Audit Report

TRANSPORTATION, PLANNING, AND SUSTAINABILITY DEPARTMENT: TRAFFIC FLOW AND SIGNALIZATION

November 2001

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MEMORANDUM

To: Mayor and Council Members

From: Stephen L. Morgan, City Auditor

Date: November 20, 2001

Subject: Transportation, Planning and Sustainability Department's Traffic Flow and Signalization Audit

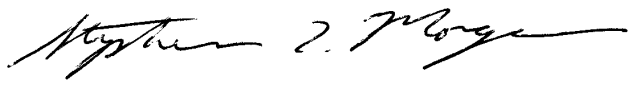
I am pleased to present our audit report on Traffic Flow and Signalization. This audit, which began just as the City's transportation function was being moved to the newly created Transportation, Planning and Sustainability Department (TPSD), was intended to provide assurance that the Transportation Division's signals system upgrade would be on-time and within budget. Additionally, our other objectives were to determine whether traffic data is systematically collected, analyzed, and shared with relevant agencies and citizens and whether planning for response and minimization of temporary traffic disruptions was in place.

We found that, while the Transportation Division of the Transportation, Planning, and Sustainability Department has, through its signal system upgrade, successfully installed the backbone of a modern traffic management system, significant work remains before the benefits of a comprehensive intelligent transportation system are realized.

The upgraded signal system has been operational since early October, with just over one-third of Austin's intersection controllers connected via fiber-optic cable to the control operations center. Operators demonstrated competence in operating the basic features of the new system; however, additional training is needed for making use of the full capabilities of the new signal system. Moreover, the means for sharing information from the upgraded traffic management system with other agencies and citizens are not in place. Furthermore, more effort can be expended to minimize the effects of both planned and unplanned temporary disruptions to traffic.

We made 15 recommendations addressed to the TPSD, the Austin Police Department, and the Infrastructure Support Services with the aim to help the City derive all the potential of its new signal system upgrade for improving the flow of traffic in Austin.

We appreciate the cooperation and assistance received from City staff during this audit.



Stephen L. Morgan, CIA, CGAP, CFE, CFGM
City Auditor

COUNCIL SUMMARY

The two-year traffic signals upgrade project successfully installed many core elements of a modern traffic system. However, our traffic signal system is not fully upgraded and several planned features were only partially addressed. Much of the fiber-optic cabling was not installed in the central business district, and the majority of the new signal controllers have not been wired into the new traffic computer system. The Transportation, Planning, and Sustainability Department (TPSD) is not ready to share real-time traffic information because the majority of the planned system detector loops were not installed and because plans on how to share data have not been finalized.

TPSD staff was able to demonstrate the functionality and capabilities of the new system, although we are unsure if enough employees were trained as intended. In addition, we successfully tested the redundancy features of the signals upgrade, but TPSD has not developed guidelines to use these features to recover from disasters or unforeseen events.

Also, this two-year project to upgrade to a modern traffic management system was only the first step toward the City's six-year vision of an intelligent transportation system. In order to achieve this larger vision, the TPSD must help feed data from the new system to roadway planning efforts and to incident management efforts. In addition, real-time data needs to go to other agencies and to the public in order to help them navigate around existing conditions as smoothly as possible.

Although not responsible for responding to unplanned incidents (such as traffic accidents), the TPSD could be helping the APD to minimize the resulting delays. In addition, City data on planned disruptions (such as construction blocking roadways) is difficult to obtain and therefore hard to monitor. Thus, additional work is clearly needed both in terms of finishing the system upgrade and achieving the complex coordinating and planning efforts needed to go beyond a traffic system to an intelligent transportation system. However, how the work will be funded is not clear.

