VII. TRANSPORTATION PLAN

INTRODUCTION

Purpose

The *Transportation Plan* is designed to provide a sound transportation framework to accommodate development. It is a guide to coordinate individual projects into an overall community arrangement.

The Plan encourages minimizing traffic movement through neighborhoods, and providing high capacity routes for moving regional traffic to and from the City. It creates a comprehensive concept so that all agencies responsible for thoroughfare development can coordinate their efforts. The plan addresses the need for streets to provide convenient access to all parts of the City, as well as adjacent cities.

Process Overview

The prior *Thoroughfare Plan* was developed in 1982. It was the result of staff analysis of existing conditions. Traffic volumes were then projected from those existing estimates. Using these projected volumes, the "ultimate" thoroughfare network for the City was developed.

While the development boom of the mid-1980's was taking place, the City realized that projected growth in the northern part of the City was underestimated. The proposed thoroughfare system for that portion of the City would not be able to serve the citizens as property developed. In 1986 an addendum to the 1982 Plan was developed which addressed these shortcomings. In cooperation with property owners, the City worked to create a *Thoroughfare Plan* for the Denton County portion of the City to adequately meet anticipated development.

The TRANPLAN computer model was used in developing the current Plan. This traffic forecasting program incorporates population and employment estimates to project the distribution and volume of traffic on the City's streets. These projections were then used to develop a transportation network, including thoroughfare location and number of lanes necessary, to accommodate the projected traffic volumes. The TRANPLAN model will assist in implementing the *Future Land Use* and *Transportation Plan*s by assessing potential traffic impacts of projects before they occur.

The *Transportation Plan* has two components: the *Thoroughfare Plan* and the *Transit Plan*. The *Thoroughfare Plan* addresses the street network. It analyzes existing conditions and established design criteria. It recommends goals, objectives, and policies to achieve a desired thoroughfare network. The *Transit Plan* concerns itself with modes of mass transit. The two plans need to be coordinated. The thoroughfare network should support mass transit services. This may be anything from reconstructing intersections for easier bus movements to increasing street capacities at an end-of-the-line rail station.

THOROUGHFARE PLAN

Area Characteristics

The operating conditions of a thoroughfare system are dependant on the amount of traffic present at any given moment (volume) and the characteristics of that traffic. These characteristics are dependent upon many factors. They include the types of land uses served by the roadway system and the adequacy of the system to meet the drivers' needs. These factors can cause characteristics to vary from system to system, and/or roadway to roadway. They can also cause roadways similar in design and construction to operate very differently.

Relationship to Regional Network

The *Transportation Plan* consists of a network of existing and planned arterials and collectors designed to accommodate the traffic demand within the City. The major thoroughfares are mainly oriented east/west or north/south. Carrollton is served by two major highways. Interstate Highway 35E runs southeast-to-northwest through the western portion of the City. The President George Bush Turnpike is an east-west toll road traversing the middle of the City, providing a link between IH-35E and the Dallas North Tollway.

The two highways serving the City carry many commuters journeying to and from work. Consequently, arterials intersecting with the highways become congested during peak hours. Traffic accidents during peak hours can often divert traffic from the highways onto the adjacent arterial street system as motorists seek alternative routes. Technological advances in the field of accident management are making it possible to introduce real-time solutions based on a given set of roadway conditions.

Access to IH-35E is provided from Hebron Parkway, SH-121, Frankford Road, the PGBT, Sandy Lake/Whitlock Road, Belt Line Road and Crosby Road. Access to IH-35E has improved as additional east-west thoroughfares have been completed.

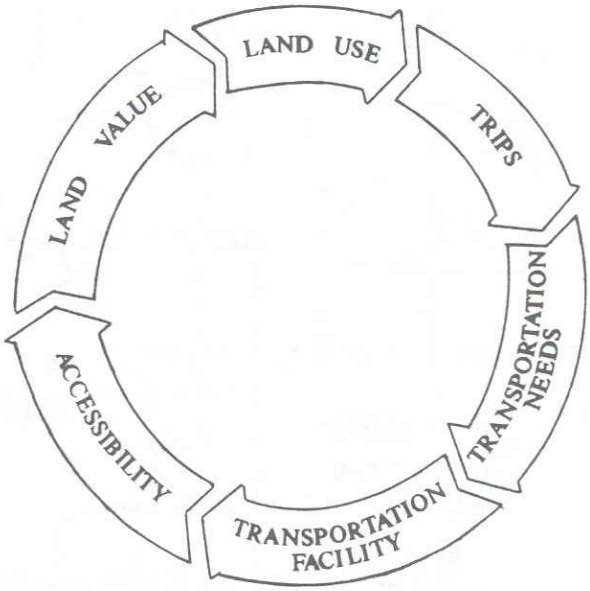
Access to the PGBT is provided from IH-35E, Old Denton Road, Josey Lane, Marsh Lane & Frankford Road, and Midway Road. The opening of this turnpike has improved east-west mobility through the City.

