TEXAS DEPARTMENT OF TRANSPORTATION

Texas Metropolitan Mobility Plan: Breaking the Gridlock

CONTENTS

Overview

Traffic congestion in Texas metropolitan areas threatens public safety, the state's economic vitality, and the quality of life for millions of people.

The air Texans breathe is degraded by idling and slow-moving vehicles. Productivity goes down and costs go up as business deliveries and industry shipments are stuck in traffic. Commuters, shoppers and tourists are frustrated and tired of constant delays.

It is time to change the way Texas plans, funds and delivers transportation systems in metropolitan areas. Regional solutions should be developed at the local level by officials given the responsibility to set funding priorities and the tools to deliver transportation improvements faster.

A framework to address the long-term needs for the movement of people and goods across Texas has been laid through adoption of the Trans Texas Corridor System. It will improve safety, reduce regional congestion, divert long-haul and hazardous materials from population centers, create a comprehensive rail system, provide under-developed areas of Texas access to competitive utility service and improve air quality in urban areas.

The Trans Texas Corridor is a bold approach to address intrastate transportation needs. A similarly bold approach is needed to solve travel needs in metropolitan areas.

In *Transportation Partnerships* (August 2001), the Texas Department of Transportation (TxDOT) offered a blueprint for addressing the state's transportation challenges. The report recognized that the future of Texas is intricately tied to an efficient and effective transportation system — a system that must provide reliable mobility, improved safety, streamlined project delivery, and economic vitality. Building on that report, this Texas Metropolitan Mobility Plan presents a framework for addressing the remaining intracity needs in the metropolitan areas. It is based on basic concepts of **planning**, **funding** and **streamlined project delivery**.

■ Planning

The metropolitan areas need a comprehensive, locally developed, visionary, and realistic plan to reduce congestion and improve mobility. Such a plan must include all modes of transportation. These regional mobility plans need to be developed by the individual metropolitan areas based on measurable objectives/goals to relieve congestion while improving safety, air quality, economic development opportunities and quality of life. These plans will be needs-based and not financially constrained. (Financially constrained plans will still need to be developed by the metropolitan planning organization to meet federal requirements.)

Regional mobility plans need to address future land use and private-sector development activities. Regional mobility plans need to address connectivity with the Trans Texas Corridor and other inter-regional systems.

■ Funding

Texas needs access to additional mobility funds, particularly a secured Texas Mobility Fund.

Metropolitan areas need to know what funds can be expected from TxDOT through state and federal sources for years to come. This should be a regional, baseline allocation of expected TxDOT funds. These funds will not be reduced because of local innovative financing or because a region is aggressive in meeting goals to reduce traffic congestion.

Metropolitan areas need increased flexibility to generate user-pay funds beyond expected TxDOT funding. The metropolitan areas need to retain control of any locally generated user-pay funds for locally developed, comprehensive plans to reduce congestion and improve mobility. This increased ability will help metropolitan areas fill the gap between a regional, baseline allocation of TxDOT funds and plan implementation.

Regions may need to develop mechanisms to secure user-pay funds for implementation of the regional mobility plan.

Changes will need to be made in rules for funding state projects. The purpose will be to maximize the flexibility required to move transportation funds between modes.

■ Streamlined Project Delivery

To reduce congestion and improve mobility, metropolitan areas and TxDOT need improved and streamlined processes.

More public-private partnerships are needed.

More efficient cash-flow management is needed.

The Texas Metropolitan Mobility Plan can bring about these concepts to reduce congestion and improve mobility in the state's metropolitan areas.

This report contains recommendations specific to planning, funding, and timely completion of projects.

An action plan also is included.

Introduction

Why a Metropolitan Mobility Plan?
Congestion in metropolitan areas is bad for Texas. The average Houstonian spends more than 50 hours stuck in traffic each year. Delays result in loss of productivity, reduced air quality, reduced quality of life, and increased costs for services and goods.

But the problem is not limited to Houston. Metropolitan areas across the state have experienced tremendous growth in the past decades without adequate funding to increase the capacity of the transportation system.

The 2000 census found that 60 percent of Texans live in the state's eight major metropolitan areas (those with populations exceeding 200,000): Austin, Corpus Christi, North Central Texas (Dallas-Fort Worth), El Paso, Lubbock, Hidalgo County, Houston-Galveston, and San Antonio — that is more than 12.4 million people. Congestion in Texas metropolitan areas cost the state over $45 billion between 1990 and 2000 in terms of delay and wasted fuel.

The Texas Metropolitan Mobility Plan will result in each of the major metropolitan areas developing locally conceived, comprehensive regional mobility plans to improve traffic flow by using all modes of transportation.

Each plan will include strategies to reduce congestion and improve system mobility as well as overall system performance. The implementation of these regional mobility plans will be through a regional, baseline allocation of TxDOT metropolitan mobility funds and the locally generated "gap" funding.

The Texas Transportation Commission will periodically approve these implementation plans. Approval will be based on progress toward achieving mutually agreed congestion reduction goals for each of the metropolitan areas.

The Texas Metropolitan Mobility Plan is a firm step in the direction of increased local control of metropolitan transportation planning and mobility funding to reduce urban congestion and improve quality of life.

The plan will allow each of the metropolitan areas flexibility to develop plans unique to their needs, anticipate realistic baseline allocation of funds, arrange for gap funding, and use new and improved methods to streamline delivery of projects.

Time lost due to congestion is time that will never be recovered. It is time better spent at work, at play, with family, and in service to community. The Texas Metropolitan Mobility Plan is intended to save metropolitan Texans the most precious non-renewable resource: TIME.

Planning

Regional Mobility Plans
Under the Texas Metropolitan Mobility Plan, each of the metropolitan areas will develop, for periodic review and concurrence by the Transportation Commission, individual regional mobility plans. These plans will be composed of strategies to reduce congestion and improve urban mobility as well as system performance.

This effort should include an annual reporting of progress made toward plan implementation for all modes.

These plans will be comprehensive across all modes and tailored to the needs of the individual metropolitan areas. They likely will vary greatly. In Dallas-Fort Worth, the regional plan may be primarily concerned with commuter traffic and recurrent congestion. In Houston, freight transport to the Port of Houston may be an additional major concern. These different concerns and points of emphasis may result in different approaches to improving the mobility of people and goods.

While different, each of the regional mobility plans will address five common goals:

- Relieve congestion
- Improved safety
- Improved air quality
- Improved quality of life
- Improved opportunities for economic development

With each region consisting of cities, counties, transit providers, TxDOT districts, and other interests, the preparation of the regional metropolitan mobility plan must be a collaborative and comprehensive process. The policy board of the metropolitan planning organization (MPO) is seen as the appropriate agency to lead this effort. The MPO will be able to adapt many of its current planning efforts in support of this plan. This plan will not be financially constrained. This plan will list all the identified needs to reduce or limit congestion to meet established goals.