ACTION SUMMARY

Traffic Flow and Signalization

Rec#	Recommendation Text	Management Concurrence	Proposed Implementation Date
01	In order to offset the cost for the completion of cabling within the Central Business District, the Director of the TPSD should pursue recovery of costs from contractors who have damaged existing conduit.	Concur	11/15/2001
02	In order to clarify the recording of project-related expenditures, the Director of Infrastructure Support Services should isolate and separate project funding from the 1992 bonds and grant funding into project-specific accounts.	Concur	06/30/2002
03	To properly account for inventory items, the manager of the Traffic Signals activity at the TPSD should establish a perpetual inventory system that will track controllers, cabinets, and other high-value equipment, including those that are returned to the warehouse for repair and re-issue and those that are damaged beyond repair.	Concur	03/01/2002

Rec#	Recommendation Text	Management Concurrence	Proposed Implementation Date
04	In order to recover funds expended outside the scope of the signals upgrade project, the Director of the TPSD should pursue reimbursement for work performed on the GAATN fiber-optic network.	Concur	02/01/2002
05	To support future funding decisions, the manager of the Traffic Signals activity at the TPSD should prepare cost estimates and time frames for completing additional phases of the signals upgrade project.	Concur	06/01/2002
06	In order to make use of the signal upgrade's redundancy features, the Transportation Division Manager should develop and communicate written guidelines for responding to unforeseen contingencies or disasters affecting traffic signals or the Central Control Operations Center.	Concur	07/01/2002
07	In order to ensure that signals staff receive uniform training, the Transportation Division Manager should pursue delivery of formal training by the consultant and videotape the sessions for future use, as permitted according to the contract.	Concur	11/15/2001
08	To encourage employee development and meet City training requirements, the Transportation Division manager should make sure that all training hours are recorded in the City's on-line training database and that training information is incorporated into personnel records.	Concur	02/01/2002

Rec#	Recommendation Text	Management Concurrence	Proposed Implementation Date
09	To establish future data-sharing efforts, the Transportation Division Manager should coordinate with other City departments involved in the Combined Emergency Communications Center to resolve how the TPSD will share the video and data feeds under the adopted protocol.	Concur	08/01/2002
10	To collect data on vehicular traffic to review and share with the public and to assist in setting signal timing patterns, the Transportation Division manager should ensure the installation of the system detector loops.	Concur	08/01/2002
11	In order to give the public direct access to benefits of the new traffic management system, the Transportation division manager should finalize the responsibility for maintaining the integrated website to ensure that educational web pages are designed and implemented.	Concur	08/01/2002
12	To facilitate inspection and improve compliance of contractors at construction sites, the manager of the Work Zone Safety activity should work with the Information Systems Department to complete permitting information system improvements to provide accurate data for monitoring and enforcement by inspectors.	Concur	08/01/2002

Rec#	Recommendation Text	Management Concurrence	Proposed Implementation Date
13	To improve the consistency of traffic management at incident scenes and minimize the impacts of incidents on traffic flow, the Training activity at the Police Department should develop and implement in-service training on traffic management based on the Incident Management Manual used in Academy training.	Concur	08/01/2002
14	To effectively develop the ITS priority of an incident management system, the manager of the Transportation Division should work with responsible parties to develop a coordinated traffic incident management system.	Concur	08/01/2002
15	To improve wrecker response to incidents and clear the roadway more rapidly, the Wrecker Enforcement section at the Police Department should disseminate information to officers addressing enforcement of wrecker noncompliance.	Concur	08/01/2002

TRAFFIC FLOW AND SIGNALIZATION
TABLE OF CONTENTS

Exhibits

Appendices

BACKGROUND

Austin has seen tremendous population growth impact traffic congestion on area roadways. While various local and regional planning efforts help shape the traffic infrastructure, Austin's Transportation, Planning, and Sustainability Department (TPSD) is responsible for maximizing traffic flow within that infrastructure.

Austin is facing traffic challenges.

The Austin area has been one of the fastest growing areas in the nation. This tremendous growth has led to traffic congestion problems within the City. However, not all of the traffic is within the City's direct control.

Over the last decade, rapid growth in the greater Austin five-county area has created new stresses on the City's roadway infrastructure. According to the 2000 census, the area has experienced a growth rate of 48 percent since 1990, with Travis County alone growing in the ten-year period by 41 percent. Williamson County to the north grew by 79 percent, while Hays County to the south grew 49 percent. This growth meant more cars and traffic contributing to traffic congestion.

In 1999, Austin was rated the most congested medium-sized City in the nation. A study of 68 cities carried out by Texas A & M University's Texas Transportation Institute (TTI) showed that in 1999 Austin was the most congested medium-sized city in the country.

