illustrates the added community value of transforming an older, underutilized suburban shopping center into a vibrant destination supporting a variety of mobility choices.
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Development Plan, Credits, and Mobility Fee

Town and Country Shopping Redevelopment (20 ac):
- 600 m.f. dwelling units
- 300k s.f. commercial
- 200K s.f. office

Gross Daily Vehicle Trips (with 6,716 existing use trip credits) = 9,690
Net External Trips (w/ Internal Capture/Pass By/Diverted Link) = 874
Trip Reduction % = 50.02%
URBEMIS-based Trip Adjustment = 437
Subtotal (Mobility Fee Eligible Trips) = 437
TDM Credit (if applicable) = 0
Net New Trips (Mobility Fee Eligible Trips) = 437
Cost Per VMT = $24.31
Average Trip Length (Miles) = 9.24
Est. Mobility Fee = $98,116.34
Test Site 2: Pecan Park/I-95 Multiuse Development (Hypothetical Greenfield Development)

As a hypothetical comparison to the Town and Country redevelopment site, the same development pro forma was applied to the currently vacant northwest quadrant of I-95 and Pecan Park Road. This location, on the Northside of Jacksonville north of JIA, consists of three parcels totaling 127 acres held in separate ownership. The two smaller parcels directly adjacent to the interchange are currently zoned commercial (CCG-1), while the larger, adjoining parcel to the immediate west is zoned planned unit development (PUD) with a business park (BP) land use. The site is directly between the I-95 corridor to the east and the adjacent, 527-unit Bainebridge Estates single family development to the immediate west. In addition, its general proximity to the International Airport and the River City Marketplace regional shopping center to the south, make the site well-suited for a variety of potential development types including, residential, office and retail. Entitlement history indicates that the area was largely programmed for industrial park use with a mix of retail/commercial.

Whether attributed to current, industrial market realities or other economic factors, the site currently has no development activity outside of timber production. Regardless of the intended use or current entitlement status, the purpose of this exercise is to illustrate the difference in mobility fee outcome relative to the potential Town and Country redevelopment use. Under this illustration, it is assumed that the hypothetical, multi-use development plan is spread over the three parcels as a single PUD.

Notably, the most recent Fair Share associated with the larger, PUD parcel was estimated at $998,073 for 1.2 million square feet of warehousing use only. While this assessment was reduced following the enactment of the City’s industrial incentive ordinance (relaxing transportation concurrency standards for such uses) it is assumed that a
much higher Fair Share would result under the hypothetical development plan.

From a trip generation perspective, a minor difference in daily external trips occurs as a result of the conversion of the 600 mid rise apartment units at the Town and Country location to 300 low rise apartments and 300 condominium units. This change was to account for the relatively low density characteristics of the area, recognizing that urban-scale, mid to high-rise apartments would likely not be suited to this context. However, the 200,000 square feet of office park, and 300,000 square feet of commercial remain the same. A major advantage provided to Town and Country is the existing use trip credit.

When applying the URBEMIS-based mitigation factors, a comparatively modest reduction in vehicle trips occurs with the Pecan Park site. This is largely attributed to the substantial difference in densities among the two locations, with Pecan Park yielding 4.62 units per acre (compared with 30 units per acre at Town and Country). This provides a 6.79% density-based reduction in external vehicle trips. In addition, given the lack of transit service, virtually no measurable bicycle/pedestrian connectivity, or any local serving retail, the site receives no credits for such variables. This case assumes that no TDM credits have been applied to the site, recognizing that transit service to the area is non-existent. The combined trip reduction adjustment is 14.86% based on the planned use mix and modest densities. Factoring in the location’s average trip length of 10.28 miles applied to the fixed cost per VMT, the estimated mobility fee is calculated at $2,101,407 under the proposed scenario. While it remains to be seen how the PUD or the adjacent commercial parcels will develop, incorporating additional densities, interconnectivity and multimodal provisions may contribute to additional design-based or TDM trip adjustments.
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Test Site 2: I-95/Pecan Park Multi Use Center

Development Plan, Credits, and Mobility Fee

I-95/Pecan Park Multi Use Center (130 ac):