Relieve Congestion
TxDOT will adopt a Texas congestion index to aid the metropolitan areas in setting goals for congestion reduction. This index will assess the mobility of people and goods in each metropolitan area of Texas. Focusing on surface modes of transportation, the index will be based on the delay time experienced by people and in the delivery of goods.

The travel-time index is an important measure of urban mobility. The Texas congestion index will include the travel-time index as a factor in its formulation.

Each of the metropolitan areas in consultation with TxDOT will develop improvement goals based on that area's congestion index.

For example, there is an opportunity in many areas of Texas to target a 1.15 peak-period travel-time index as a goal. This goal would mean that a peak-period trip would take no more than 15 percent longer than a non-peak period trip.

This goal-setting will require a comprehensive local and regional examination of the impact of potential improvement projects and policy approaches across all transportation modes based on index results.

For example, in an area where slow freight movement negatively affects index results, a metropolitan area may develop freight-rail projects to reduce dependence on trucking. Such a project might result in a regional, multimodal freight hub outside the urban area (possibly near a Trans Texas Corridor).

Individual regional mobility plans also will include access-management philosophies and policies for improving mobility on existing and planned highway projects.

Improved Safety
Each regional mobility plan will address safety improvement across all transportation modes. Some specific goals for safety could include:

- Separation of truck and personal-vehicle traffic on high-speed metropolitan corridors
- Reduction of fatal or injurious crashes in metropolitan areas, including at-grade railroad crossings
- Improved safety on transit systems (which would encourage use)
- Improved security for freight arriving from foreign ports (by air, land or sea)
- Reduction in vehicle-bicycle and vehicle-pedestrian fatalities and injuries

Improved Air Quality
Through established procedures and future refinements, each of the metropolitan areas will assess the regional mobility plans for impact on air quality. It is a stated goal of the Texas Metropolitan Mobility Plan that air-quality improvements, in conformance with established guidelines, will be a result of each regional mobility plan. Again, this will require comprehensive planning through the metropolitan area across modes.

Improved Quality of Life
Beyond reducing congestion and improving air quality, each regional mobility plan will address the quality-of-life impacts of proposed projects and approaches. The issues associated with this quality-of-life assessment will include:

- Hazardous-material transport
- Access to various modes of transportation
- Policies for in-fill and new development
- Noise and aesthetic assessments

This quality-of-life assessment, integral to regional plan approval, will serve with the air-quality assessment as a basis for improved methods of project implementation. The required regional mobility plans likely will serve as a springboard for local entities in the adoption of practical land-use policies and zoning ordinances complementing improved mobility.

Improved Opportunities for Economic Development
Reduced congestion and improved mobility are crucial to the economic vitality of the state's metropolitan areas. Failing to solve metropolitan congestion problems will result in significant economic consequences for existing and emerging metropolitan regions in Texas. Further growth must be well-planned and comprehensively integrated with all transportation modes.

Outcome of the
Regional Mobility Planning Effort

From the regional mobility plans, each metropolitan area will develop a prioritized list of improvement projects and policy approaches to improve mobility and meet the established goals for reduced congestion, greater safety, improved air quality, improved quality of life, and improved opportunities for economic development. The regional mobility plans will address all modes of surface transportation in a comprehensive and integrated manner.

The projects and policy approaches will be assessed for impacts on improving congestion. The individual metropolitan areas will develop funding strategies for each. The funding will come from regional, baseline allocation of TxDOT funds and locally derived and controlled "gap" funding. The prioritized projects listed and policies to be implemented are solely up to the individual metropolitan areas and their needs and desires.

The Texas Transportation Commission will review and concur with the regional mobility plans to meet established goals. Periodic review and approval will be required as progress is made and conditions change. The review period likely will be every five years. The review cycle will be coordinated with the federal and state planning requirements.

The regional mobility plans should include strategies that address:

- Improvements to traffic management and operations
- Intelligent transportation systems
- Tollways and freeways
- Arterial streets
- Transit (bus, rail, other)
- Freight rail
- Modal interfaces
- Truck lanes
- Hazardous-materials routes
- Pedestrian/bicycle facilities
- Utilities
- Ports (air, water and inland)
- Operational improvements
- Other issues as identified

Funding

A comprehensive and multi-year plan to finance and construct the prioritized transportation improvements to meet Texas congestion-index goals must be developed. This plan will include financing of all modes of projects by many agencies, including TxDOT. The cost of achieving the goals and implementing the plan will be substantial. For example, the Governor's Business Council estimates the need for highway improvement alone will require an additional $78 billion over the next 25 years. However, the council also estimates that such an increase in highway-improvement expenditures would result in reduced delay, reduced fuel consumption, increased efficiency, reduced pollution, and increased jobs. This would produce a benefit of $511 billion. The benefit is substantially more than the cost. The financing of the needed improvements to achieve the goals will encompass numerous methods including the use of state and federal funds as well as locally generated user fees.

Regional Allocation of TxDOT Funds
To allow for better financial planning at the individual metropolitan-area level, TxDOT will change from allocating mobility funds on a per project basis to allocating funds to regional metropolitan areas.

Regional allocations will be based on a TxDOT assessment of traffic, population, and other factors. A recent joint effort by the eight metropolitan areas, the nine TxDOT districts in which they are located, and TxDOT headquarters personnel recommended this process.

Under the Texas Metropolitan Mobility Plan, each metropolitan area would be allocated a portion of the anticipated available metropolitan mobility funds for implementation of their approved regional mobility plans.

This allocation would not be reduced if the region were aggressive in developing "gap" funding initiatives. In fact, this method would encourage individual metropolitan areas to tailor "gap" funding initiatives based on local needs and desires. The number of projects from the prioritized listing in the regional mobility plans that could be funded through TxDOT funds would be known to the metropolitan area well in advance of implementation. This will allow a metropolitan area to realistically assess how it will fund needs not met by the regional allocation from TxDOT.

The Transportation Commission will determine the total available funds for metropolitan mobility baseline allocation using traditional forecasts of revenue and needs and the implementation of a fully secured state mobility fund. This fund will give metropolitan areas instant access to the revenue needed to jump start costly metropolitan projects. The Transportation Commission will designate a majority of this new bonding capacity for mobility improvements in the metropolitan areas. Additionally, the Transportation Commission may reserve a portion of state high-priority funds for assisting with critical and innovative projects in the metropolitan areas.