Only 6 of the 68 cities studied outranked Austin in hours of annual traffic delay per person. Austin's citizens spent an estimated 45 hours delayed in traffic in 1999. For more information on Austin's ranking, see Appendix B.

In addition, the City's own Voice of the Customer citizen survey in 1998 reported that only 50 percent of respondents were satisfied with signal timing. Moreover, satisfaction with traffic flow received only a 23 percent favorable rating.

Congestion on state-controlled roadways is part of Austin's traffic problem. The primary carriers of roadway traffic in and out of the City, Interstate Highway 35 (IH-35) and Loop 1 (Mopac), are controlled not by the City but by the State of Texas' Department of Transportation (TxDOT). The City does, however, provide timing and maintenance of traffic signals on freeway access roads and highways through contracts with the state.

Transportation planning to shape the traffic infrastructure is underway.

Transportation and traffic planning efforts must address other conditions besides just moving cars in peak travel times. The various organizations charged with long-term transportation planning must balance between City, state, and federal concerns.

Federal transportation planning initiatives. The U. S. Department of Transportation's Federal Highway Administration (FHWA) has proposed aggressive strategies for alleviating congestion by promoting Intelligent Transportation Systems (ITS) to better manage roadway transit without necessarily adding more lane miles.

A 1997 FHWA "Toolbox for Alleviating Traffic Congestion and Enhancing Mobility" emphasized coordination and sharing of responsibility among agencies. The "toolbox" outlined three strategic categories for reducing congestion:

- Roadway design tools include planning and design strategies such as super street arterials or corridors, intersection improvements, one-way streets, reversible traffic lanes, and arterial access management.
- System management addresses the relationships among transportation issues as a whole and has become an integral emphasis of federal transportation programming and funding through the Transportation Equity Act for the 21st Century (TEA-21).
- Operational tools or strategies include traffic signal improvements, computerized/interconnected signal systems, arterial surveillance and management, turn prohibitions, and improved traffic control devices.

Roadway and system management strategies are typically more costly than operational strategies and require long-range planning and coordination among federal, state, and local authorities. As an example, Austin's position on IH-35, considered the North American Free Trade Act highway, illustrates the system management complexities of balancing the national interests for freight movement with the need for congestion mitigation for local traffic.

Federal strategies are increasingly aggressive, promoting alternatives to single-occupancy motor vehicles, such as high occupancy transit vehicles like buses and vanpools and provision of facilities to serve them. Providing for park-and-ride alternatives is also part of a systematic approach to transportation pressures. Finally, federal legislation has mandated that attention be paid to alternative transportation modes using no fossil fuels, such as bicycling and walking or telecommuting.

Regional Transportation Responsibilities. The TxDOT ensures federal roadway planning requirements and funds for local governments through

Metropolitan Planning Organizations (MPO). The Capital Area Metropolitan Planning Organization (CAMPO) is the official MPO for the Austin metropolitan area. The CAMPO's purpose is twofold: to coordinate regional transportation planning with the State of Texas, three counties, nineteen cities, and the Capital Metropolitan Transportation Authority (CapMetro) and to approve the use of federal transportation funds within the Austin metropolitan area.

Governed by a 21-member Policy Advisory Committee, the CAMPO is charged with promoting multi-modal transportation systems that efficiently maximize the mobility of people and goods with minimal energy consumption, air and water pollution, and social impacts. Long-range plans are drawn for the urban portions of the region, those likely to experience major growth in the next 20 years, and nonurban areas that extend intercommunity travel patterns.

Roadway funds from the FHWA are channeled to state and local governments through the TEA-21, signed into law on June 9, 1998, to replace the Intermodal Surface Transportation Efficiency Act (ISTEA), originally passed in 1991.

The TxDOT administers funds for federal highway construction and maintenance and fulfills its mission through activities in 25 geographical districts. Although each district has responsibility for the design, location, construction, and maintenance of its area transportation systems, they must follow federal acts, codes, and guidelines.

Local Initiatives. Transportation planners seek to arrive at solutions benefiting the broadest numbers of citizens; however, they must give careful consideration to the diverse interests of the community, as well. The relationship between traffic congestion and long-term transportation planning decisions is a complex one. The City of Austin's desire to encourage sustainability and balance between consumption of resources and creation of resources challenges traffic demands and transportation needs for all citizens. In order to balance transportation needs and congestion management, Austin has used various planning mechanisms.

