



THE LAND USE & TRANSPORTATION

Connection



A STUDY FOR THE PLANO TOMORROW COMPREHENSIVE PLAN



THIS PAGE INTENTIONALLY LEFT BLANK

THE CONTENTS

THE CONNECTION.....	1
THE NETWORK.....	2
THE COST.....	4
THE CONCERNS.....	5
THE SCENARIOS.....	9
THE RECOMMENDATIONS.....	12





THE CONNECTION

LAND USE & TRANSPORTATION PLANNING

Transportation and land use are inexorably connected. Every land use decision has transportation implications and every transportation action affects land use. Historic development patterns in North Texas illustrate this relationship as vacant land and roadway expansions have often generated population booms in rural communities. For example, the early 1960's marked the beginning of a period of tremendous growth for Plano, as the community transitioned from an agricultural business center into a suburban community. This was due in large part to the extension of Central Expressway (U.S. Highway 75) from Dallas County into Collin County. Other formally rural communities have begun experiencing similar population increases due to extensions of major thoroughfares, such as the cities of Frisco and Prosper with the expansion of the Dallas North Tollway.

As transportation improvements occur, land uses are impacted and must be carefully organized to complement planned capacity. City leaders in Plano created the first Comprehensive Plan in 1963 to create the street network, utility infrastructure, and organization of suburban land use activities in the city. By the 1980's, plans were underway for the expansion of the Dallas North Tollway and creation of Legacy Business Park, which spurred city leaders to create a new comprehensive plan in 1986 supporting the transition into a major employment center. The implementation of the 1986 plan can be seen throughout Plano today as the foundations were set to accommodate a population of 300,000. Most of the roadway network and commercial and residential land use activities currently found in the city were established in this plan.



Central Expressway at Mockingbird Lane, 1950



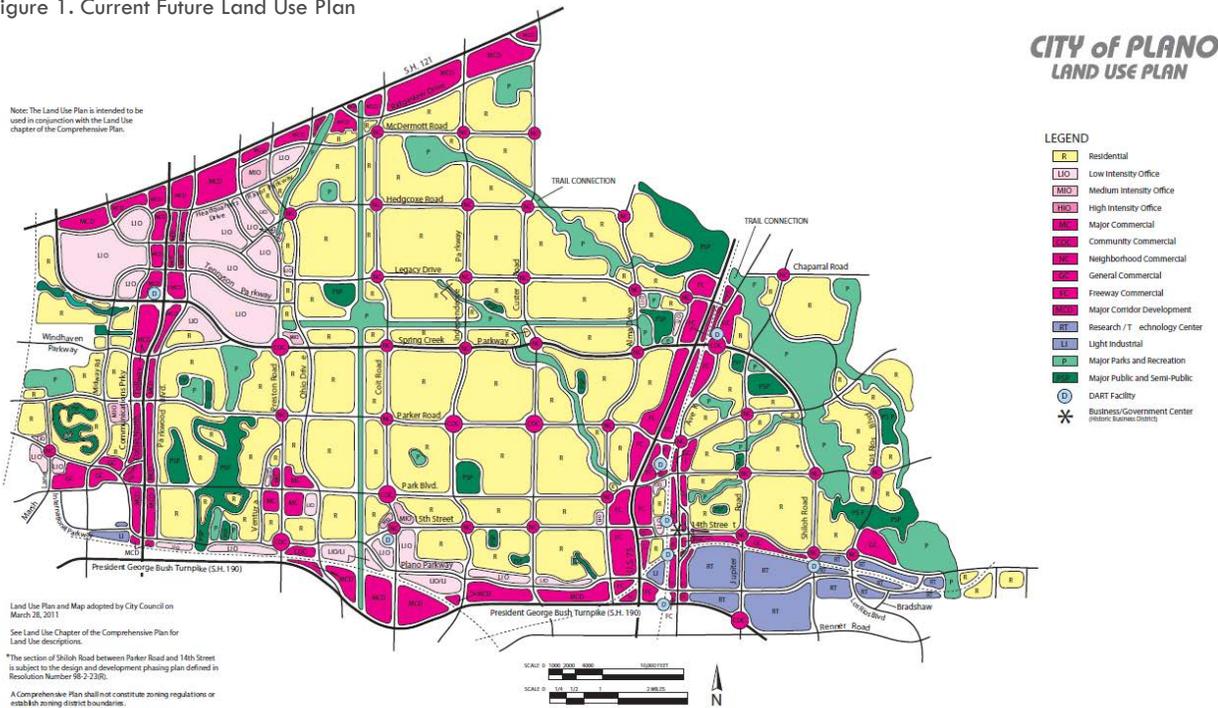
Dallas North Tollway at President George Bush Turnpike, 2014

Today, Plano has an extensive roadway network built nearly to capacity. Over 2,900 lane miles of paved streets have been constructed over the last 55 years; the equivalent of driving from New York City to San Francisco. Roadways account for 9,300 acres of land in Plano and comprise 20% of the city's total land area. The city has less than 7% of vacant land remaining for new development, which limits Plano's opportunities for additional roadway expansions. As Plano transitions into an established community, the city must carefully evaluate its transportation capacity as redevelopment occurs. In addition, the population growth of neighboring cities will continue to add traffic volume to Plano's roadway network and should be considered when evaluating congestion solutions.