Gap Funds

In the Texas Metropolitan Mobility Plan, the metropolitan areas will be given greater local ability to identify and prioritize projects that improve mobility. The metropolitan areas will be granted a baseline allocation of TxDOT metropolitan mobility funds.

It is anticipated that this regional baseline allocation of TxDOT funds will not be sufficient to meet all the mobility needs of the Texas metropolitan areas. In these cases, local metropolitan areas will be given increased flexibility to generate user-pay system funds and public-private partnerships to fill the gap between their prioritized needs and the baseline TxDOT allocation.

Enabling legislation will be required for many of these gap-fund initiatives. However, under the Texas Metropolitan Mobility Plan, the gap funds generated in a metropolitan area will be for the exclusive use of that metropolitan area to supplement the baseline, regional allocation of TxDOT funds for congestion relief.

It is anticipated that the metropolitan areas may develop other initiatives — yet to be identified — for user-pay funds. Based on need, each metropolitan area will develop user-pay initiatives to generate gap funds.

Gap funds from a user-pay system can be generated several ways. Some methods that a metropolitan area may use include:

Assess traffic impact fees for development

Issue local general-obligation bonds

Toll added-capacity projects and issue bonds

Manage demand and generate funds through a toll-ring concept (as in London, England)

Allocate a portion of a statewide gasoline tax increase for urban/metro areas

Manage truck utilization of the highway system though specific congestion-based pricing

Implement added vehicle-registration fees designated for local mobility projects

To improve system performance, implement a toll system for projects that ease bottlenecks on existing freeway segments (example: toll approach roads to fund an interchange or bridge project)

Implement a retro-toll system allowing for the tolling of existing congested interstates and other freeways to improve system mobility.

Streamlined Project Delivery

With a developed regional mobility plan consisting of a prioritized listing of projects, policies, and identified funding (allocated and gap), the citizens of Texas metropolitan areas should see more timely delivery of improvements. The Texas Metropolitan Mobility Plan will allow for expanded use of innovative tools for project delivery. These include:

Improved environmental review through the development of comprehensive regional mobility plans. It is anticipated that these plans may serve as Tier I environmental documents to reduce specific project-development and approval timelines.

Unrestricted use of the authority in comprehensive development agreements. This would occur in cooperation with TxDOT for more rapid development of complex projects in metropolitan areas. This seamless contract-and-construction option will allow the immediate negotiation with public and private-sector organizations to design, build, finance, and manage transportation corridors anywhere in the state — including those within metropolitan areas.

Seek specific exemption from the current (30 percent) restriction on toll equity for toll projects in urban Texas. This will allow TxDOT and individual metropolitan areas to maximize the baseline allocation and gap funds. In turn, this will attract additional private-sector investments to create new toll projects in Texas metropolitan areas.

Institute the concept of "pass-through tolling" for the TxDOT portion of metropolitan projects. Seek approval for TxDOT to enter into these special financing agreements, based on traffic and regional mobility plans, with local metropolitan governments and the private sector. Under such arrangements, TxDOT or a local government would award a consortium the right to design, build, finance, and operate a highway-improvement project for an agreed period. TxDOT and/or the metropolitan area then would pay the consortium, based on the volume of traffic using the facility. Using this tool, TxDOT and/or the local metropolitan entity will be able to maximize its cash flow while allowing projects to move quickly to construction.

Seek blanket approval to add toll lanes to existing highways. In addition to quickly adding capacity, this will provide timelier availability of gap revenue.

Institute policies for allowing metropolitan entities to receive fund credits for their expenditures to construct off-state system projects, consistent with the regional mobility plan. Allow these credits to be used as the local required match for future off-state-system federal projects (similar to the off-system federal-aid bridge program).

Streamline state and federal oversight roles for small off-state-system projects. The purpose is to reduce costs and to complete projects sooner. This may take the form of adoption of more cost-effective standards for these types of projects.

When a project is funded wholly or partially by toll or other gap funds, the capital ability of those funds is directly linked to timely project delivery. The faster the project starts generating revenue, more of the generated funds then are applied to the bond balance and less to interest. As use increases of tolls and other gap-funding measures, so does the importance of rapid delivery of projects.

Action Plan

The Texas Metropolitan Mobility Plan will be implemented with the 2005 Texas Unified Transportation Program (UTP), scheduled for adoption in the fall of 2004.

With the concurrence of the metropolitan MPOs, projects now identified for construction in years 2004-2007 (2004 UTP) will be added to the first version of the regional mobility plans for inclusion in the 2005 UTP. The individual metropolitan areas will have the option of changing priorities of projects in the 2005 UTP.

In many cases, the 2005 regional mobility plans may not be able to meet fully the vision of the Texas Metropolitan Mobility Plan. The Transportation Commission may elect to grant provisional approval of the prioritized project listing pending development of the comprehensive regional mobility plan.

The Transportation Commission, the governor, the lieutenant governor, state elected leadership, and individual metropolitan areas will begin working with the Texas Legislature and Congress to change the identified state planning regulations, gap-funding restrictions, toll-equity funding provisions, and rapid-project-delivery restrictions to allow the full implementation of the Texas Metropolitan Mobility Plan.

Following is an action plan listing tasks that need to be performed by TxDOT and the MPOs to implement the Texas Metropolitan Mobility Plan.

TxDOT Actions		Date
1.	Designate a member of its senior administration to oversee the implementation of the Texas Metropolitan Mobility Plan and assist the governor, individual metropolitan areas, and legislators in identifying and drafting legislation for implementation. This senior administration official's staff will work closely with each metropolitan area and TxDOT district to develop regional mobility plans and seek innovative ways to fund and rapidly deliver projects. By letter to the governor, TxDOT identified the deputy executive director to oversee this implementation.	4/03
2.	Complete planning process for FY 2004 Unified Transportation Plan (UTP).	9/03
3.	Adopt Texas congestion index.	9/03
4.	Enact regional, baseline metropolitan funding allocations for FY 2005 UTP.	12/03
5.	Review and concur with regional mobility plans for metropolitan areas.	10/04
6.	Include prioritized metro-area project lists in the 2005 UTP.	11/04
7.	Develop and prepare an annual report on implementation of the Texas Metropolitan Mobility Plan and impact on congestion reduction.	8/06
8.	Review metropolitan regional mobility plans.	Every 5 yrs
9.	Category 2 Work Group review funding formula.	Every 5 yrs

Metropolitan Planning Organization Actions		Date
1.	Define the regional metropolitan mobility planning boundaries. These may be the boundaries of the existing MPOs and expanded now or later to include a more regional area. This expansion will be in cooperation with the local entities and approved by the Texas Transportation Commission.	7/03
2.	Identify the management structure and makeup of regional planning board. This may be the metropolitan planning organization's (MPO) policy board or a different panel as needed by the individual metro areas. It may be that for the first regional mobility plan, the existing MPO policy board structure will be appropriate.	9/03
3.	Adapt unified-planning work programs to address the data needs of a regional mobility plan. TxDOT will work with the Federal Highway Administration to adjust MPO work programs as needed to complete the regional mobility plans.	12/03
4.	Develop comprehensive, regional-needs mobility plan.	5/04
5.	Identify gap-funding sources.	5/04
6.	Use all available funding sources to develop a financially constrained regional list of prioritized projects to reduce congestion.	9/04
7.	Update regional mobility plans.	Every five years

Summary

Texans want all of Texas to be safe and to prosper. But Texans want prosperity in an intelligent, comprehensive, and environmentally sensitive way that improves the quality of life for all our citizens.