The thoroughfare system in north Carrollton was constructed primarily as development occurred. As the City reaches "build-out," fewer major roadways will be built. Major projects planned are primarily multi-jurisdictional efforts (e.g., FM 544 /Parker Road and the Dickerson Overpass) or are located in areas that contain difficult challenges for development (e.g., Capital Parkway).

Local Traffic Generation

While regional traffic greatly affects Carrollton, local traffic usually represents the majority of trips in any community. This local traffic is the result of interaction between the residents and land uses. Land use decisions impose limitations on transportation policies and vice versa. In the long term, a balance between the transportation system and land use patterns must be provided if efficient community development is to be achieved.

The basic relationship between land uses and transportation facilities is illustrated below. This continuous cycle starts with LAND USE. Activities on the site generate TRIPS to and from the site. These trips identify TRANSPORTATION NEEDS for the existing facilities. The TRANSPORTATION FACILITY, in turn, provides additional ACCESSIBILITY to the site. With better access, LAND VALUE is enhanced. Increased land value completes the cycle by affecting the land use. Continued operation of the cycle leads to more intensive land uses on land that is more expensive with greater transportation demands. This can eventually culminate in the breakdown of the transportation facility.


LAND USE
TRIPS
TRANSPORTATION NEEDS
TRANSPORTATION FACILITY
ACCESSIBILITY
LAND VALUE

Land Uses

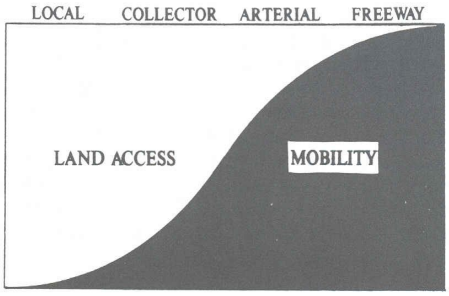
Carrollton is a population and employment center. With a history of providing quality homes, the City has grown to approximately 113,000 residents. Over the last twenty years, this growth has occurred almost exclusively in the northern part of the City. This, coupled with an employment population of approximately 63,000 people, puts a constant strain on the City's street network.

As a population center, Carrollton experiences sharp increases in traffic volumes during morning and afternoon peak hours as residents travel to and from work. Since the majority of Carrollton residents work outside the City, the thoroughfare system experiences large differences in the direction of travel on particular roadways. For example - during the morning peak most traffic travels south, while during the evening peak most traffic travels north. This large directional split places a heavy burden on the Carrollton thoroughfare system during the morning and afternoon rush hours.

Employment centers put a strain on the City's street network. Light industrial and warehousing/distribution facilities along Belt Line Road and in areas such as Valwood Industrial Park and the Frankford Trade Center are strategically located due to the proximity of the IH-35E corridor. These facilities generate large amounts of truck traffic. Large trucks exhibit completely different operating characteristics than a typical passenger car. Much slower to accelerate and decelerate, a large truck can be considered the equivalent of up to six passenger cars when calculating the effective capacity of a thoroughfare. Designated truck routes have been identified throughout the City in an attempt to limit the impact of trucks to selected areas.

ROADWAY CLASSIFICATION

The functional classification system consists of a hierarchy of streets, ranging from those providing for traffic movement to those whose function is access to adjacent properties. MOBILITY refers to the efficient movement of traffic. ACCESS refers to the accessibility of adjacent properties from the particular street. Local streets provide good access to adjacent properties but function poorly at mobility. Principal arterials function and provide mobility very well, but serve poorly as access roads to adjacent property.