- 600 m.f. dwelling units
- 300k s.f. commercial
- 200K s.f. office

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Daily Vehicle Trips</td>
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<tr>
<td>Net External Trips (w/ Internal Capture/Pass By/Diverted Link)</td>
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<td>Trip Reduction %</td>
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<td>USBEMIS-based Trip Adjustment</td>
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<tr>
<td>Subtotal (Mobility Fee Eligible Trips)</td>
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<tr>
<td>TDM Credit (if applicable)</td>
<td>0</td>
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<tr>
<td>Net New Trips (Mobility Fee Eligible Trips)</td>
<td>8,409</td>
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<tr>
<td>Cost Per VMT</td>
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</tr>
<tr>
<td>Average Trip Length (Miles)</td>
<td>10.28</td>
</tr>
<tr>
<td>Est. Mobility Fee</td>
<td>$2,101,407.11</td>
</tr>
</tbody>
</table>

Legend:
- I-95 / Pecan Park Boundary
- Half Mile Buffer
Test Site 3: St. Johns Town Center (Existing “Power Center” Retail Development)

To highlight the application of the trip reduction factors to a recently developed suburban retail location, the St. Johns Town Center DRI was selected. This 207-acre open-air lifestyle center, owned by the Simon Property Group, opened in March 2005. Located at the northwest corner of J. Turner Butler Boulevard and State Road 9A project construction is estimated at $158 million and includes more than 100 retailers, many of whom used the development as an entry into the Jacksonville market. The second phase of retail may include upscale stores such as Nieman-Marcus and/or Nordstrom. As such, the project development plan at build-out will consist of approximately 2 million square feet of retail, 330,000 square feet of office, 450 multifamily units, 250 hotel rooms, and a 500 seat movie theatre.

From a transportation concurrency standpoint, the DRI is part of an established transportation management area (TMA) under the auspices of a private landowner. Under this arrangement, any transportation-related impact fees are paid by the prospective developer through a private agreement between the developer and the landholder. The City draws the resulting trips down following the execution of the development agreement and reserves these trips under its concurrency management system. Based upon the DRI development agreement in 2001, the proportionate share was calculated at $13,339,378 in cash payments and funded transportation improvements to offset the transportation impacts of the DRI, including those to J. Turner Butler Boulevard, State Road 9A, and Southside Boulevard.

When applying the URBEMIS-based mitigation factors under the mobility fee scenario, a negligible reduction in vehicle trips occurs with this site. This is also largely related to the low density characteristics of the area. The 450 multifamily units over the 207 acre parcel yields a net negative density-based credit because of this. While the site receives nominal credits for mix of uses, the presence of local serving retail, and bicycle and pedestrian accommodations, the overall lack of
residential density and use mix reduces the overall trip reduction. This case assumes that no TDM credits have been applied to the site recognizing that current frequency of transit service is very low. As proposed, the combined trip reduction adjustment is 3.48%. Under the proposed mobility scenario, the estimated payment is a comparable $13,815,804 based upon the 55,284 net, daily mobility fee-eligible trips.

While the southern portion of the St. Johns Town Center provides, to some extent, an urban and pedestrian orientation, the overall project design could be further modified to capitalize upon the three “D’s” and receive additional trip reduction credits. The lack of housing within a safe and comfortable walking distance to available employment combined with the domination of free and abundant parking particularly at the northern shopping area, promotes an autocentric quality to the site. Examples such as CityPlace in West Palm Beach and Mizner Park in Boca Raton, offer alternative design and programmatic approaches that could be incorporated into future phases of the Town Center. Such truly mixed-use design and density elements within these projects have resulted in the creation of new, vibrant, walkable places offering a “live/work/play” environment that continues to be in high demand among growing demographic segments—particularly Millennials and downsizing Baby Boomers. These projects have also substantially increased adjacent real property values.

The residential component of Cityplace includes over 2,300 residential units built since 1994. Additionally, over 10,000 new residential units have been built within a one mile radius of the site within the last 12 years. Cityplace includes a wide variety of housing types ranging from affordable three-story garden apartments on the east side of Central Expressway to luxury high rise units and townhouses on the west. Over 1,400 apartments have been built on the west side of the site in buildings ranging from four stories to twenty stories. Roughly 60% of the
apartments are within mixed-use buildings and 40% are in stand-alone apartment buildings.