The Trans Texas Corridor is a bold approach for addressing growth and economic vitality for intrastate movement of people and goods.

Likewise, the Texas Metropolitan Mobility Plan is an innovative framework for reducing congestion, addressing safety, improving air quality, improving quality of life, and improving economic development opportunities in the metropolitan areas. The Texas Metropolitan Mobility Plan comprehensively addresses needs, realistically and fairly allocates funds, and increases local decision-making authority and innovation opportunities.

The Texas Metropolitan Mobility Plan is not a single concept, but a framework that can be tailored to the needs of the individual metropolitan areas in a fair and realistic manner.

The time for the Texas Metropolitan Mobility Plan is now. With each day of delay, millions of Texans lose time — stuck in traffic — that they will never see again.

Appendix

Texas Congestion Index

Background and Significance of Work

A single congestion measure is needed that addresses the transportation of persons and freight by all modes within the major metropolitan areas of the state. The measure should show the effect of spending to relieve congestion by all agencies and the private sector, and should be useable for current and future conditions. The intent is to use the measure to examine a range of geographical areas from the entire metro area, to sub-regions, corridors, and individual projects. The procedure should accommodate the major congestion-reduction techniques used in the areas, as well as provide a method for other techniques to be included. The Texas congestion index will be developed initially using available data from the eight metropolitan areas. As the metropolitan areas use the index and as more data is made available, it will be updated and modified.

Texas Congestion-Index Goal

The objective for the index would be to describe mobility conditions for people and freight. There are many challenges that flow from this objective. Possibly the most significant is to develop a framework for an ultimate index formulation in some future year that can take advantage of modeling and data improvements. Such a framework would need to include procedures that can use current models, methods and data to produce an index by August 2003.

General Model Structure

The index will use the data and models that have been produced for other purposes to generate congestion-index statistics. The specific index formula may be a new element, but the data and supporting analyses should be from some combination of the long-range transportation-planning model, post-processing steps for model outputs, and other procedures necessary to estimate current and future urban-congestion conditions — either not included in a model or for location where current models are not available.

This might take the form of a "modally oriented" construction of the index (Exhibit 1). Or it may be more appropriate to identify the sources of delay and map the potential improvement that can be gained from the several different types of treatment as shown in Exhibit 2. Some other approach or a combination of approaches also may prove to be the right method.

Exhibit 1. General Model Structure (Future Version)

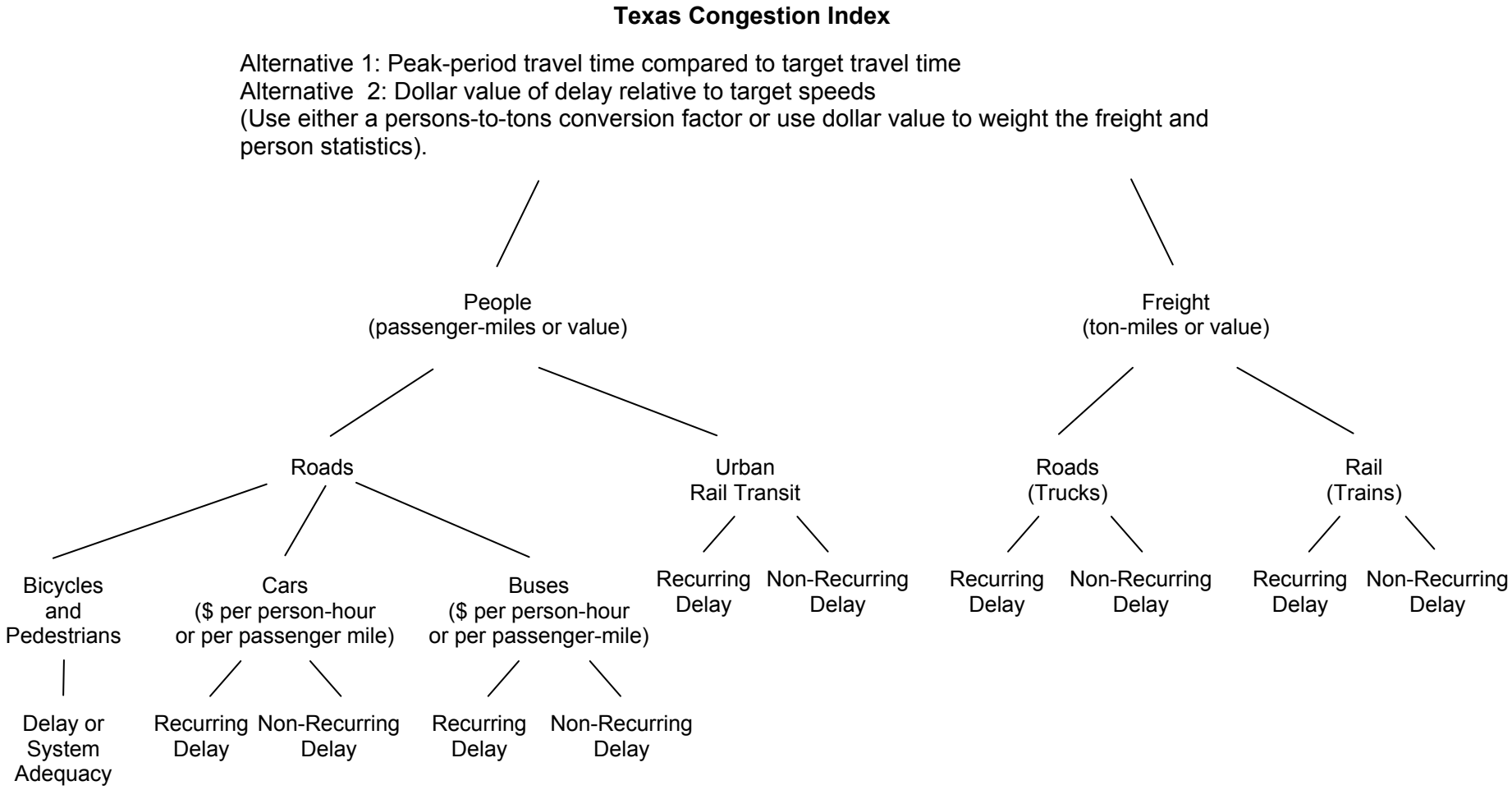


Exhibit 2.