This report explores the impacts of Plano's transportation system resulting from land use decisions and presents six solutions to mitigate congestion. Three local growth scenarios are also evaluated to show potential impacts on the city's transportation system based on future growth and redevelopment patterns.

THE NETWORK

Figure 1. Current Future Land Use Plan



SUMMARY OF THE EXISTING LAND USE & TRANSPORTATION NETWORK

As illustrated in the 1986 Land Use Plan shown in Figure 1 above, the City of Plano’s land use pattern was designed around automobile travel. Employment and commercial uses are situated along the perimeter of the city within regional transportation corridors, while residential uses are primarily located in the central sector of the community. Four expressways surround the city, which connect Plano to other communities and destinations within the region and state. The city is also served by six-lane thoroughfares roughly configured in a one mile grid pattern with neighborhood retail centers situated at the thoroughfare intersections. Multifamily, office, and institutional uses such as churches are often located between single-family uses and commercial uses to serve as a transitional buffer. Placed within the center of the neighborhood grid is a school and/or a park and collector streets distribute traffic from residential neighborhoods onto the major thoroughfares. An example of a typical neighborhood center design is shown in Figure 2.

Figure 2. Typical Neighborhood Center Design



- Blue Non-Residential Uses (Retail Centers)
- Yellow Single-Family Residential
- Green Schools/Parks
- Orange Multifamily, Institutional Uses

SUMMARY OF THE EXISTING LAND USE & TRANSPORTATION NETWORK

Figure 3. Current Bicycle Transportation Plan

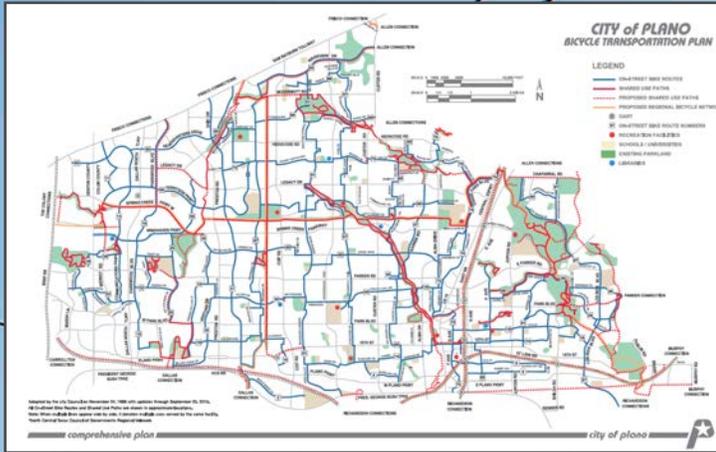
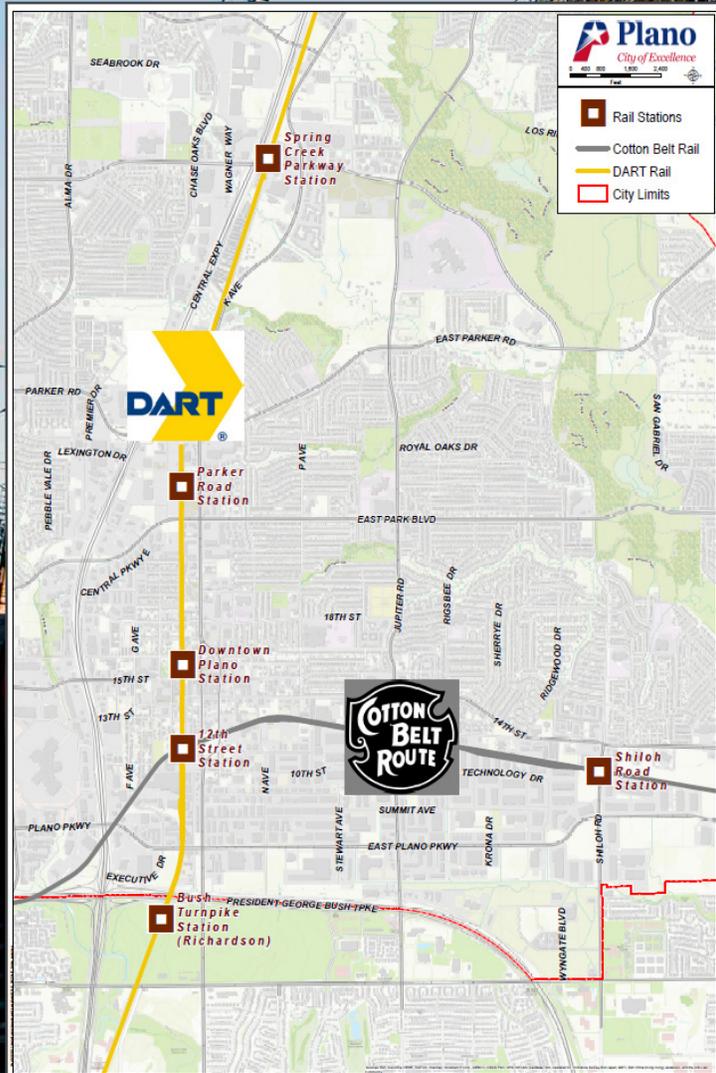