The mixed-use, Mizner Park town center clearly demonstrates how suburban communities can create vital downtowns by redeveloping abandoned shopping centers. Crocker and Company worked with Boca Raton’s Community Development Agency to replace the failed shopping mall with a 28.7-acre mixed-use project that includes 272 homes, a public promenade and park, retail shops and restaurants, 262,000 square feet of office space, a movie theater, and a museum.

The success of Mizner Park has sparked other cities in Florida to convert their under-performing shopping malls into new town centers. Mizner Park would likely receive substantial trip reduction credits under this mobility fee credit system based upon redevelopment and the ability to capitalize upon a dense residential context. In addition, this project provides a great reference for the potential redevelopment of the Town and Country Shopping Center, converting the underused shopping mall into a new mixed use center, removing a blighted property and helping to revitalize the surrounding community.

Mizner Park in Boca Raton provides a successful example of “Dead Mall” redevelopment. From the short-lived Boca Raton Mall (above) to its immensely popular transformation (below), this illustrates a typology that would receive substantial trip reduction benefits under the proposed mobility credit system. (Courtesy of Ellen Dunham Jones’ “Retrofitting Suburbia”)
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Test Site 4: ICI Rural Villages (Approved Planned Unit Development)

To test a proposed, master planned community in the designated Rural Development area of the City of Jacksonville under the mobility fee scenario, the ICI Rural Villages PUD was selected. The site is located on 5,520 acres in the southwest portion of the City of Jacksonville approximately 1.7 miles south of I-10 with direct frontage on U.S. 301. This large, vacant tract has been rezoned and reclassified from a predominant agricultural and silvicultural district to a planned unit development-satellite community between 2006 and 2010. The project master plan was based on both the criteria for a “Rural Village” as documented the Southwest Vision Plan and “a combination of conventional and traditional master planning principles.” The development plan, as proposed, consists of approximately 15,000 dwelling units, 750,000 square feet of regional retail/shopping, 300,000 square feet of office park, as well as two school sites and other community support amenities.

The site is intended to consist of multiple residential villages connected directly to one or more neighborhood centers with a mix of civic and commercial uses. Over 1,500 acres of the site has been set aside for conservation and open space purposes, which provides a negligible density credit of 3.84%. However, it does not benefit substantially under the overall package of available design and transit-based credits of the URBEMIS model. The site’s remote location, low density, and lack of adjacent development and multimodal context results in an overall trip reduction of 4.85%

Under the Fair Share scenario, the gross assessment was estimated at $5,843,668 in 2007. This is reflective of minimal roadway capacity improvements warranted given the lack of congestion and/or constrained facilities within the specified traffic impact area. Using the revised mobility fee methodology and credit system, the development would be assessed $39,471,792. This number is substantially higher based on the amount of daily external trips generated and minimal internal capture as a result of the amount of proposed residential development. While in this case it is also assumed that no TDM component is included, even if such a credit of 5 to 10 percent maximum was applied through a development agreement, the fee would be minimally reduced.

This example continues to illustrate the importance of high density, jobs/housing balance, and the frequency and characteristics of the transit and pedestrian environment in order to maximize the URBEMIS-based trip reduction credits. In order to increase credit opportunities under this example, clustering the proposed villages over a smaller area and providing a greater mix of use within proposed neighborhood centers would result in additional open space preservation and increase the density variable by excluding such lands from the calculation.
Test Site 5: Thomas Creek (Approved Regional Activity Center)

Thomas Creek Village is a 1,093 acre parcel located on Lem Turner Road approximately two miles north of I-295 in Jacksonville, Florida. The property is currently owned by Transworld Investment Corporation and was originally entitled for approximately 2,600 residential units. The original development plan has been adjusted to reflect the current residential market downturn to include the following uses: 319 acres of warehouse distribution uses or approximately 4.9 million square feet; 180 acres or approximately 672 units of single family residential; and 33 acres of general office/commercial uses, including 93,000 square feet of office and 26,000 square feet of retail.

The warehouse, office and commercial parcels will be accessed from Lem Turner Road on the east side of the property. This access point is adjacent to lands with industrial and commercial land uses that are within ½ mile of the cargo entrance to Jacksonville International Airport. The residential development is buffered from the other uses by large wetland areas and would be accessed from Braddock Road on the west side of the property. The area surrounding this access point is largely low-density residential in nature.