Delay Source Used as a Basis for the Texas Congestion Index

Texas Congestion Index (weighted average of Metropolitan Congestion Index values)							
Metropolitan Congestion Index							
	Recurring Delay Sources			Non-recurring Delay Sources			
Toolbox Element	Excess Demand	Bottlenecks	Traffic Control	Weather	Work Zones	Incidents	Special Events
Add Capacity							
New lanes							
New highways							
Improve street continuity							
New Lanes without new road							
New toll roads							
Grade separation							
Geometric design							
Managed/truck lanes							
New streets/new development							
HOV lanes							
Multimodal transportation corridor							
Freight-rail improvements							
Bus rapid transit							
Heavy rail							
Light rail							
Commuter rail							
Increase System Efficiency							
Alternate hours of travel							
Variable-pricing strategies							
Flow signals							
Traffic-signal improvements							
Incident management							
Event management							
Electronic toll collection							
Intersection improvement							
One-way streets							
Changeable lane assignments							
Access management							
Technology-based transit improvements							
NOTE: No "tool" should be evaluated in isolation. There are significant benefits to enacting several tools together.							

Exhibit 2. (continued)
Delay Source Used as a Basis for the Texas Congestion Index

Texas Congestion Index (weighted average of Metropolitan Congestion Index values)							
Metropolitan Congestion Index							
	Recurring Delay Sources			Non-recurring Delay Sources			
Toolbox Element	Excess Demand	Bottlenecks	Traffic Control	Weather	Work Zones	Incidents	Special Events
Manage the Demand							
Local bus service							
Neighborhood circulators							
Activity-center circulators							
Express & park/ride							
Demand-response and hybrid bus service							
Fare strategies							
Park-and-ride lots							
Vanpools							
Ridesharing							
Telecommuting							
Change the urban scheme							
Assess transportation impacts							
Parking strategies							
Bicycle and pedestrian							
Manage the Construction							
Contracting strategies							
Working-day adjustments							
Design-build strategies							
Public/private partnerships							
Toll roads							
GARVEE bonds							
Tax-increment financing							
Work-zone traffic control							
Local option fees							
Variable pricing							
NOTE: No "tool" should be evaluated in isolation. There are significant benefits to enacting several tools together.							

The person-movement component will be time-consuming to estimate and model, but there has been a significant amount of work on those models. The freight model and measures may be much more difficult to accomplish due to private-sector reluctance to share data. Information that public-sector agencies consider basic data elements can be the competitive business advantage that one company has over another. The Texas congestion index will attempt to model the freight transportation components using information being developed in Texas and at the national level, but the freight measures may rely more on models and less on directly collected data than the person-movement measures.

Key Elements of the Index and General-Model Evolution

Procedures for calculating the congestion index and for processing the general model are designed to work with a range of data and techniques, but desirably will incorporate a broader variety of information. Key elements of the index, however, will remain fairly stable. These elements include:

Speed, travel rate (e.g., minutes per mile), or travel time

Person-miles-moved (one way to value passenger-carrying systems)

Ton-miles-moved (one way to value freight-carrying systems)

Dollar value (a possible way to link the various components of congestion and mobility)

Target speeds (a method of identifying the beginning of undesirable congestion levels; example: any facility with a speed greater than the target speed would be considered as not requiring immediate improvements)

Travel delay (the difference between desirable speeds or travel times) and the current or projected condition

A method to include the full range of transportation improvements, land use, and other programs designed to yield transportation benefits

Variation in speed or reliability of travel time (as a component that needs to be incorporated in some way, although data will be a challenge in most locations)

Bicycles and pedestrians included in some way (although operating data may not be the appropriate mechanism)

In general, the model may evolve through the following steps, with some metropolitan areas proceeding toward Phase 3 more rapidly than others.

Phase 1
Start with estimation procedures. Provide a method to accommodate credits for operational or other treatments from before-after/studies or other evaluations.

Phase 2
Use computer models (perhaps from TransCAD/EMME-2) to generate mobility statistics.

Use speed estimates based on computer output (perhaps from TransCAD/EMME-2) and follow-on analysis.

Modify capacities or operating speeds to accommodate operational improvements, or use the "credit" approach.

Biggest benefit — to show the effect of land use changes.

Phase 3
Identify real-time data sources and methods to include them. Freeway data exists in Houston, Austin and San Antonio. Such data soon will exist in Dallas-Fort Worth. Data might be used to predict reliability levels.

An Initial Suggested Approach to Describing and Using Optimum Congestion

Optimum congestion is a term that seems very appropriate for use with the Texas congestion index. The working definition at this time is: *The target speed or person density for a portion of the transportation system that identifies the difference between slow or crowded traffic that is slightly inconvenient versus a congested situation that should be remedied.*

The optimum-congestion term would allow agencies to grade the system according to local targets that could be based on local values. With funding decisions being made at the local level, there is less need for a measure that uses one standard (such as free-flow conditions or the speed limit) for all facilities and operations across the state.

Further, such a common standard to measure congestion still could be created to identify a free-flow, speed-based congestion level.

The definition for "optimum congestion" could allow an area to recognize that congestion is more likely, more acceptable, and more costly to remedy in urban core areas or downtowns.

Likewise, a city could recognize that there is more economic or social value to creating denser development in urban core areas that may have more congested roadways within them, but which provide more travel options, and ensure that workers, shoppers, residents, or others can travel to and from these areas with relatively less trouble.

In practice, metropolitan planning organizations might initially identify target speeds for system components by type of adjacent development or by urban-area type (used in long-range model).

These will include peak-period and off-peak-period speed targets. Also, they may include travel-time-reliability targets. The target also might be expressed as a travel rate (in minutes per mile) due to the ease of mathematical use, but travel rate is somewhat more difficult to communicate to the public even though such a rate is closer to representing the travel-time factor that is of importance to their trips.

As part of a separate period of public comment, or as an element of the next long-range plan update, the targets might be revisited with more scrutiny. The goal would be for the land-use changes and transportation-improvement plans to be related in a manner that can be displayed and used in identifying needed investments.