Figure 4. Existing and Future Rail Stations



In addition to its roadway network, the City of Plano has a comprehensive bicycle transportation system shown in Figure 3. There are 168 miles of on-street trails marked with route signage generally situated on collector streets. The city has three recreational trails, known as shared use paths, which are composed of 70 miles of paved trails that serve both bicycles and pedestrians. Plano's bicycle trail system is primarily designed to accommodate recreational users and connects with institutional destinations such as libraries and recreation centers.

Plano is also a member of the Dallas Area Rapid Transit (DART) and receives light rail, local bus, express bus and on call services. According to DART, the system has a total of 652 buses and 11,972 bus stops within the region, generating an average of 126,229 weekday passenger trips in 2014. The DART light rail system is 90 miles long, the longest light rail system in the United States, with 62 stations generating an average of 96,380 weekday passenger trips in 2014. There are two existing light rail stations located within the Plano at Parker Road and Downtown Plano and one station located along the city's southern border in Richardson. As of March 2014, Parker Road Station had the sixth largest weekday ridership in the system with an average of 2,944 passenger trips. A third station within Plano is proposed at Spring Creek Parkway, should the system expand north.

DART also owns the Cotton Belt railroad right-of-way passing through southeast Plano. There are plans for a commuter rail or bus rapid transit route that would provide direct service from Wylie to the Dallas-Fort Worth International Airport, with two planned stations in Plano at Shiloh Road and 12th Street. A map of all existing and future rail stations is shown in Figure 4.



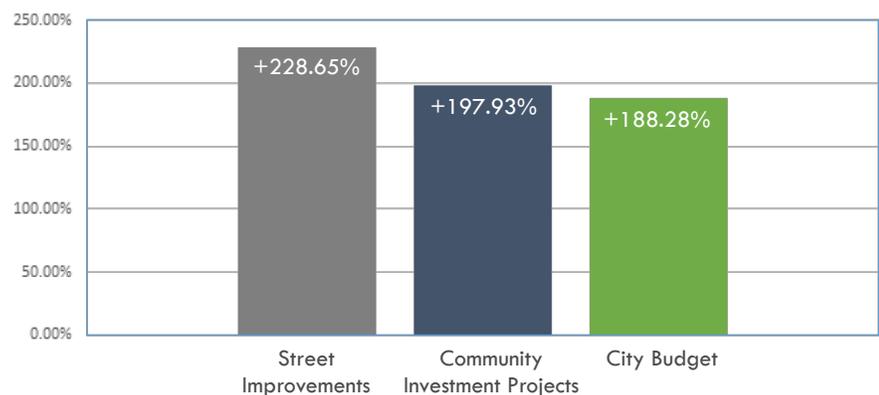
THE COST

RISING COSTS OF TRANSPORTATION INFRASTRUCTURE

One of the biggest challenges facing Plano in the future is maintenance and upkeep of the city's roadway system in light of increasing traffic demand and insufficient land for roadway expansion. Figure 5 illustrates the budget increase (in percentage) over a 20 year timeframe for street improvements, community investment projects (CIP), and the city budget.

In the 1994-95 fiscal year, the City of Plano spent \$17.1 million dollars on street improvements as compared to \$56.2 million in 2014-2015, indicating an increase of 228% over the 20 year period. Larger costs are attributed to the increasing number and complexity of repair and maintenance projects, enhancements to improve traffic flow, and the rising cost of materials and labor. This figure will likely increase as Plano's roadway infrastructure ages and maintenance costs grow.

Figure 5. Percent Change of Budget Increases from 1994 to 2014 for Street Improvements, Community Investment Projects (CIP) and City Budget



According to Figure 5, the street improvements budget has increased 40% more than the city budget and 30% more than the Community Investment Program budget over the last 20 years. The percentage of the city budget expended on the transportation network has remained relatively steady during the last 20 years from 7.9% to 9.0% as funding for street improvements primarily comes from the capital reserve fund and bonds.