Based upon the latest information provided by the City, this project was assessed a Fair Share contribution of $4,047,697 for adjacent roadway improvements. This amount is slightly less than what would be assessed under the mobility fee system. As can be shown in the following table, the resulting mobility fee is estimated at $5,922,337 and includes no trip adjustment credits. While the project receives a notable 6.51% reduction in trips associated with the proposed use mix, the gains are offset by the substantial reduction in single family homes over the same acreage. This has resulted in a density of less than one unit per acre and a net negative reduction. Combined with the vicinity’s lack of meaningful transit service and bicycle/pedestrian provisions and connectivity, no trip reduction adjustments are provided. If the project were to remove the residential component, thereby eliminating the density parameter from the model, a combined trip reduction percentage of 8.77% would result and the fee would drop to approximately $5.4 million.
Test Site 6: Jackson Square TOD (Proposed Transit Oriented Development)

The proposed Jackson Square project occupies the former site of an automotive dealership and repair facility on approximately 17.3 acres along the west side of Philips Highway, south of Atlantic Boulevard between Mitchell Avenue and River Oaks Road. The project is also adjacent to the existing Florida East Coast rail line, well positioning the site for potential commuter rail service along JTA’s proposed Southeast Commuter Rail Corridor. The property was rezoned and reclassified from largely commercial and light industrial uses to planned unit development in 2008. The project provides a unique opportunity to demonstrate to the City and the region the implementation of transit oriented development at an infill site strategically located near Downtown.

The development plan consists of 750 multifamily units, 150,000 square feet of commercial/retail and 200,000 square feet of general office use. Under the latest adopted ordinance, the project, prior to any development beyond 30 residential units per acre, must incorporate an enhanced mass transit station and amenities. These features are designed to be consistent with long-range transit development options including potential BRT, commuter rail, and/or other modes identified or implemented by the Jacksonville Transportation Authority. The following conceptual master plan, prepared by Basham and Lucas, illustrates the placement and orientation of the proposed mix of uses, including multimodal features such as the required transit amenities, roundabouts, landscaping, signage and wayfinding, as well as traffic calming and internal circulation elements.

As tested under a preliminary Fair Share calculation, the site would be responsible for $1,243,311 in transportation-related improvement costs associated with project traffic impacts to I-95 near Downtown. Applying the alternative mobility fee and credit methodology, the costs are approximately 60% less. Based upon the existing use credit, the site receives a deduction of 3,018 daily trips from the gross daily vehicle trips. The average density of 44 units per acre alone provides an additional 41.4% reduction in trips. The project nearly achieves the 9% maximum possible reduction associated with use mix. The combination of the design and density credits provides an approximate 56% reduction in daily external vehicle trips. Based upon the location, density, and transit-supportive characteristics, the site would also likely be eligible for substantial TDM credits. This, of course, assumes a revised development agreement that would ensure such provisions are included and monitored. The project’s urban priority location also reduces the average VMT in the calculation and as a result the estimated mobility fee is $550,462.
The proposed Jackson Square Conceptual Master Site Plan (above), courtesy of Basham and Lucas, illustrates desired use and design features, such as office space above retail and a new transit hub, within the dense urban fabric of the vicinity (below). Such projects amplify the significance of the 3Ds in promoting mobility and maximizing the available trip reduction credits.
design principles for mobility | application of principles to development typologies

Development Plan, Credits, and Mobility Fee
Jackson Square PUD (17 ac):
- 750 m.f. dwelling units
- 200K s.f. office
- 150K s.f. retail
- Gross Daily Vehicle Trips (with 3,018 existing use trip credits) 10,568
- Net External Trips (w/ Internal Capture/Pass By/Diverted Link) 5,515
- Trip Reduction % 55.89%
- URBEMIS-based Trip Adjustment 3,104
- Subtotal (Mobility Fee Eligible Trips) 2,451
- TDM Credit (if applicable) 0
- Net New Trips (Mobility Fee Eligible Trips) 2,451
- Cost Per VMT $24.31
- Average Trip Length (Miles) 9.24
- Est. Mobility Fee $550,462.86

Legend
- Jackson Square Boundary
- Half Mile Buffer

CITY OF JACKSONVILLE | NORTH FLORIDA TPO | RS&H 54
Jacksonville Smart Growth Concept Development Opportunities

As a next step, or concurrent to the development of an automated system (to be discussed in the next section), it is recommended that the City create a Smart Growth Development Opportunities manual linked to the implementation of the mobility fee and design-based credit system. As a further extension of this section, which tests a number of existing and proposed locations and projects, the purpose of this value-added document would be to explore and showcase particular development sites in Jacksonville where trip reduction credits could be maximized.