In the Central Business District (CBD), the Great Streets program seeks to improve the quality of downtown streets and sidewalks. The program's ultimate aim is to synthesize transportation issues with a more pedestrian-oriented infrastructure and design the public right-of-ways into integrated and harmonious public spaces.

Local efforts to analyze traffic flow downtown, such as the Downtown Access Mobility Plan, examine existing traffic circulation systems and how workers and visitors use them. The study identifies and develops traffic and street improvement scenarios including improvements in roadways, traffic signal operations, and transit systems.

Commercial interests in downtown areas are frequently more concerned with providing for optimal access through street design and plentiful parking for driving customers and pedestrians, rather than assuring speedy passage to motorists. Furthermore, when considering adding capacity to existing roadways, transportation planners must give careful consideration to concerns regarding taking of right-of-way or the use of eminent domain to alleviate congestion for many, at the expense of the few. Other issues include balancing neighborhood concerns for assuring safe and quiet streets with the City's need to promote alternative routes over those same streets.

Finally, Austin is actively promoting alternative transportation strategies in seeking to address congestion mitigation. The City has partnered with CapMetro in encouraging bus transit, van pooling, and telecommuting within the business community, thereby cutting back on the number of single occupancy motor vehicles on the road during peak congestion periods. Moreover, the City has promoted bike lanes, an employee telecommuting program, discounted bus passes, and the yellow and white bicycle efforts.

The City's Transportation, Planning, and Sustainability Department has the responsibility for maximizing daily management of the traffic system.

The Transportation, Planning, and Sustainability Department (TPSD) is currently upgrading the City to a new traffic signal system. This new signal system should offer a variety of benefits in terms of both staff maintenance savings and public convenience. Overall, the new automated signal system is the first step toward accomplishing transportation system priorities developed by state and local planners.

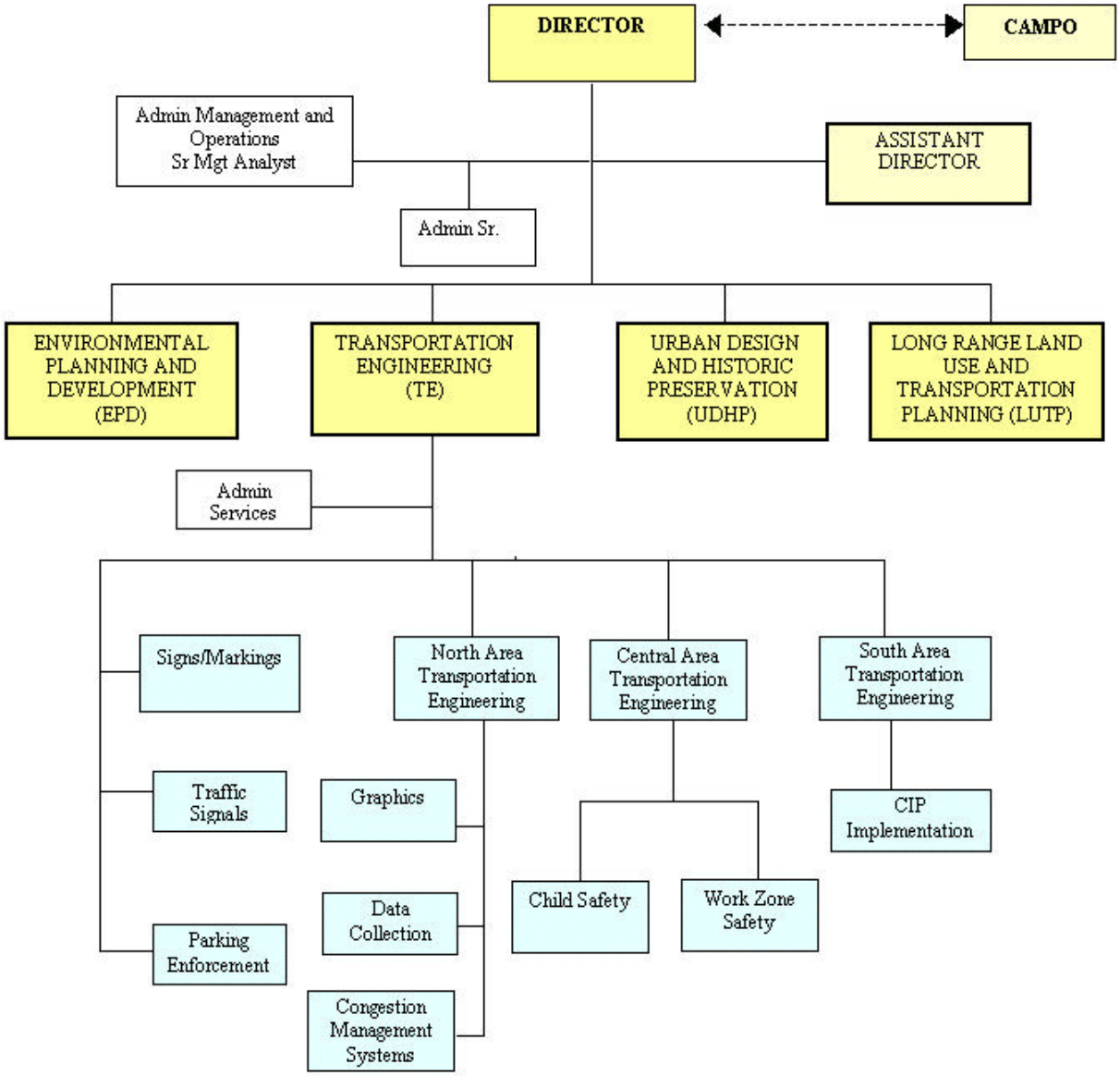
The TPSD is modernizing and automating the City's traffic management system. The Transportation Division is responsible for overseeing the implementation of the signal system upgrade. Although formerly associated with the Public Works and Transportation Department, the division became part of the TPSD in March 2001.