The application of functional classification and design principles leads to a better thoroughfare system. Advantages include preservation of residential neighborhoods, long-term stability in land use patterns, increased value of commercial property, and fewer traffic accidents. Also, less land is devoted to roadways. In a typical grid system, 30% or more of the land in an area is normally devoted to streets. However, in areas developed in accordance with functional circulation concepts, only 20% of land may be devoted to streets, including arterials.

The descriptions that follow represent the current practice of functional classification in Carrollton:

Controlled Access Highway. This is the highest capacity thoroughfare in the transportation system. This thoroughfare usually requires 400 feet or more of right-of-way and has control of access from adjacent land and streets. Access is restricted to widely spaced interchange points, typically up to one mile apart. Land adjacent to the freeway is usually accessed by a parallel frontage road, which is separated from the main highway lanes. All thoroughfare crossings are grade-separated.

Limited Access Arterial. The primary function of a limited access arterial is to move traffic through an area. With a typical right-of-way of 140 to 300 feet, it is similar to a freeway but does not require as much right-of-way. Access is more restrictive than a typical arterial, yet not as much as a controlled access highway. Major intersections are normally grade-separated. This "super street" should be used in areas where higher traffic volumes are experienced or predicted.

Arterial. The main function of the arterial is to provide for continuity and high volume traffic movement between major traffic centers; neighborhoods, commercial centers, etc. These thoroughfares are usually spaced at approximately one mile intervals, unless terrain or barriers prevent it. The minimum arterial cross section contains four moving traffic lanes. Right-of-way for arterials typically range from 90 to 150 feet. Since arterials carry high volumes of traffic, it is essential that they have continuous and direct alignment and that they interconnect with controlled access highways. For similar reasons, access from adjacent property should be minimal. This can be accomplished by limiting the number and location of curb cuts and driveways. Also, arterials are normally divided roadways since it is important to provide left-turn lanes separate from through traffic lanes.

Major Collector. The primary function of the major collector is to collect and distribute traffic from streets of lower classifications to arterials. Due to arterial spacing and capacity, however, major collectors may also function as arterials in some places. Also, in some instances, major collectors may function as neighborhood collectors (see below). This is not desirable since the continuity of the major collector tends to attract high traffic volumes disruptive to a residential environment. If used as a neighborhood collector, direct access from residential structures should be prohibited.

Major collectors typically provide for a minimum of four lanes of traffic. Left turns can be accommodated through the use of continuous left-turn lanes where there are frequent driveways and/or unsignalized street intersections. A minimum right-of-way of 70 feet is required for a major collector.

Residential Collector. A residential collector's primary function is to collect and distribute traffic from local streets and convey it to arterials. This thoroughfare usually discourages through traffic with offset intersections near the center of the neighborhood or curvilinear design. The residential collector may also be used as a local street in multi-family residential areas and may provide access to elementary schools and neighborhood parks. Since they are designed to carry higher volumes of traffic than local residential streets (see below), single-family homes should not front residential collectors. The residential collector cross-section design is also used for the internal streets of commercial and/or industrial developments.

The minimum right-of-way requirement for residential collectors is 60 feet. Sufficient paving should be provided for two moving lanes of traffic plus any on-street parking.

Local Residential Street. The function of the local residential street is to provide access from houses within a neighborhood to residential collectors. Only vehicles having an origin or destination on the local residential street usually use it. Trucks, except for delivery trucks, are normally prohibited from using local residential streets. Minimum right-of-way is 50 feet, and a paving requirement of 30 feet allows for two moving lanes of traffic as well as on-street parking.

Grade Separations

A grade separation is the vertical separation of one roadway from another at an intersection by an "overpass" or an "underpass." Grade separations are used in order to reduce congestion and increase intersection capacities. The Texas Transportation Institute (TTI) recommends grade separation for intersections having or projected to have 90,000 vehicles or more per day. Grade-separated intersections typically require more right-of-way than "at-grade" intersections.

Another location where a grade separation should exist is where an arterial street intersects a railroad. Factors in addition to traffic volume, such as accident statistics, automobile speeds, hazardous material routing and the speed and frequency of trains, determine the need for a grade separation. Where appropriate, grade separations at railroad crossings should be constructed.

While the construction of grade separations is expensive, the benefits on the arterial roadway normally justify the cost. The construction of grade separations decreases delays to motorists and emergency vehicles. Pollution is decreased and vehicles use less fuel when grade separations exist.