Plano is preparing for the rising costs associated with maintaining Plano's roadway network as the number of projects and construction costs increase. Many roadways were originally built by the developer at the time of construction, alleviating the city's initial cost, but now must be maintained by the city. In addition, the city's Impact Fee Program, which once served as a funding tool for roadway projects, was eliminated in 2008 as the majority of thoroughfares were complete at this time.



THE CONCERNS

TRANSPORTATION SYSTEM CONCERNS

Several internal and external concerns are associated with the increase of traffic congestion within Plano. While the city can address internal matters directly, external factors will provide greater challenges for traffic mitigation. This report analyses four main issues, which should be considered when evaluating mitigation strategies.

1. Growing Jobs/Housing Imbalance (Internal Issue)

Plano's strong business community has been built by visionary companies and leaders, and economic development is a long-standing community priority. Economic development benefits our citizens by creating job opportunities to provide access to wealth through economic growth, diversifying the economic base to cushion against economic shock, and increasing the tax base to provide services to citizens. As a result of this strategy, Plano serves as a regional employment center with over 140,000 jobs. These jobs contribute to the overall financial well-being of the community, as businesses supplied more than half of both the property tax and sales tax revenue to the city in 2014, helping maintain excellent services with a low tax rate. However, the city has less than 110,000 housing units, creating a shortage of housing options for Plano workers. Employers unable to find housing in Plano may locate in surrounding communities offering newer and more plentiful housing options. As a result, commute times and roadway congestion increases as more Plano employers drive to and from their residence each day. In addition, the lack of housing availability in Plano can effect tax revenue as families will spend their evenings and weekends outside of the city.

As of March 2015, a total of 3,312 acres remain for new development with over 83% of this land (almost 2,800 acres) zoned for nonresidential uses, adding additional jobs to the city. Most of this land is located along Plano's regional transportation corridors such as the Dallas North Tollway, President George Bush Turnpike and Sam Rayburn Tollway. As this land develops into employment generating uses, there will be increased traffic demand on the thoroughfare network and expressways, and this increase will be more acute if additional housing units are not provided.

2. Collin County Growth (External Issue)

An important issue that contributes to increased traffic on local roadways is population growth. Figure 6 on the following page displays the population increase for Plano and nine other surrounding communities from 2000 to 2013. While Plano grew by 52,000 residents, other communities nearly doubled Plano's population growth including Frisco (103,000 residents) and McKinney (94,000 residents) during this timeframe. These communities are comprised primarily of residential uses that do not currently have the employment base or public transit network that is found in Plano, forcing additional stress on the Plano's roadways during peak commute travel. In addition to employment travel, Plano has multiple facilities and programs that are accessible for any individual regardless of residency.

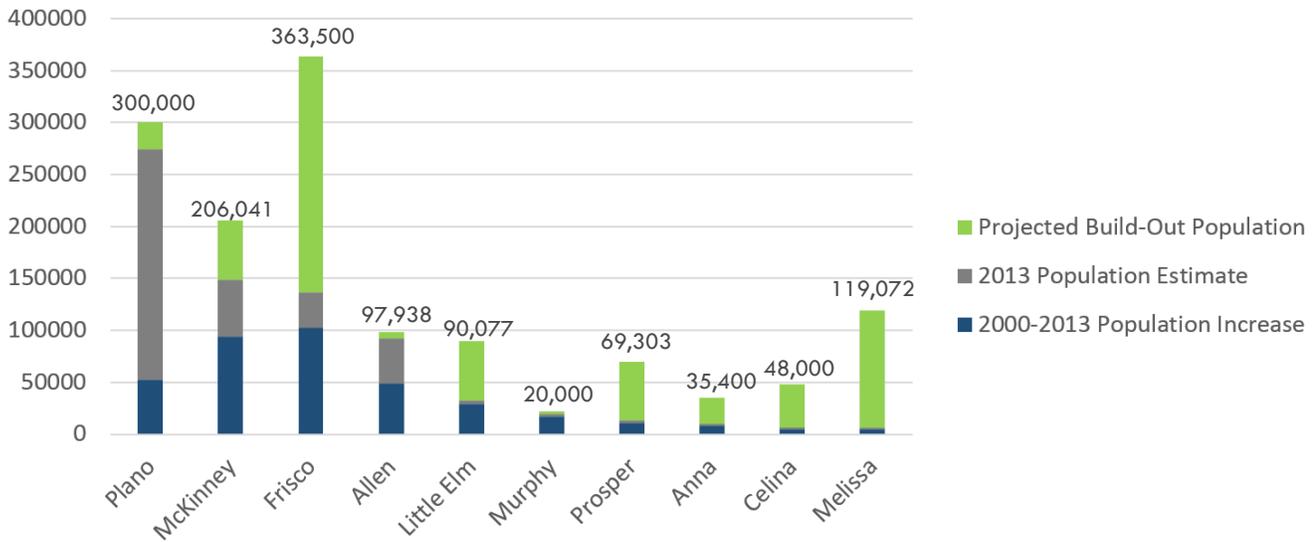
For example, the Plano Public Library System has nearly 6,000 registered library card patrons residing in the City of Frisco, which will result in increased travel to and from the libraries. In

TRANSPORTATION SYSTEM CONCERNS

comparison, Plano residents will utilize Frisco roads when attending events at Toyota Stadium or Dr. Pepper Ballpark. Roads are a shared amenity among cities and are impacted by population growth regardless if the growth occurs in Plano.