Actual locations would be surveyed in terms of accommodating mixed use opportunities and multimodal design features. Within the manual, realistic pro-formas, photo and place type documentation, as well as conceptual site plans and renderings would be included with each of the identified locations. The selected examples will illustrate both development potential and the corresponding discounted mobility fees or even credits that result from a net surplus of trips that could be banked and transferred to other sites. More importantly, such a manual could serve as a potential real estate development marketing guide to be used by the Planning Department and the Chamber of Commerce in order to attract investment to strategic locations which optimize such incentives.

This effort is also strongly supportive of the City’s Comprehensive Plan Future Land Use Element Policies 6.3.1 and 6.3.2, which encourage new investment and multimodal design elements in targeted infill and redevelopment areas.
An interactive, web-based application is proposed as a means to automate the trip generation, credit, and mobility fee estimation process. Combining the City’s established trip generation and internal capture/pass-by procedures with the URBEMIS-based mitigation measures, this proposed application (preliminarily referred to as “MOBILJax”) will enable the City, developers and other parties of interest to test various site locations, compare preliminary fee estimates, and potentially determine optimal location(s) for development “on the fly”.

The web application will require minimal user input with calculations for trip generation, internal capture, credit reduction and estimated fee processing automatically in the background on a hosted server. The adjacent table lists the data variables needed to calculate the trip reduction credits along with which items represent user inputs and which calculations would be performed by the application on a remote server.

<table>
<thead>
<tr>
<th>“MOBILJax” Variables</th>
<th>Source</th>
<th>Update Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project Location</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Development Area</td>
<td>City of Jacksonville</td>
<td>5 Years</td>
</tr>
<tr>
<td><strong>Land Use (Residential / Non-Residential)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Acreage/Units/Sq Ft</td>
<td>User Input</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Housing Units</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proposed Units (automatically populated from trip generation section)</td>
<td>Census or NERPM TAZ</td>
<td>10 years or As Available</td>
</tr>
<tr>
<td>Households Per Acre</td>
<td>Census or NERPM TAZ</td>
<td>10 years or As Available</td>
</tr>
<tr>
<td>Total Housing Units</td>
<td>Census or NERPM TAZ</td>
<td>10 years or As Available</td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proposed Employees (automatically populated from trip generation section)</td>
<td>User Input</td>
<td>N/A</td>
</tr>
<tr>
<td>Total Employees</td>
<td>InfoUSA</td>
<td>As Available</td>
</tr>
<tr>
<td><strong>Local Serving Retail</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes/No</td>
<td>User Input</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Transit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number Weekday Buses Stops</td>
<td>Jacksonville Transportation Authority (JTA)</td>
<td>6 months</td>
</tr>
<tr>
<td>Number of Daily Rapid Transit Buses Stops</td>
<td>Jacksonville Transportation Authority (JTA)</td>
<td>6 months</td>
</tr>
<tr>
<td>Number Daily Shuttles</td>
<td>Jacksonville Transportation Authority (JTA)</td>
<td>6 months</td>
</tr>
<tr>
<td><strong>Intersection Density</strong></td>
<td>City of Jacksonville</td>
<td>Continually maintain file and update as needed</td>
</tr>
<tr>
<td><strong>Sidewalk Coverage</strong></td>
<td>City of Jacksonville</td>
<td>Continually maintain file and update as needed</td>
</tr>
<tr>
<td><strong>Bike Lane Coverage</strong></td>
<td>City of Jacksonville</td>
<td>Continually maintain file and update as needed</td>
</tr>
<tr>
<td><strong>Existing Use Trip Credit</strong></td>
<td>City of Jacksonville</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Transportation Demand Management (TDM) Credit</strong></td>
<td>City of Jacksonville</td>
<td>N/A</td>
</tr>
</tbody>
</table>
The following datasets will be required to perform the automated processes listed above: Based on accurate trip reduction calculations, it is anticipated that particular datasets will need to be updated on a minimum annual or semi-annual basis to account for changes in both JTA’s transit service and/or property appraiser (parcel) information.