LEVEL OF SERVICE

The purpose of a thoroughfare system is to accommodate the maximum amount of traffic at an acceptable speed. The amount of traffic is considered the CAPACITY of a street. The capacity of a street is a measure of its ability to accommodate a stream of moving vehicles. It is expressed as a flow rate rather than a quantity and is not directly comparable to the capacity of a container of enclosed space.

The service quality of a thoroughfare is the ratio of the rate of traffic flow to the capacity of the street. This ratio is traditionally described as the LEVEL OF SERVICE (LOS) and is a measure of traffic congestion. It represents factors of speed, travel time, traffic interruptions, maneuverability, safety, driver comfort, and operating costs under a specific traffic volume condition.

The capacity of a street and its level of service can be affected by a number of factors, including roadway condition, vehicle characteristics, operational controls, and environmental elements. A variety of specific factors affect the capacity of arterial roadways. The primary ones are listed and discussed below.

Signalized Intersections. The location and timing of signalized intersections are usually the principal determinant of arterial capacities.

Mid-Block Driveways. Vehicles entering or leaving the traffic stream from adjacent driveways reduce arterial capacity.

Curb Parking or Loading. The area occupied by parked vehicles blocks traffic movement and reduces arterial capacity.

Lane Width. Narrow lanes generally result in lower traffic speeds, which can adversely affect capacity and LOS.

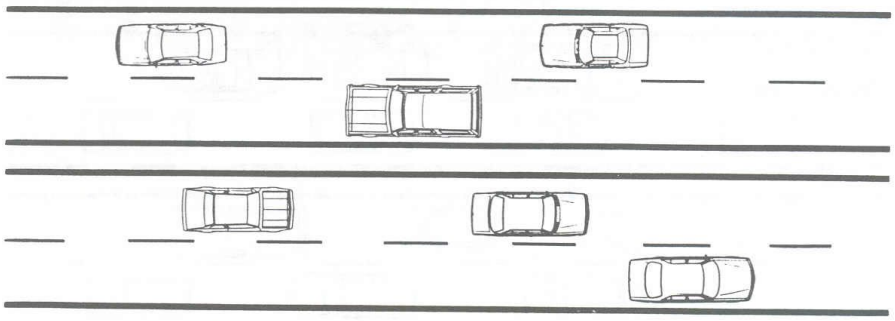
Turning Movements. Left-turn (and to a lesser extent, right-turn) movements impede traffic and thus reduce arterial capacity. Capacity is improved if these movements are placed in dedicated left- or right-turn lanes.

One-Way Operation. One-way streets are generally more efficient than two-way streets due to the removal of left-turn conflicts and simpler intersections.

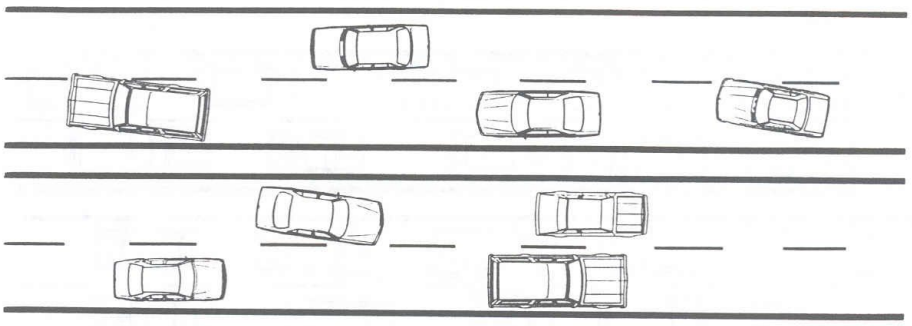
Trucks and Buses. The principal negative effect of trucks and buses is due to their size and lower performance characteristics.

Pedestrians. Unregulated mid-block pedestrian crossings adversely affect arterial capacity. High pedestrian volumes interfere with vehicular turning movements.

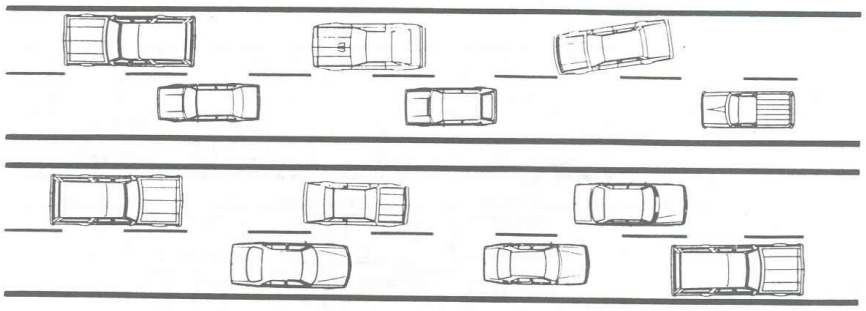
To provide a better understanding of the various levels of congestion, six LOS concepts are described below.