As seen in Figure 6, many cities are projecting large build-out populations including Frisco at 363,500 and McKinney at 206,041. According to the projected build-out figures, a combined 610,000 more residents are expected to live within these ten cities with only 4.2% of those living in Plano. The increase in population from neighboring communities will continue to contribute to the congestion of roadways as Plano remains a regional employment center with superior public services and amenities. Plano's central location in the region also generates a high pass-through rate for commuters as residents will drive through Plano from outer-ring suburbs to other regional employment centers such as Dallas, Addison, and Las Colinas.

Figure 6. Regional Population Figures and Projections



Sources: North Central Texas Council of Governments and Comprehensive Plans from Frisco, Allen, Little Elm, Murphy, Prosper, Anna, Celina, and Melissa

3. Regional Transportation (External Issue)

The North Central Texas Council of Governments (COG) estimated the region's population at 6.8 million people as of January 1, 2015. This number is projected to increase to 9.8 million by the year 2035. This new growth equates to land required to provide housing, education, employment, entertainment, and recreation facilities to accommodate an extra 3 million people, the population of the state of Arkansas.

Additional development and more people will result in increased traffic problems on the Dallas-Fort Worth regional roadway network. More roadways and increased transportation options will be required to meet the travel needs of a growing population. Plano's role as an employment center with additional undeveloped land available to accommodate more jobs will attract some of the region's new employment growth to the city.