1. Development Area Boundaries
2. NERPM TAZ Information, updated as 2010 Census becomes available
3. Info USA
4. Daily Weekday Bus Schedule and Stops
5. Daily Rapid Transit Bus Schedule and Stops
6. Dedicated Daily Shuttles
7. Scored Intersections
8. Sidewalk Inventory
9. Bike Lane Inventory

**Project Location**

The system will consist of a GIS-based graphical interface enabling the user to select the project location. Parcel boundaries and road names will be visible to assist the user in finding the desired location. The project area can also be selected based on the real estate (RE #) number. Once the project location is selected, the application will automatically determine the appropriate Development Area from which to populate the average trip length (VMT) into the fee calculation parameter— including Downtown Development, Urban Priority, Urban Development, Suburban Development, or Rural Development Area. The Development Area category boundaries are predefined and the web application performs a spatial selection of the category that contains the project location. The Development Area category dictates the average VMT that is used in the mobility fee formula calculation.

**Land Use (Residential Household Density)**

A simple, pull down menu or radio button will be provided in the Land Use section of the web interface to allow the user to choose if the development is residential or exclusively non-residential. This component is directly linked to the density calculation model to determine the extent of trip reduction credits associated with residential density. Under exclusively non-residential developments, the density calculation would be eliminated from the sum of credit percentages.
Housing Units (Mix of Uses)
The use mix credit model is a function of the total number of housing units relative to employees within ½ mile of a project boundary. The total number of housing units reflects both existing units within the immediate area and the proposed number of units associated with a project. The user will input the number of proposed housing units in the trip generation interface as planned for the development. The number of households per acre will be calculated based on the number of proposed housing units divided by the total acreage of the project. The application will also calculate the number of existing housing units within ½ mile of the project boundary. Until the 2010 Census Data is readily available by block group or traffic analysis zone (TAZ), it is recommended to obtain the existing housing units from the Northeast Regional Planning Model (NERPM). The NERPM model provides number of total housing units as of 2008 for each TAZ. The application will automatically create a ½ mile buffer of the project boundary and clip the TAZ data layer. The total housing units will be extracted from the TAZ data based on the coverage of the project location buffer. The proposed and existing housing units will be added together for the total number of Housing Units that is used to calculate any potential trip adjustments associated with mix of uses.

Employment (Mix of Uses)
The number of proposed employees as planned for the development will be derived from the trip generation component. This is based upon an established rate of employees per 1,000 square feet associated with the specific, non-residential square footage as input by the user. The web application will estimate the existing (“other”) employees utilizing the most current InfoUSA point data. InfoUSA is a comprehensive database that provides total number of employees for each point representing businesses. By spatially selecting the InfoUSA data points that fall within the ½ mile buffer of the project location, the total number of existing employees is determined. The proposed project and existing employees are then automatically added together to yield a total number of employees that is incorporated into the mix of uses trip reduction equation.

Local Serving Retail
A 2% maximum credit is incorporated relative to the presence of local serving retail within the ½ mile buffer radius. A simple, pull down menu or radio button will be provided for the user to choose if there is or is not retail property within ½ mile of the project boundary.

Transit Service
Comprehensive data files of weekday buses, rapid transit buses, and daily shuttles are required for the web application to calculate transit use within the project area. Currently, the user would be required to manually check the posted schedule from JTA’s website to confirm the number of weekday stops within the ½ mile buffer of the project. It is recommended that the City coordinate with the JTA to link the schedule database to the stop point files so that the information is geo-referenced and can be automatically selected out of the buffer and incorporated into the server-based calculations.
The URBEMIS guidance provides a ¼ mile radius for buses and ½ mile radius for high capacity shuttles or rail service.

However, for ease of analysis and to be able to capture all potential modes of high capacity transit service within a 10 minute walk distance, it is recommended to use ½ mile radius in order to capture all available services. Upon receipt of the appropriate data, the web application will spatially select the bus stops within ½ mile of the project’s center and multiply by the bus frequency schedule to obtain the number of weekday buses, rapid transit buses, and daily shuttles stopping within the project area.

**Intersection Density (Bicycle/Pedestrian Friendliness)**
As an excellent measure of the walkability characteristics within the project influence area, intersection network density per square mile is built-in to the trip reduction credit component.