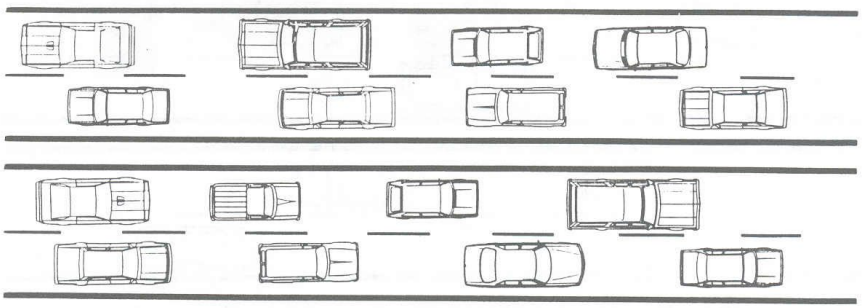
Level of Service "A": The highest quality of service a thoroughfare can provide. It is a condition of free flow in which there are few or no restrictions on speed or maneuverability caused by the presence of other vehicles.



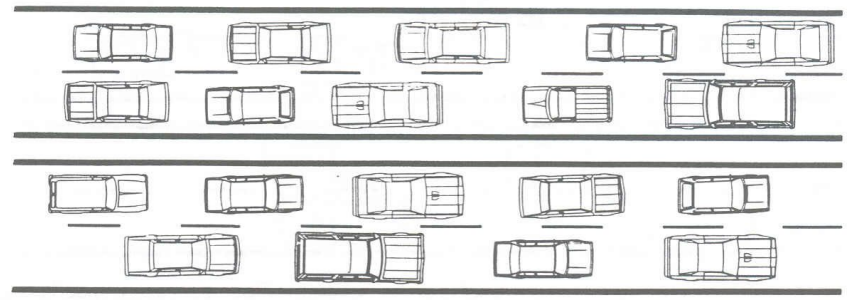
Level of Service "B": Even though this level is a zone of stable flow, operating speeds begin to be restricted by other traffic. Restriction of maneuvering is still negligible.



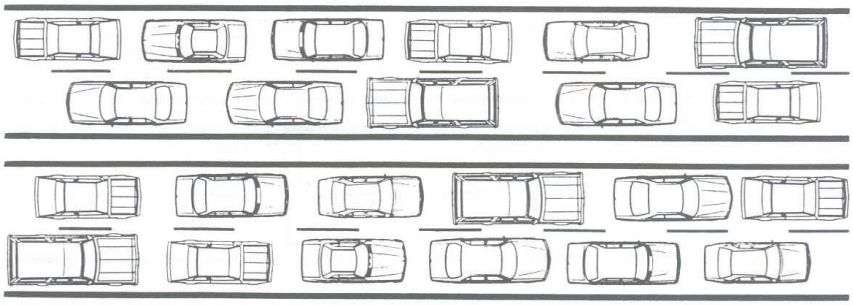
Level of Service "C": This level of service still provides stable traffic flows, but at this volume and density level most drivers are becoming restricted in their freedom to select speed, change lanes, or perform passing maneuvers.



Level of Service "D": Unstable flow of traffic is approached at this level. Tolerable average operating speeds are maintained, yet are subject to considerable and sudden variation. Freedom to maneuver and driving comfort are low. Most drivers consider this service level unsatisfactory.



Level of Service "E": Traffic operations at this level are unstable, speeds and flow rates fluctuate, and there is little independence of speed selection or maneuvering. Driver comfort is low and accident potential is high.



Level of Service "F": This level of service describes forced flow conditions. Speed and flow rates are very low and may, for short periods of time, drop to zero.

FUNDING THOROUGHFARE IMPROVEMENTS

There are many funding sources for thoroughfare improvements. The City is constantly exploring opportunities and partnerships with various entities that have a vested interest in the street system, including but not limited to: City and County Bond Programs, Federal and State Aid, the Texas Department of Transportation, and DART.