The division is divided into areas, which include programs and activities such as child safety, in addition to transportation engineering for the north, south, and central parts of the City. The division also contains three separate sections responsible for signs and markings, parking management, and traffic signals that report directly to the division's director. See Exhibit 1 for organizational detail.

To partially mitigate roadway congestion, City staff proposed an upgraded traffic management system, which would provide traffic control and signal

device improvements through computerized, interconnected signals and arterial surveillance and management.

EXHIBIT 1
TPSD Organizational Chart

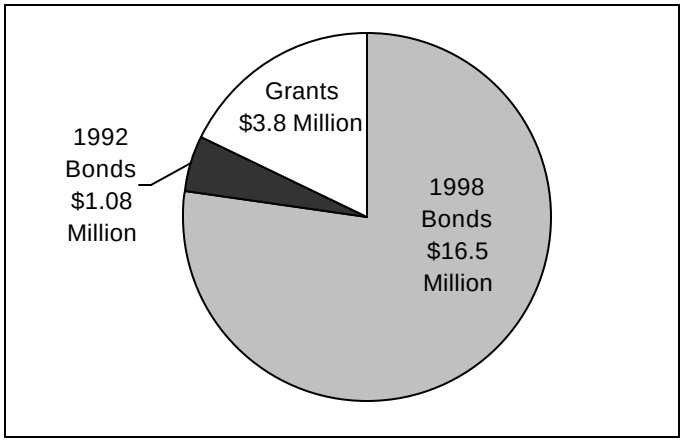


SOURCE: Ada pted from TPSD's Organizational Chart.

In November 1998, Austin citizens voted almost three-to-one in favor of a bond proposition to issue $152 million in tax-supported General Obligation Bonds for improving traffic signalization and control systems, acquiring and installing traffic signals, and improving and constructing roads and streets, as well as other issues related to these improvements.

Of the $152 million bond money, the City budgeted $16.5 million for the upgraded traffic signal system. In addition, the project budget also incorporated $1.08 million from bonds authorized in 1992 and grant funding of $3.8 million for a total project budget of $21.4 million. The implementation date was set as October 1, 2001.

EXHIBIT 2
Traffic Signal Upgrade Funding Sources



SOURCE: OCA analysis of project funding.