The City of Jacksonville Planning and Development Department has developed a point file of all intersections in Duval County, to which each point is provided a score. The scoring process is based on the number of legs at a given intersection. A three-legged intersection receives a score of “3” with four and five-legged intersections receiving scores of “4” and “5” respectively. The web application will automatically select the points within the ½ mile buffer of the project location and sum these scores. The total score is then divided by 0.79 to obtain the number of intersections per square mile.

**Sidewalk Coverage (Bicycle/Pedestrian Friendliness)**
The total sidewalk coverage is based on the City’s sidewalk inventory file provided by the City of Jacksonville Planning and Development Department. This file provides the percentage of sidewalks on one side or both sides of the street. The web application will clip the sidewalk inventory file to contain only those segments which fall in the ½ mile buffer of the project location. The percentage of sidewalk coverage on one side and both sides will be calculated relative to the total roadway length and the sidewalk percentage.

**Bike Lane Coverage (Bicycle/Pedestrian Friendliness)**
The total bike lane coverage is based on the 2009 City of Jacksonville Bike and Pedestrian Network file. This file contains attributes describing the type of bike path as developed by the City: Bike Lane, Limited Access, Multi-Use Path, Nonstandard Path, Parking Lane, Paved Shoulder and None. The application will spatially select the features that are within ½ mile of the project’s center. The lengths of the features that are attributed as Bike Path, Limited Access, Multi-Use Path, and Non-standard Path are summed and divided by the total roadway length. This calculation results in the percentage of arterials/collectors with bike lanes that is incorporated into the bicycle/pedestrian trip reduction measures.

The following summary tables illustrate how the preceding information is populated via the discrete variables inputs, as well as the resulting trip reduction credits and estimated mobility fee for the Town and Country example:
### Trip Adjustment Calculations

<table>
<thead>
<tr>
<th>Item</th>
<th>Calculation</th>
</tr>
</thead>
</table>
| A. Mix of Uses | Trip reduction = \( 1 - \frac{(ABS(1.5 \cdot h - e) / (1.5 \cdot h + e)) - 0.25}{0.25} \times 0.03 \)  
Where: 
\( h \) = study area households (or housing units) 
\( e \) = study area employment |
| B. Household Density | Trip reduction = \( \frac{1}{1 + 0.1 \cdot h / e} \)  |
| C. Local Serving Retail | Trip reduction = 2% |
| D. Transit Service | Trip reduction = 1.54% |
| E. Bicycle and Pedestrian Measures | Trip reduction = 0.9% of ped/bike factor = 2.08%  
Where: 
\( \text{Ped/bike factor} = \left( \frac{\text{network density} + \text{sidewalk completeness} + \text{bike lane completeness}}{3} \right) \) |
| F. Trip Reduction | Trip reduction = A + B + C + D + E (For Non-residential, A + C + D + E) 50.02%  
\( \text{G. Gross Vehicle Trips} = \text{Average daily trips from trip generation worksheet} \) 18,406 |
| H. Existing Trip Credit | Average daily trips from current use 8,716 |
| I. Adjusted Gross Vehicle Trips (G - H) | 9,690 |
| J. Internal Trips | From internal capture worksheet 3,142 |
| K. Gross External Trips = (I - J) | 6,548 |
| L. Pass-By Trips | From trip generation worksheet 4,656 |
| M. 25% of Diverted Linked Trips | From trip generation worksheet 1,018 |
| N. Net External Trips = (K - L - M) | 874 |
| O. Trip Adjustment = F * N | 437 |
| P. Subtotal Mobility Fee Eligible Trips = (N - O) | 437 |
| Q. TDM Credit = P * x % (as determined through City review) | 0 |
| R. Net New Trips (Mobility Fee Eligible Trips) = (P - Q) | 437 |

**Mobility Fee Calculation**

- **S. Cost per VMT (County Wide)** $24.31
- **T. Average Trip Length in Project Development Area** 9.26
- **U. Mobility Fee = R * S * T** $99,116.34

### Required Data

<table>
<thead>
<tr>
<th>Project Location (Development Area)</th>
<th>Choose From Below</th>
<th>Average Trip Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Downtown Development Area</td>
<td></td>
<td>9.09</td>
</tr>
<tr>
<td>2 Urban Priority Area</td>
<td></td>
<td>9.24</td>
</tr>
<tr>
<td>3 Urban Development Area</td>
<td></td>
<td>9.46</td>
</tr>
<tr>
<td>4 Suburban Development Area</td>
<td></td>
<td>10.28</td>
</tr>
<tr>
<td>5 Rural Development Area</td>
<td></td>
<td>12.27</td>
</tr>
</tbody>
</table>