Developer participation is a key component in the construction of new infrastructure. The City's *Subdivision Ordinance* requires developers to contribute land and monies to assist the City in building streets. This contribution takes place at the time property is developed. This important funding source helps assure that an adequate street system is developed to handle the traffic generated by a project.

TRANSIT PLAN
DALLAS AREA RAPID TRANSIT

DART currently offers a variety of services, including express, local, cross-town and radial fixed-route routes, as well as "para-transit," "vanpool" and "RideMatch" programs. Starting in 2008, DART will offer Light Rail Transit (LRT) service from downtown Dallas to Carrollton. Current services will be linked to the LRT stations.

In 1989 the DART Board of Directors approved a program to help fund transportation-related improvements in member cities which did not receive rail service during the first seven years of the implementation of DART's *Transit System Plan.* Local Assistance Program (LAP) funds are used for projects that would compliment and accommodate bus and public transit operations, improve transit service, and reduce interference with other traffic. The City will continue to receive LAP funding until LRT service begins operating in Carrollton.

DART's long-range plans call for improvements in the services previously mentioned. They also involve other improvements listed below.

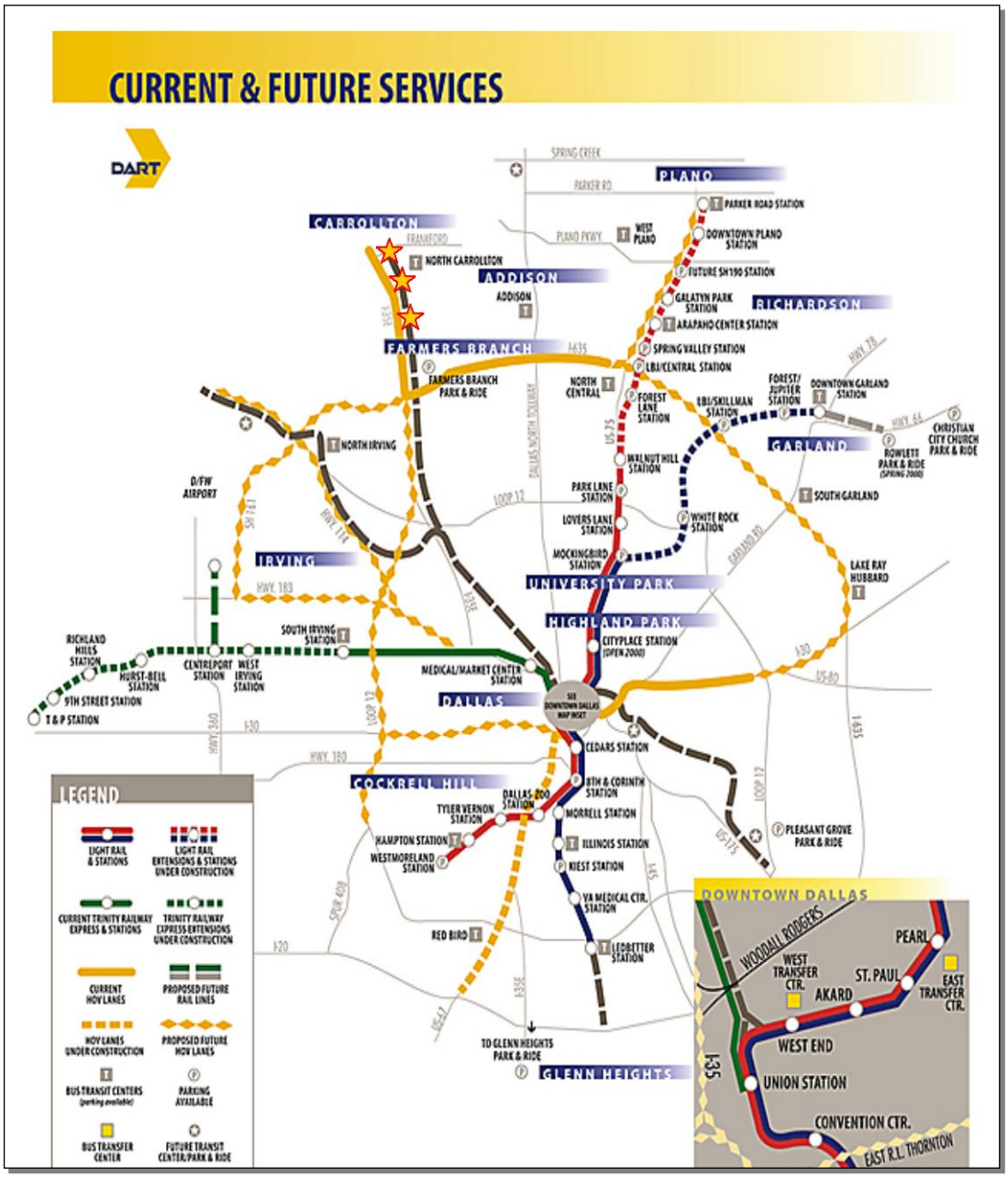
High Occupancy Vehicle Lanes. HOV lanes are special lanes reserved for buses and any vehicle carrying more than a certain number of occupants (usually two or three). HOV lanes are currently provided on IH-35E. DART plans to improve the existing design. A "managed" HOV concept could be implemented on the PGBT, but it is not known if DART would participate in this effort with the North Texas Tollway Authority. There are no plans to incorporate HOV lanes along SH-121.