According to the TPSD, an upgraded traffic signal system will provide numerous benefits to Austin's drivers. Advantages cited include improved reliability and flexibility combined with ease of expansion and upgrade. Specifically, the new system is expected to reduce the maintenance problems associated with older and outdated equipment.

For example, the new signal controllers feature improved timing technology to eliminate problems associated with "clock drift." Special software will constantly monitor those intersections controlled by the central computer system for timing deviations. In the event that malfunctions occur, the newly computerized traffic management system will allow traffic signal engineers to identify and repair malfunctions faster. System software provides self-monitoring and reporting for malfunctions and failures, enabling easy troubleshooting, and the ability to detect and verify arterial street incidents to dispatch maintenance or other assistance to affected intersections.

Additional timing patterns may also be developed and added to signal controllers to mitigate situations arising from special events or incidents or to minimize difficulties in balancing conflicting right-of-way needs, such as those in heavily congested areas or time periods like rush hour in the downtown area. The TPSD cautioned, however, that the system would not increase roadway capacity, decrease travel demand, or maintain itself.

With the upgrade to a new signal system for managing traffic, Austin begins to accomplish Intelligent Transportation System (ITS) priorities identified in an earlier federal ITS report. During the late 1990's, the City assisted the Texas Department of Transportation (TxDOT) in developing a plan for deploying intelligent traffic management systems in our area. The resulting regional transportation report, "Austin Area-Wide Intelligent Vehicle Highway System and IH-35 Corridor Deployment Plan," incorporated the City of Austin (COA) plans for "Arterial-Street Surveillance and Incident Management System."

In the incorporated City plan, staff identified six major goals for traffic management:

- Improve traffic operations, traffic flow, and safety.
- Minimize negative impacts or disruptions related to implementation.
- Design the system for ease of additions, deletions, and/or upgrades.
- Maximize reliability and fail-safe operations.
- Maximize the ability of the system to monitor itself and report on system performance.
- Maximize the system's ability to quickly adapt to changing traffic patterns.

In addition, the regional report laid out a six-year plan that recommended 13 ITS priority components for arterial streets. Each priority included specific recommendations, benefits to be derived and justification for implementation, potential partners, and issues/questions. The ITS priorities identified were:

- **Enhanced Signal System**
- **Video Surveillance System**
- **Management Center**
- **Traveler Information**
- **Dynamic Lane Control Signs**
- **Advanced Traffic Controllers**
- Video Image Detection
- **Adaptive Signal Control**
- Incident Management Program
- **Signal Pre-emption**
- Transit Signal Priority
- **Arterial-Street Travel Time Measurement, and**
- Reversible Lanes

The current initiative, the traffic management system signal upgrade, is intended to achieve initial development of 9 components (bolded above) identified in the COA Arterial ITS Plan through the following system components: system planning; field devices including local intersection control, communications, closed-circuit television monitoring, vehicle detection, motorist information, automatic vehicle location; a centralized traffic management center, and appropriate system staffing.

OBJECTIVES, SCOPE AND METHODOLOGY

Objectives. Our audit objectives were threefold, to determine whether or not:

1. The traffic signal system was delivered on-time, on-budget, and functioning correctly.
2. Data is systematically collected, analyzed, and shared with other agencies and the public.
3. Planning to respond to and minimize temporary traffic disruptions is in place.

Scope. The scope for objective one includes financial data, contracts, project plans, and personnel records generated by the Transportation, Planning, and Sustainability Department (TPSD) from the inception of the signals upgrade project to the present.

The scope for objective two includes plans for data sharing by each of the groups involved in establishing the Combined Emergency Communications and Transportation Management Center (CECC) and the plans for sharing of traffic data with the general public through use of an integrated website.

The scope for objective three includes traffic management in place this fiscal year within the downtown area and on major arterials leading into downtown during peak morning and evening hours. Included in this scope are the Traffic Response group in the Police Department and the Parking Enforcement and Work Zone Safety groups in the TPSD.