As a beginning, optimum-congestion levels might include information as in Exhibit 3. This is similar to the process used by many states and cities where a target level of service is used to determine the need for additional transportation improvements. The level of specificity and variation across area types may, however, be more than is typically seen in these processes.

For both the peak and off-peak periods, the optimum speeds for several modes of travel are included. The area types are used to match the expectations of travelers with the environmental, social and economic concerns that might be exhibited in each area.

The speeds in Exhibit 3 are for illustration only.

More area types and modes also can be developed, but the table provides a view of the information needs.

In practice, there will be a need for an average value per corridor (or, also expressed as “corridor-average value”). This would be used as the improvement target for facilities, operations, or programs.

The optimum congestion per facility or mode can be used for evaluation, but improvement strategies should be based on corridor-level decisions.

Exhibit 3. Example of Optimum Congestion Matrix

PEAK PERIOD

	Optimum Travel Speed (miles per hour)					
Area Type	Freeway Mainlane	Freeway HOV Lane	Major Street	Bus on Street	Rail in Street	Bike
Central Business District	35	60	12	8	10	10
Central City/ Major Activity Center	40	60	20	12	13	10
Suburban	45	60	24	15	15	12
Fringe	50	65	30	17	20	15

OFF-PEAK PERIOD

	Optimum Travel Speed (miles per hour)					
Area Type	Freeway Mainlane	Freeway HOV Lane	Major Street	Bus on Street	Rail in Street	Bike
Central Business District	40	65	20	12	13	12
Central City/ Major Activity Center	60	65	24	15	15	13
Suburban	60	65	30	17	17	15
Fringe	60	65	40	20	24	15

Note: These speeds should reflect a consensus of input from technical and non-technical groups. An informational packet should include data on the relationship between economic development, environmental impact, land use, and transportation-system choices. It should also identify current operating conditions for facilities in each matrix cell, so that comparisons with known facilities can be made.

Estimating Travel Delay and "Credits"

Travel delay will be estimated using either the post-processed speeds from the long-range planning models, or will be obtained from a combination of highway-performance monitoring system, roadway-inventory data, and Texas Transportation Institute procedures.

The general approach for collecting the index data will be the following:

1. Use model or computer-generated or estimated speeds.

2. Compare to target speeds for major streets and freeways.

3. Initially prepare delay estimates for regular conditions.

4. Estimate event delay (separately or together) for: special events, weather conditions, collisions and vehicle breakdowns, construction and maintenance activities.

5. Estimate the delay-reduction effect of operational improvements, ramp metering, incident management, signal coordination, access management, and other treatments.

6. Estimate high-occupancy vehicle facilities and public transportation passenger-miles and delay or travel time.

7. Use before/after studies or data from direct monitoring to improve estimates of delay or as substitutes for delay estimates.

Brief Overview: Speed-Estimation Procedure

The following is an overview of the process for estimating base-level speed. **This can currently be accomplished for any urban area within Texas.**

More sophisticated long-range planning models will provide a method to consider a broader range of treatments and land-use arrangements than can be considered with this process. Even so, it provides a consistent method that can be accomplished with current data and models.

More information on the speed-estimation procedure used in the urban-mobility study can be found in the Appendix, and on the Internet at http://mobility.tamu.edu/ums.

1. For each functional roadway class, identify traffic volume per lane for each road section and the amount of daily travel on each section.

2. Assign each road section to a congestion level "bucket" — either uncongested, or one of four congestion levels (moderate, heavy, severe or extreme).

3. Each congestion level has an average peak-period travel speed (see Exhibit 4).

4. Sum the daily vehicle miles of travel in each congestion range.

5. Multiply by 50 percent to estimate the amount of travel in the two peak periods (for each congestion range).

6. Calculate delay by multiplying the passenger-miles of travel by the amount of time to make trips at the congested speed and compare to the time to make trips at the uncongested speed. The difference is delay.

7. Estimate incident delay as a percentage of recurring delay.

Exhibit 4. Delay Calculation Summary

Congestion Range	Speed Range	Components or System Element	Traffic Level or Condition
Uncongested	60	Freeways	ADT/Lane less than 15,000
	35	Streets	ADT/Lane less than 5,500
	35	Public Transportation Service	On-schedule
Moderate	60 to 55	Freeway	15,000 to 17,500
	35 to 28	Streets	5,500 to 7,000
Heavy	55 to 48	Freeway	17,500 to 20,000
	28 to 27	Streets	7,000 to 8,500
Severe	48 to 27	Freeway	20,000 to 25,000
	27 to 26	Streets	8,500 to 10,000
Extreme	27 to 20	Freeway	Greater than 25,000
	26 to 25	Streets	Greater than 10,000

Improvement Treatments	Delay Reduction (%)
Ramp metering	0 to 12.4
Traffic-signal coordination	0.5 to 6.1
Incident management	14 to 35
Access management	To be determined
High-occupancy vehicle (HOV) facilities	Include speed and person volume directly
Other treatments	To be determined

Specific treatment considerations are discussed below:

Incorporating Operational Treatment Benefits

1. Extent of the treatment. How much of the travel on the system is affected by the operational treatment?

2. Effect of the improvement. The effect, in many cases, will vary by congestion level. The effect also may vary according to the density of the treatment (e.g., number of service-patrol vehicles per 10-mile section of roadway).

3. Estimate delay reduction due to the improvements and subtract from baseline delay estimates.

Incorporating Public-Transportation Service Effects

1. Differences in service characteristics make direct comparisons difficult. Travel speeds are less due to passenger loading/unloading.

2. Riders either know the scheduled travel time or know that the service is frequent enough that there is no need to examine the schedule.

3. What riders are looking for is a reliable travel time that meets their travel needs. Once a traveler makes the decision to use public transportation, if transit service is on-schedule the travel needs will be met. This can be thought of in the same way as uncongested roadway travel conditions.

4. If the public-transportation service speed is improved, on-time reliability improves, or more riders use the service, the system measure should improve because there will be more on-time passenger-miles of travel.

5. To incorporate public transportation service, identify the percentage of travel (passenger-miles) during the peak periods and the percent of those bus trips that arrive on time. Multiply the passenger-miles by the percentage of on-time arrivals. This amount of passenger-miles is added to the uncongested-travel amount on the roadway system. Any late or early arrivals are factored into one of the congested categories.