**Land Use**

- **R** Residential or **N** Non-Residential

- Number of Housing Units within 1/2 Mile of project center or project boundary whichever is greater 2,840
- This Project’s Housing Units (From Trip Generation Worksheet) 600
- Other Housing Units Within 1/2 Mile of project center or project boundary whichever is greater 2,240
- Study Area Employment (No. of employees within 1/2 m. of project center or project boundary whichever is greater) 5,484
- This Project’s Employment (From Trip Generation Worksheet) 1,076
- Other employees within 1/2 mile of project center or project boundary whichever is greater 4,408
- Households per Acre (From trip generation worksheet) 30.00

**Local Serving Retail (Yes/No)**

- Yes

**Number of Daily Weekday Buses Stopping Within 1/4 Mile of Site**

- 150

**Number of Daily Rapid/Transit Buses Stopping Within 1/2 Mile**

- 0

**Number of Dedicated Daily Shuttles**

- 0

**Number of Intersections Per Square Mile**

- 591.14

**Percent of Streets with Sidewalk on One Side (%)**

- 12.00%

**Percent of Streets with Sidewalk on Both Sides (%)**

- 14.00%

**Percent of Arterial/Collectors with Bike Lanes**

- 4.00%

**Transit Service Index**

- Transit service index = 0.16666667

**Number of average daily weekday buses stopping within 1/4 mile of the site**

- 150

**Plus twice the number of daily rail or bus rapid transit trips stopping within 1/2 mile of the site**

- 0

**Plus twice the number of dedicated daily shuttle trips**

- 0

**Divided by 900, the point at which the maximum benefits are assumed**

- 900

All estimates for bike or pedestrian data should be based on estimates within a 1/2 mile radius from the project’s center or the entire project, whichever is larger.
Interactive Web Mapping Application Features ("MOBILJax")

The customizable, web mapping application, or "MOBILJax", will consist of a user-friendly platform designed for non-technical users. Inputs will be kept to a minimum and the tools and map navigation will be designed to be very intuitive. As much automation as possible will be built into the application in order to minimize the amount of user inputs and enable "on-the-fly" testing.

Support/maintenance of the website will also be very flexible. Depending on the select variables, the web based application can be maintained and hosted internally at the City or externally on a web server. The latest technologies will be used to deploy the system and the application will be written using industry standard web authoring tools.

Typical of many mapping applications accessible on a web server, the users send a request to a server (i.e. an address) and the server processes the request and sends the results back as an image embedded in an HTML page via standard HTTP. The response is a standard web page that most browsers can view. In server-side internet GIS applications, all the complex and/or proprietary software, in addition to the spatial and tabular data remain on the server. This architecture has several advantages because the application and data are centralized on a server. These advantages include simplified development, deployment, and maintenance. As such, the basic framework of the application will consist of the following:

- Windows server-based
- 100% browser-based using Adobe Flash
- Accessible to users via password protected, encrypted (SSL) log in page
- All data would reside on server – no cross domain/server queries necessary
- Trip Generation and Trip Reduction Credits sections would be selectable via a sequential "tabbed" section that guides users in steps, such as "I. Trip Generation and Internal Capture"; "II. Trip Adjustment Credits"; "III. Mobility Fee Calculation"
- User-friendly, graphical "tools" and/or "icons" selectable from toolbar for zoom, pan, and calculate commands
- Users would be guided via overlaid instructions/tips
- Users would have clearly labeled fields to enter necessary input data (both the user’s project information and JPDD provided data) for the server-based calculations
- All data manually entered by the user would be validated client-side in order to correct invalid data quickly. Before form results are submitted land use and trip reduction inputs would be presented via copy/paste/downloadable window
REFERENCES


**City of Jacksonville Planning and Development Department References**

2030 City of Jacksonville Mobility Plan

2030 City of Jacksonville Multimodal Transportation Study

- Greater Arlington/Beaches Vision Plan
- Urban Core Vision Plan
- Southeast Vision Plan
- Southwest Vision Plan
- Northwest Vision Plan
- North Vision Plan

Adopted Town Center Program (Phase I) Plans (2004-2006)
This booklet is printed on recycled paper.