Methodology. To ensure an on-time, on-budget, and functional signals system, we tested several areas. We verified the purchase and installation of major components through observation and documentation review. We also used interviews and observation to ascertain how the division was positioned to cope with contingency and disaster recovery for the new transportation management center and system. Lastly, we identified specific elements in the contract related to training and skills acquisition. In addition to key personnel interviews, we also examined hiring and personnel records to ascertain baseline skills, as well as the City's training database to determine extent of continuing development available to signal staff.

To determine whether plans are in place to share video and data feeds, we interviewed state agency and City personnel, reviewed documentation of data-sharing efforts, and reviewed plans for sharing information with the public through an integrated website.

To evaluate the City's management of temporary traffic disruptions including traffic incidents and construction sites in the roadway, field observations were conducted to assess traffic management by police officers for traffic incidents and construction site compliance with City time-of-day requirements.

Interviews with police officers and with Transportation Division staff were also conducted.

To aid us with technology and engineering issues for the above objectives, WHM Transportation Engineering Consultants, Inc. developed tools to guide us in testing traffic-related operations. WHM consultants also compared Austin's signals upgrade with national information technology systems structure.

This audit was conducted in accordance with generally accepted government auditing standards.

AUDIT FINDINGS

The Transportation, Planning, and Sustainability Department (TPSD) has successfully installed the backbone of a modern traffic management system, although significant work remains before the City's vision of an intelligent traffic system is realized. While signal system operators demonstrated competence in operating the basic features of the new traffic signals management system, additional training is needed if the City is to achieve all the benefits of the new system. Mechanisms to share information from the traffic management system with other agencies and the public are not in place. Also, more can be done to minimize the effects of temporary traffic disruptions, both planned and unplanned.

Although much work remains before the City's vision of an intelligent transportation system is realized, the Transportation, Planning, and Sustainability Department has successfully installed the backbone of a modern traffic management system.

The TPSD signals upgrade successfully completed many of the objectives contained within the project's two-year planning horizon. By implementing the upgrades to the traffic management system, many of the region's 13 intelligent transportation system (ITS) priorities were either partially or fully addressed. However, some work still needs to be accomplished in order to finish out the two-year signals upgrade project.

Further, significant work remains ahead in order to achieve the 13 ITS priorities set forth in the regional report's six-year deployment plan. Our testwork indicated that installed components were working properly and that staff was adequately trained, although more training and contingency planning are needed.

The delivered system varies from the conceptual design report that supported the funding decision. The assumption that the Greater Austin Area Telecommunications Network (GAATN) fiber-optic network could be used as the backbone of the fiber-optic communications network resulted in a significant increase in costs, which caused significant changes in project scope.

In January 1998, the City's project consultant submitted the 'Alternatives Analysis and Conceptual Design Report,' which focused on the planned traffic signal upgrade project. An executive summary of this report was used as support for the November 1998 bond election, when funding for the traffic signal upgrade project was approved.

The plan called for use of the GAATN fiber-optic network at a cost of approximately $9.3 million. The project consultant's later work indicated that using GAATN was not technically feasible, and made the following points:

- There would be a substantial amount of cable plant required to pick up each traffic signal controller and closed circuit television camera for routing to the backbone hubs.
- The existing GAATN cable plant is not physically located along routes where traffic signal controllers and closed circuit television cameras would be.
- The City's entire allocation of fiber from the GAATN charter is only 12 fibers; traffic distribution communications typically require upwards of 24 to 48 fibers.
- When the major corridors were laid out for new fiber-optic cable, an inherent Citywide backbone forms, that complements the existing GAATN cable.
- A request for dedicated use of GAATN fiber was denied.

Revised estimates from the project consultant priced the cabling options in the $14.6 million to $20.9 million range. We were unable to determine why the project consultant did not consider the above points when preparing the conceptual design, but this change to an independent fiber-optic network did incur additional costs.

When the TPSD tried to bid out the entire signals upgrade as a turnkey project, the bids came in over the project budget. With the help of the City's purchasing department, the upgrade project was divided into manageable areas of expertise and placed for bid again.

The key to making the project more affordable was to use TPSD labor to help implement the upgrade by setting up new controllers and final connections in the field. Another cost saving measure was the elimination of another feature, the automated vehicle locator system. Construction began in November 1999 with the assurance that the Central Business District (CBD) and major arterials would be completed and on-line by October 2001.