Light Rail Transit (LRT). DART plans to extend passenger rail service from downtown Dallas to Carrollton by 2010. Known as the Northwest Corridor, this line will operate within the same alignment as the former Union Pacific Railroad along the east side of IH-35E. Three stations in Carrollton have been identified: Downtown Carrollton Station (Belt Line Road), Trinity Mills Station (Trinity Mills Road/PGBT), and North Carrollton Station (Frankford Road). The North Central Texas Council of Government (NCTCOG) identified in their *Mobility 2025 Update* the possibility of commuter rail extending north of Frankford Road to Denton. There are several possibilities that would allow for this extension, but the station at Frankford Road will be an end-of-the-line LRT station for the foreseeable future.

Rail expansion plans beyond the Northwest Corridor would likely occur after 2013. NCTCOG plans for regional mobility include passenger rail service along the Cotton Belt

FIGURE 13: DART SERVICE PLAN

Railroad, referred to as the North Cross-town Corridor. This line would connect DFW Airport to Plano, through downtown Carrollton and Addison. The Burlington Northern line could connect Irving and Las Colinas to McKinney through downtown.



TRANSPORTATION GOALS, OBJECTIVES & POLICIES

Goal T1 A transportation system which will effectively, efficiently, and economically meet the existing and anticipated needs of the community, while protecting and enhancing the quality of life.

Objective T1.1 To develop a transportation planning process which addresses long-range needs, but emphasizes short-and mid-range problem solving.

Policy T1.11 The City should maintain a long-range *Transportation Plan* map for the purpose of facility planning and right-of-way reservation and dedication.

Policy T1.12 The City should require right-of-way dedication in accordance with the *Transportation Plan* map at the time of platting or replatting property within the City limits or the City's extraterritorial jurisdiction.

Policy T1.13 The City should evaluate and update the *Transportation Plan* when necessary.

Policy T1.14 Amendments to the *Transportation Plan* map should be allowed between citywide updates only when essential for land development and when supported by a study of the operational and fiscal impacts of the proposed change.

Policy T1.15 Amendments to the *Transportation Plan* map should not be allowed solely as a means of mitigating the negative traffic impacts of a proposed zoning change, but rather for their effect on the entire transportation network.

Policy T1.16 The functional classification of future thoroughfares should be based on anticipated needs as determined by accepted travel modeling and forecasting techniques.

Policy T1.17 Orderly extensions of all arterial and collector streets, as shown on the *Transportation Plan* map, should be required.

Policy T1.18 All streets should be extended in a logical manner, using standard engineering principles.

Objective T1.2 To ensure a balanced relationship between land use development and the transportation system.

Policy T1.21 The target Level of Service for streets in the City and its extraterritorial jurisdiction is LOS "C" on both a daily and peak period basis. If LOS "C" cannot be met, even if appropriate mitigation measures are taken, LOS "D" may be acceptable. At no time, however, should LOS "E" or "F" be acceptable on arterial streets. Appropriate mitigation measures may include, but are not limited to:

Daily Volume Analysis

(a) closing median openings,

(b) adding travel lanes,

(c) widening existing travel lanes, or

(d) adding acceleration and/or deceleration lanes.