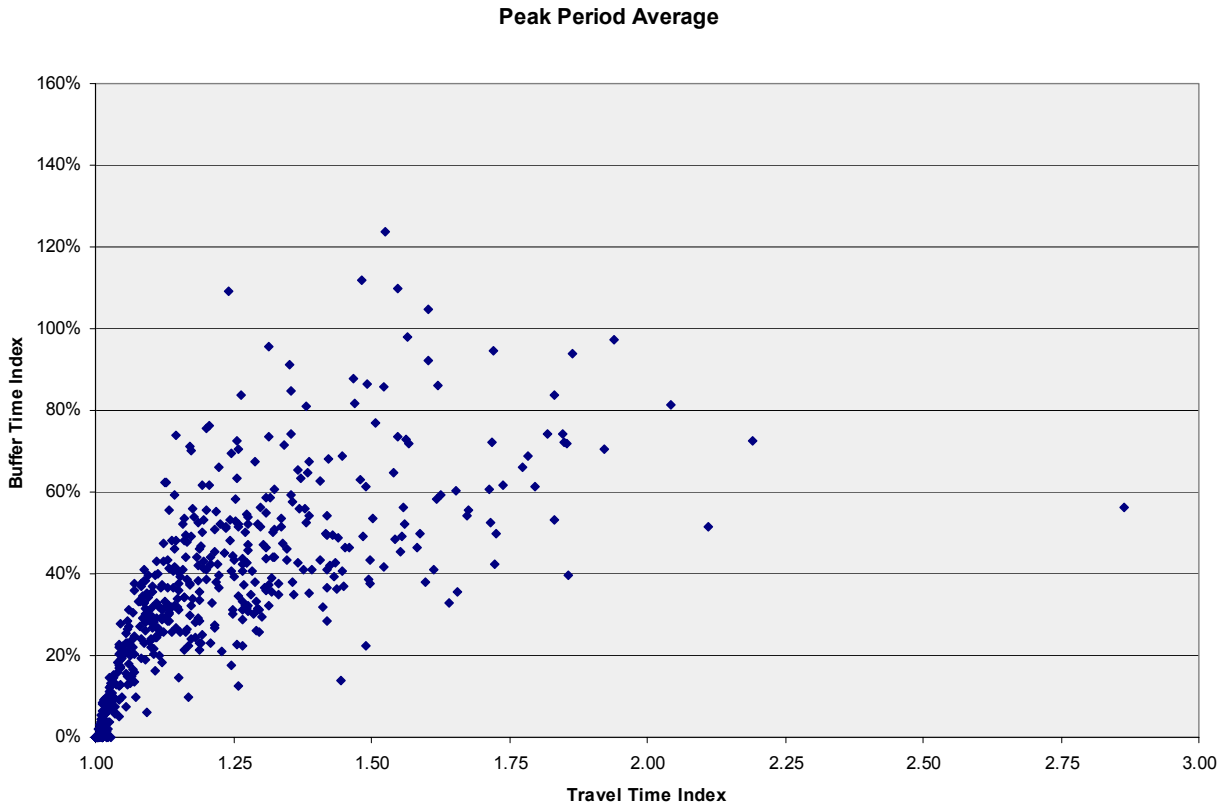
Incorporating High-Occupancy Vehicle (HOV) Facilities

1. HOV lanes operate in a manner similar to roadways, but are not included in typical reports about roadway congestion. The bus service on the lanes does not stop to load/unload passengers along the lanes.

2. Many HOV lanes, including all those in Texas, are monitored for travel-speed and person-volume.

3. Since the HOV service has not been incorporated into previous sets of mobility statistics, the HOV speed and passenger-miles of travel in the peak period can be added to the roadway database.

Exhibit 5. Relationship Between Peak-Period Congestion and Reliability Levels



Incorporating a Reliability Component

1. Reliability is important for people and freight. It is a problem that might be easier to address within current funding trends than daily traffic delay.

2. Studies in 21 cities in the United States indicate there is a strong relationship between roadway congestion and unreliability. As congestion increases, so does unreliability (i.e., the variation in travel time from day to day increases). See the graph in Exhibit 5.

3. Current procedures for road-delay estimates include many reliability-related causes.

4. For people, use congestion to estimate reliability. For freight, reliability might be even more important than uncongested trips. This is particularly true for just-in-time manufacturing operations, but also holds for many service-oriented companies. The method of using congestion to estimate reliability levels on roads might be useful in this context, but more information is needed on how businesses view reliability to understand the issue fully. That information will not be collected in this project.

5. Rail-freight reliability might be easier to assess using delivery schedules, but our initial examination of the issue indicates that railroads will be reluctant to provide the on-time or schedule information that will be needed. It may be possible to look at this as a transfer from road-travel issue, unless there is a funding request or project proposal that would be supported by data. This would provide the railroad companies with the business-data security they seek, and not require the public-sector agencies to create measures that may not be connected to the business processes they are intended to assist.

Other Significant Questions Related to Freight

1. When does the process start? We believe that "time zero" and "location zero" is when the freight is on the ground in an urban area of the state. So, waterborne commerce would become part of the measure when it reaches the dock or wharf.

2. How much of the possible capacity and operating changes are we going to try to include in the model? There are a range of possible transportation investments — identifying those that need to be accommodated is an issue. For example, there may be a benefit for metropolitan truck congestion to providing a double-track section in a rural area between two cities. But many rail investments are made for the benefit of the private rail companies.

3. For road freight, the general congestion-index concepts of speed, distance, and amount of travel seem to apply. Initial estimates of congestion may use the estimation procedures for passenger-movement speed. They also might apply estimates of truck percentage to determine truck delay. This process might be improved with better data about truck percentages on specific road sections.

4. There is no single source of data regarding truck volumes, origin and destination, and routes. Research project 0-4713 will focus on identifying data sources and designing a method for collecting such data in a form that lends itself to analysis with respect to volumes, origin, destination, and route. That project should be examined for results that can be derived from other versions of the method used to determine the Texas congestion index. The desired result is two-fold:

   development of a data source or sources, and
   a method for assembling a database that can be regularly updated while providing the basis for accurate analysis of interstate and intercity commercial truck traffic.

Summary

The estimation processes for the freight-movement and person-movement congestion index are summarized in exhibits 6 and 7. These processes would happen concurrently and would use some of the same data sources, procedures and models.