TRANSPORTATION SYSTEM CONCERNS

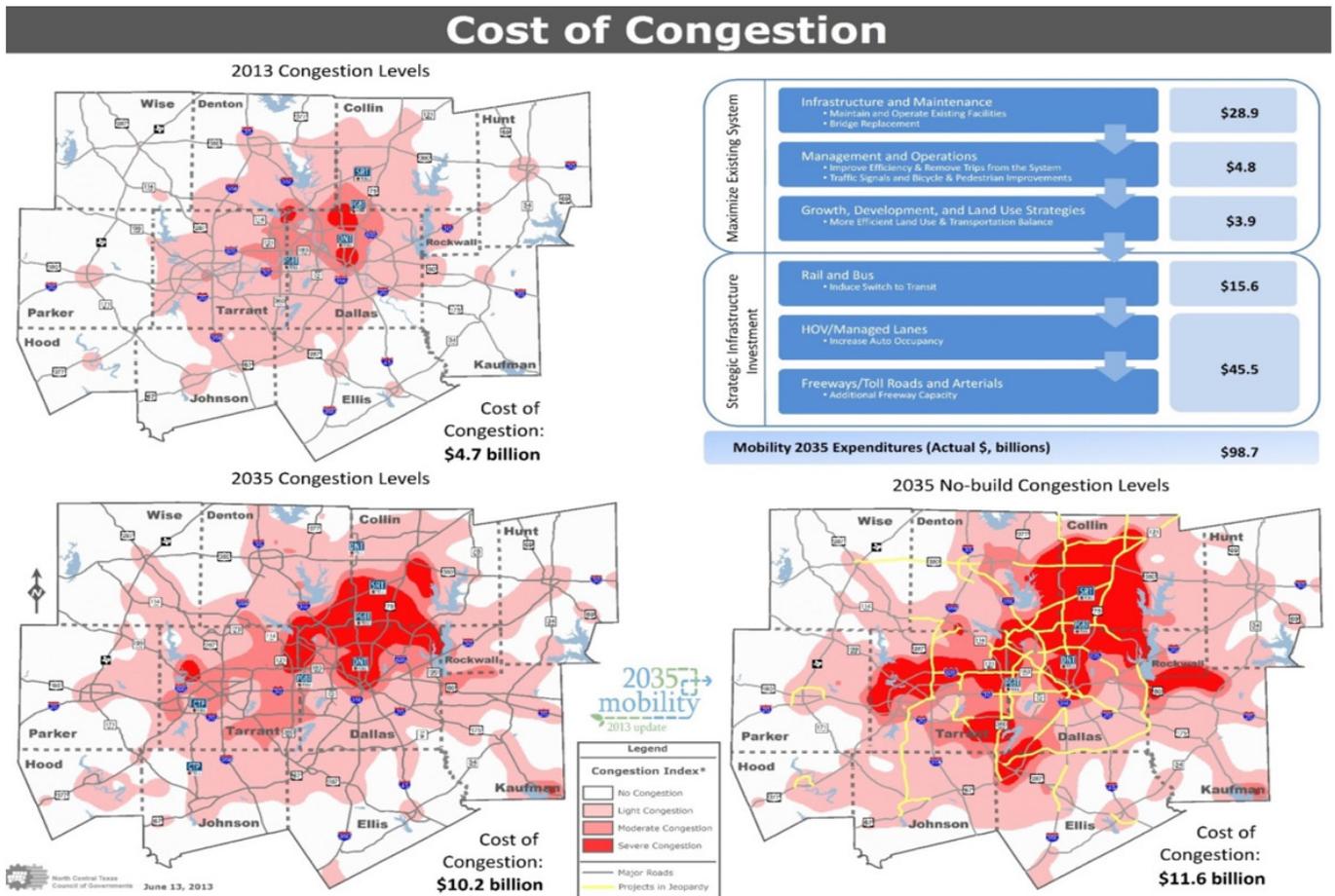


Figure 7 – Cost of Traffic Congestion for the Dallas-Fort Worth Region – North Central Texas Council of Governments

As previously stated, Plano’s roadway transportation system is interconnected with the Dallas-Fort Worth region. The regional roadway network allows North Texas residents to access employment and cultural opportunities in the city or pass through Plano to other destinations. Figure 7 contains a map and chart displaying the cost of congestion by the year 2035. These graphics illustrate the level of congestion in the region and associated costs. The blue chart within Figure 7 shows over \$96 billion of transportation infrastructure improvements will be necessary to mitigate congestion problems by the year 2035. Even if funding is expended and roadway projects are constructed, congestion levels in North Texas will be much higher in 2035 than in 2013. If expansion projects are not completed, the congestion levels will be severely intensified as shown in the 2035 No-build Congestion Levels map.

The map in Figure 7 illustrates Plano currently experiencing light to moderate traffic congestion. Conditions will deteriorate to severe for most of the community regardless if improvements are funded and constructed by 2035 because of the rapid rate of population growth in the region.

4. Design of Existing Network (Internal Issue)

According to literature review of land use and transportation studies, particularly from the Arizona Department of Transportation and Portland State University, the design of Plano’s roadway network may also contribute to the city’s

TRANSPORTATION SYSTEM CONCERNS

roadway congestion. The six-lane thoroughfare system in the city is designed to accommodate long distance trips and move through traffic in and out of the city. An increasing number of through trips from residents outside of Plano combined with local traffic can lead to travel difficulties, especially during peak travel.

In addition, Plano's automobile-dependent land use patterns also generates traffic. Much of the city is divided into separate land use zones that separate residential, retail, and office developments. While this layout is intended to protect residential areas from intense uses such as factories and manufacturing warehouses, the development separation forces multiple daily trips for other complementary uses such as office uses (employment, doctor, dentist) and retail uses (grocery store, gas station, pharmacy). Plano's suburban layout also poses challenges for an effective mass transit and bicycle system as well as an inviting pedestrian environment. Bus stops are limited within the city and often require residents to walk or drive long distances from their homes. A lack of bus stop amenities such as benches and shade structures discourages ridership. In addition, the current and planned rail stations within the city are situated along existing rail lines in east Plano and are difficult to utilize for central or west Plano residents without driving to the station. Finally, bicycle routes on collector streets are not protected lanes and users may be required to use major thoroughfares while traveling to commercial and employment uses. The lack of end-of-trip amenities such as locker rooms and shower facilities also attribute to a lower bicycle ridership, especially during the summer months.





THE SCENARIOS

SHOULD PLANO CONTINUE TO GROW?

As traffic patterns stated previously show future congestion levels likely increasing, Plano must evaluate its growth patterns to ensure its transportation system has adequate capacity while providing a stable tax base for street improvements. Below are three growth scenarios to consider when evaluating the final recommendations for congestion mitigation. Pros and Cons related to the transportation impact of growth and redevelopment have been provided with each scenario.

Proactive Growth and Redevelopment (Scenario 1)

Proactive growth and redevelopment would consider all transportation corridors (expressway, rail, and major thoroughfare) for appropriate new housing and employment opportunities. An emphasis would be placed on infill residential development to reduce the employment imbalance and provide housing opportunities for all Plano employees.