Peak Period Analysis

(a) improving signal timing,

(b) installing traffic signal(s),

(c) adding acceleration and/or deceleration lanes,

(d) adding designated turning lanes at intersections,

(e) improving existing turning radii,

(f) applying accepted traffic management techniques, or

(g) modifying specific movements.

Policy T1.22 The City acknowledges that LOS "C" cannot be maintained on all streets throughout the City. As a result, the City accepts LOS "D" on Hebron Parkway (between the Atchison, Topeka & Santa Fe and Burlington Northern Railroads). The City accepts LOS "E" on Virginia Pine and Standridge Drive (between Hebron Parkway and Frankford Road) and Furneaux Lane (north of Frankford Road).

Policy T1.23 The City should minimize the impact of externally generated traffic carried by residential collectors. Driveways for commercial, multi-family or other high-traffic generators should be located so that they do not route traffic through residential neighborhoods.

Policy T1.24 When determined appropriate by the Director of Transportation Engineering, the City should require a traffic impact study for a proposed rezoning.

Policy T1.25 Estimated future traffic volumes and the resulting level of service of streets and intersections should be included in the criteria on which zoning changes are evaluated.

Policy T1.26 The City should encourage the creation of pedestrian and bicycle links between residential areas, and office & retail areas, schools and recreational facilities.

Policy T1.27 Compatibility between the transportation system and adjacent land uses should be achieved by:

(a) Implementing urban street design criteria which are consistent with the land use they serve;

(b) Building streets compatible with roadway functional requirements and the characteristics of adjacent land uses, and;

(c) Providing buffer zones where appropriate between transportation ways and adjacent areas.

Policy T1.28 Single-family homes should not front any street designated as a residential collector or higher unless lots are one acre or larger in size, or multiple lots are clustered to form an "eye-brow" with a landscape buffer.

Policy T1.29 Alternatives to "speed humps" should be used (i.e. "neck-downs," street trees and traffic circles) to discourage through traffic and speeding on residential streets.

Objective T1.3 To create "protected" corridors for those arterial thoroughfares that are overburdened with high daily traffic volumes.

Policy T1.31 Where feasible, the City should develop grade-separated intersections at those intersections where projected traffic volumes are greater than 90,000 trips per day.

Policy T1.32 Where feasible, the main lanes of the busier street should be depressed below grade at grade-separated intersections.

Policy T1.33 Where feasible, grade separations should be constructed at the intersection of railroads and arterial thoroughfares.

Objective T2.3 To pursue all reasonable funding sources and participate with other parties and governmental agencies to improve access to and within Carrollton.

Policy T2.31 The City should encourage private-public partnerships as a strategy for funding transportation improvements.

Policy T2.32 The City should take every feasible step to ensure the timely completion of SH-121 (main lanes) and Segment IV of the President George Bush Turnpike.

GOAL T2 An effective, coordinated local transportation system, which is responsive to regional transportation needs.

Objective T2.1 To encourage DART to provide a fiscally responsible transit system, which gives priority to journey-to-work trips and the needs of transit-dependent persons.

Policy T2.11 The City should recognize DART as the primary provider of transit services in Carrollton.

Policy T2.12 Encourage DART to examine para-transit (e.g., shared-ride taxi, van-pool, dial-a-ride) services as an alternative to fixed route transit service.

Policy T2.13 The City should ensure that transportation planning meets transit needs through cooperation with DART.

Policy T2.14 The City should coordinate local transportation improvements with improvements to transit facilities made by DART.

Objective T2.2 To participate in regional and inter-jurisdictional transportation programs.

Policy T2.21 The City should coordinate local thoroughfare design standards and alignments with those of the region and adjacent cities.

Policy T2.22 The City should place a high priority on the Dickerson Overpass, SH-121 main lanes and Segment IV of the PGBT (IH-35E to IH-635).

Policy T2.23 The City should encourage the development of high capacity routes (controlled access highways and arterials) for moving regional traffic to, through, around and from the City.

Policy T2.24 The City should reduce reliance on the private automobile and reduce traffic impacts by encouraging transit-oriented development at designated urban centers which have a full range of existing or planned transportation services.

Policy T2.25 The City should reduce traffic by encouraging carpooling, vanpooling, transit use, alternative work hours, mixed-use developments, etc.

Policy T2.26 The City should encourage the inclusion of mass transit and multi-modal transportation options as an integral part of the development of large employment and population centers.