Exhibit 6. Freight-Travel Estimating Overview

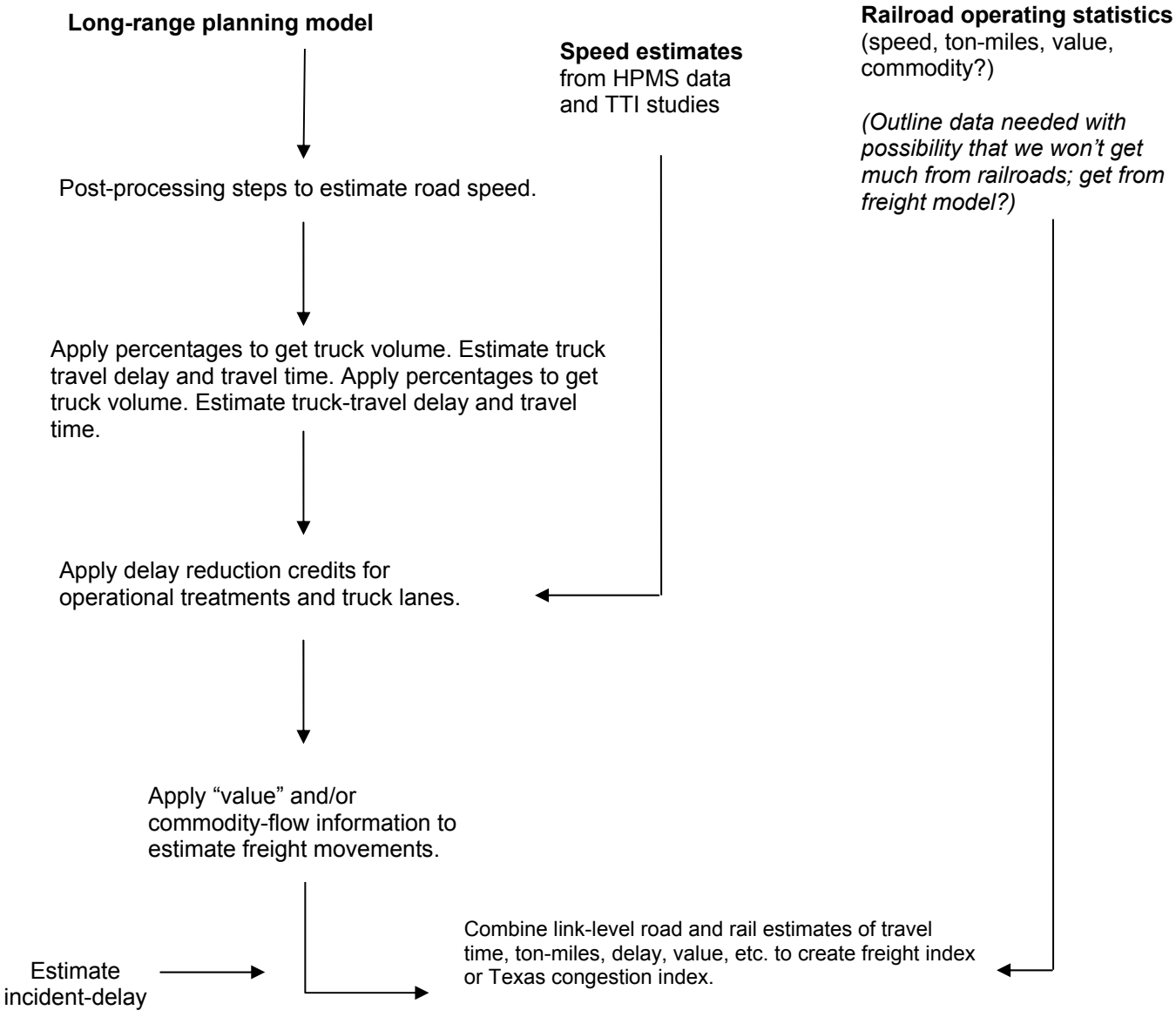
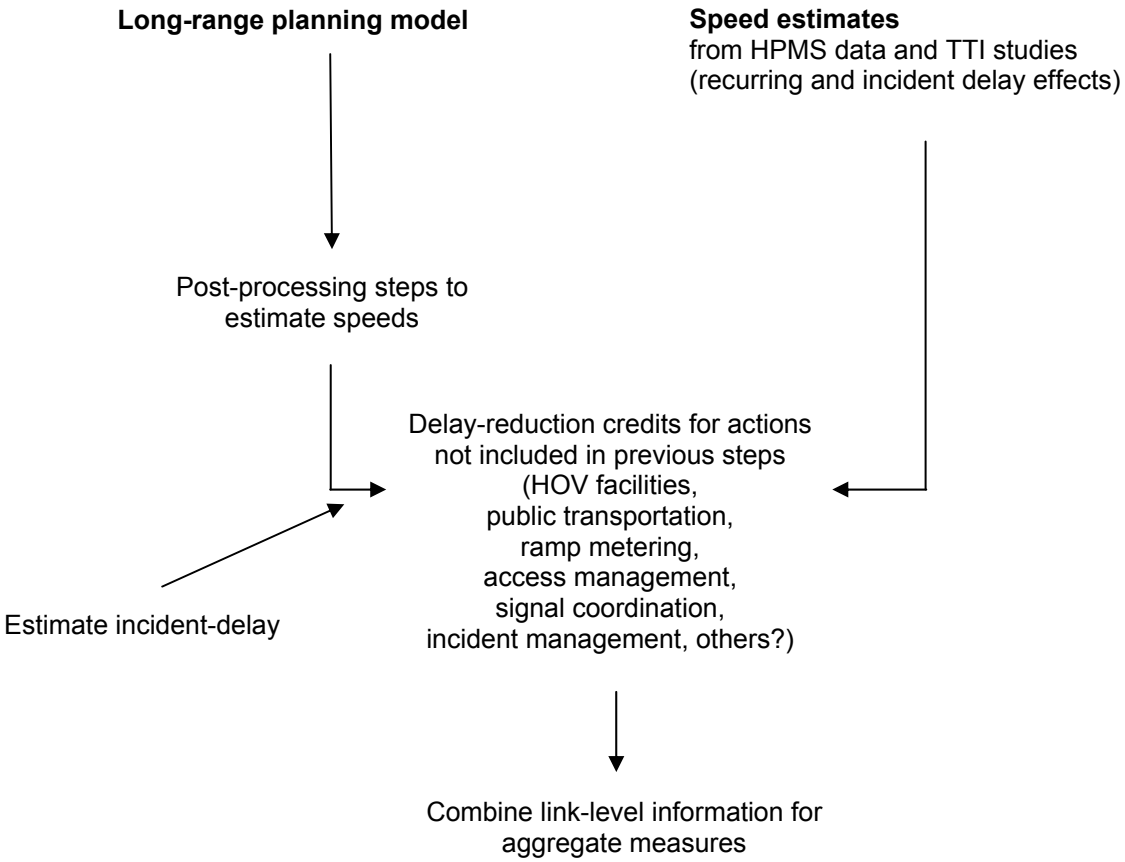


Exhibit 7. Person-Travel Estimating Overview



Implementation

The Texas congestion index will be developed in cooperation with the agencies who will use it — TxDOT and the metropolitan planning organizations. The procedures will be a part of the long-range planning model or will be accomplished using the available travel and facility-inventory information.

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