Transportation Impact

Pros

- New housing availability; providing adequate housing for employees to live and work in Plano will reduce commute times. In addition, new units are attractive to many buyers.
- Alternative transportation; new housing could locate along the existing rail or bus routes, encouraging alternative modes of transportation and reduction of roadway congestion.
- Trip elimination; new housing integrated into mixed-use centers may eliminate multiple trips to retail and service uses. New service uses will be supported by new housing and total citywide retail square footage can be reduced.
- Tax revenue; allowing for new development and redevelopment will provide increased revenues and alleviate tax burdens on residents as roadway reconstruction projects are needed.
- Community image; growth, including development and redevelopment, create positive media for the community, supporting a good community image.

THE SCENARIOS

Cons:

- Automobile travel; without change to commuting behavior, automobile travel is likely to remain the preferred transportation mode and additional residents and employees may not significantly alleviate traffic congestion.
- Development pattern; changing development patterns may have unknown consequences.

Moderate Growth and Redevelopment (Scenario 2)

Moderate growth and redevelopment would consider select locations for new additional housing and employment opportunities. Less emphasis would be placed on additional residential development as neighboring cities could provide housing resources for Plano's large employment base.

Transportation Impact

Pros

- Alternative transportation; new housing could locate along the existing rail or bus routes, encouraging alternative modes of transportation and reduction of roadway congestion.
- Trip elimination; new housing integrated into mixed-use centers may eliminate multiple trips to retail and service uses. New service uses will be supported by new housing and total citywide retail square footage can be reduced.
- Tax revenue; allowing for new development will provide increased revenues and alleviate tax burdens on residents as roadway reconstruction projects are needed.
- Community image; growth, including development and redevelopment, create positive media for the community, supporting a good community image.

Cons

- Limited mitigation of congestion; the transportation impact of moderate growth and redevelopment may be less effective than encouraging proactive growth and redevelopment. For example, by not emphasizing new residential development to reduce the employment imbalance, employees would continue to commute to Plano from neighboring communities.
- Automobile travel; without change to commuting behavior, automobile travel is likely to remain the preferred transportation mode and additional residents and employees may not significantly alleviate traffic congestion.
- Fewer resources; without new development or redevelopment, fewer financial resources will be available to addressing challenges.



THE SCENARIOS

No Growth and Redevelopment (Scenario 3)

No growth or redevelopment would assume Plano's current population and employment base would remain unchanged.

Transportation Impact

Pros

- No increase in internal traffic volume; traffic volumes would not be increased from internal development.
- Land use stability; eliminates unknown consequences of additional growth.

Cons

- Development will bypass Plano; by not accommodating any new residential or commercial development, new development would bypass Plano and locate in neighboring communities as it has done in other older suburbs.
- Increased traffic volumes; traffic volumes will continue to increase as commuters who live outside of Plano would continue to travel in and through the city for employment, entertainment, and retail activities.
- Higher tax rates or decreased services may be required; because there would be no new development to offset the costs of maintenance of the city's transportation network, increased traffic will call for more repairs and the city may require a higher tax rate to generate additional revenues to address aging transportation infrastructure needs. Alternative maintenance can be delayed to maintain revenue rates.
- Community image; growth, including development and redevelopment, create positive media for the community, supporting a good community image.



THE RECOMMENDATIONS

In conclusion, the congestion levels in Plano are likely to increase regardless of Plano's growth scenario. The city's roadway system is built nearly to capacity and communities surrounding Plano are growing at a rapid pace. The city will have to consider innovative trip reduction strategies to maximize efficient use of the current system and manage congestion.

1. Increase efficiency of existing roadway

- *Analysis and Recommendation* - Traffic Engineering will continue to make improvements to the roadway system by constructing turn lanes at intersections, reviewing traffic signal timing with neighboring cities, and developing innovative techniques to increase the efficiency of the existing roadway. A study conducted by the Texas Transportation Institute shows turn lanes reduce total crashes by 44% and increase the roadway capacity by 25%. Traffic-light timing can also significantly reduce commute times. Software for traffic-light timing is constantly evolving and recently a new simulation software developed by a professor at the Massachusetts Institute of Technology (MIT) shows that rush-hour travel can be reduced by 22%. However, due to our geographic location, Plano is dependent on cooperation from neighboring cities must work with Plano to ensure signal timing is aligned between jurisdictions.
- *Plano Tomorrow Conformance* - Increasing the efficiency of the existing roadway is addressed within the Roadway System policy in the Built Environment pillar of Plano Tomorrow.

2. Promote alternative modes of transportation

- *Analysis and Recommendation* – Large metropolitan cities across North America are striving to reduce traffic on major thoroughfares as populations increase. Vancouver is one city that has accomplished this nearly impossible task. In the 1970's, the citizens of Vancouver desired their city to be walkable and healthy, so a policy was established to prohibit the widening of any roads for accommodation of more single-occupancy vehicles. The city prioritized walkable, mixed-use development and established a strong transit system with rail, trolley buses, rapid buses, and walking and biking connections. Figures show that on major streets, traffic has dropped 20 to 30% since 2006, although the city has grown 4.5% over that time. While it is unlikely that Plano will see a reduction in automobile travel due the broad landscape of North Texas, Plano can slow the increasing rate of automobile travel by extending its mass transit system and improving bicycle and pedestrian travel. Additional marketing could be provided to assist Plano residents with navigating Plano's bus system and new bus rapid transit routes could be introduced to provide expedited travel to the rail stations. In addition, end-of-trip amenities such as shower facilities and changing rooms could be encouraged at major employment centers to promote bicycle travel to and from work.
- *Plano Tomorrow Conformance* - Promoting alternative modes of transportation is addressed within the Bicycles, Public Transit, and Pedestrian Environment policies in the Built Environment pillar of Plano Tomorrow.

THE RECOMMENDATIONS

3. Increase the mix of land uses

- *Analysis and Recommendation* - Increasing the mix of uses is also known to reduce vehicle miles traveled and roadway congestion. A study conducted by the Arizona Department of Transportation demonstrates that higher-density, mixed land-use patterns reduce dependency on automobiles, traffic congestion, and residents' vehicle miles traveled. The study found that higher density and mixed-use developments designed to be walkable and accessible to regional transit could reduce residents' vehicle miles traveled by an average of 25%. Today, Downtown Plano serves as a good example of higher-density, mixed-use patterns that are intended to reduce dependency on automobiles by encouraging regional transit travel. Increasing this land use pattern at other regional transit destinations could also assist with the reduction of traffic congestion. Other examples of mixed-use developments include Legacy Town Center, Allen's Watters Creek, and Addison Circle. While these developments are not located along transit lines, the mixture of uses and accessibility of sidewalk and trail connections can also reduce vehicle trips.
- *Plano Tomorrow Conformance* - Increasing the mix of land uses is addressed within the Transit-Oriented Development policy in the Built Environment pillar of Plano Tomorrow and within the Compact Complete Center, Regional Center, and Transit Corridor Future Land Use categories.

4. Increase Transportation Demand Management strategies

- *Analysis and Recommendation* – The creation of a Commute Trip Reduction Program has proved to be successful in several cities, including Bellevue, Washington, a suburb of Seattle. Trip reduction or Transportation Demand Management (TDM) includes several strategies that are intended to reduce travel, specifically during peak hours. These include discounted transit passes, telework and flexible work schedules, parking pricing, priority parking for carpools, vanpools, and short-term parkers. In Bellevue, the drive-alone commute rate fell by 30% over a ten year period due to the Commute Trip Reduction Program. Plano will need to work with major corporations to establish a trip reduction program and assist in its implementation to effectively reduce vehicle travel.
- *Plano Tomorrow Conformance* - Increasing Transportation Demand Management strategies is addressed within the Transportation Demand Management policy in the Built Environment pillar of Plano Tomorrow.



THE RECOMMENDATIONS



5. Discourage vehicle travel by use of speed limits, traffic calming devices, and reduction of lanes

- *Analysis and Recommendation* - Discouraging vehicle travel through Plano by use of speed limits, traffic calming devices, and reduction of lanes can also have an effect on vehicle travel. In 2014, the Town of Highland Park conducted a study to reduce speed limits and discourage town traffic. However, this strategy may also have negative effects as retail and businesses could suffer from decreased traffic and visibility. In addition, this strategy suggests that traffic congestion may only be rerouted and not reduced. If Plano were to pursue this strategy, it should carefully evaluate the location of the traffic calming device to ensure businesses will not be affected and collector streets could accommodate additional capacity.
- *Plano Tomorrow Conformance* - Implementing traffic calming methodologies is addressed within the Pedestrian Environment policy in the Built Environment pillar of Plano Tomorrow.

6. Require traffic mitigation strategies for new developments that generate 8,000 or more vehicle trips per day.

- *Analysis and Recommendation* - A traffic impact analysis is a study which assesses the effects that a particular development's traffic will have on the transportation network in the community. Both the City of Plano and the land developer share in the responsibility to consider all reasonable solutions to identified transportation problems. Today, Plano requires a Traffic Impact Analysis study be conducted for zoning revisions and preliminary site plans when additional site-generated Average Daily Traffic (ADT) is more than or equal to 8,000. Staff has concisely reviewed neighboring city requirements for TIAs and would recommend a reevaluation of Plano's threshold.
- *Plano Tomorrow Conformance* - A Traffic Impact Analysis (TIA) is part of the existing development review process and is currently part included in Plano Tomorrow. The Planning & Zoning Commission may recommend the addition of an action statement as part of the Roadway System policy to reevaluate Plano's threshold for a TIA study.



CITY OF PLANO, TEXAS
PLANNING DEPARTMENT
1520 K AVENUE, SUITE 250
PLANO, TEXAS 75074

WWW.PLANOPLANNING.ORG