However, the CBD, although an important area, was not fully included in the two-year project as intended. The TPSD reported that contractors have damaged cable conduits within the CBD, and the City has not been reimbursed for the damages. TPSD also asserted that some conduits in the CBD were deteriorated and unsuitable for fiber installation.

Thus, to summarize the changes, while GAATN was able to keep valuable bandwidth for its network, the signals upgrade project was altered in several ways to accommodate the increased costs. The primary changes from the original conceptual design plan were:

- Reduction in fiber-optic cabling purchases, with approximately 85 fewer miles of cable purchased and installed.
- Fewer controllers were connected to the Central Control Operations Center, with approximately 236 of the 680 on-line.

- Deletion of the Automated Vehicle Locator system, which was intended to help track CapMetro buses at a cost of $1.1 million.

Much of the two-year signals upgrade project was successfully accomplished. The City of Austin's two-year signals upgrade project largely consisted of installing the following:

- A central control operations center;
- A central control system using ***icons***™ software to monitor and control intersections;
- A fiber-optic network to connect intersection controllers to a central control center;
- Upgraded signal controllers at all intersections;
- Closed-circuit TV cameras at strategic intersections; and
- System detector loops installed in streets to collect traffic flow data.

We observed that a large portion of the work was successfully completed, while some of the projected tasks were not accomplished. In order to give perspective on some of the accomplishments as well as some of the remaining challenges, we have broken down the project into the results below:

Central Control Operations Center – The Signals Group building has been remodeled to house the control center for the new automated traffic management system. Along with the primary communications network, the main "hub" or distribution point for the system is also housed in the control center. Four operator "stations" are available for simultaneous use of the traffic computer system, and a wall of 24 video monitors and a (large) project screen has been installed for viewing the CCTV video feeds.

Central Control Software – The computer network used for monitoring and controlling the intersection and camera operations uses the ***icons***™ control software. The software has been installed on both the primary server network as well as the backup network. The software is functioning as intended, although management is still in the process of uploading all the intersection timing patterns into the database.

Fiber-Optic Network – The fiber-optic cable connects the intersections to the control center. Approximately 105 miles of cable have been installed along major arterials across town from Parmer Lane on the north to Slaughter Lane on the south and from Mopac freeway on the west to Airport Boulevard on the east.

However, not every intersection controller has been connected to the central control system. Many controllers are operating as stand-alone devices. While connecting each outlying or single intersection "system" to the central control software is not necessary for the intersection to function, some of the benefits (e.g. remote monitoring) are negated.

Intersection signal controller upgrades - A total of 700 model 2070 signal controllers were purchased as part of the signals upgrade project. The TPSD inventory lists approximately 764 intersections under City control. Approximately 524 intersections have now been upgraded with the new model 2070 signal light controllers.

Of the remaining 240 intersections to be upgraded, 95 are "slave" intersections that are controlled by another intersection's controller. The remaining 145 will be upgraded with the new model 2070 controllers within the next few months.

Closed Circuit TV Cameras – Sixty-five CCTV cameras were purchased as part of the signal upgrade project. Of the 65 cameras, we verified that one was defective and returned to the manufacturer, 57 were installed and operational, and 7 were installed but not yet connected to the upgraded traffic management system.

System detector loops – The City's traffic system was designed to use up to 1200 detector loops systemwide. Similar loops are used to coordinate signals at intersection approaches based on the levels of traffic entering the intersections. The new system detector loops will be strategically placed on roads between intersections, rather than at intersections, and will gauge the speed and volume of vehicular traffic. However, the sub-contractor has delayed their installation, and fewer than ten are in place.

We tested the functionality of the new signals upgrade project along with the ability of system operators to properly use the ***icons***™ control software. From the control operations center, we verified the operation of the CCTV cameras as well as the ability of the ***icons***™ control software to both graphically represent the operation of signals at intersections and to properly change signal timing at intersections on-demand. The operation of a total of 236 intersections that are centrally controlled was verified through audit testwork.

Based on the results of our testing, the upgraded signal system appears to be functioning effectively as part of the automated traffic management system. The first phase of the project is almost complete and plans for expanding the system include outlying areas, additional intersections within the initial deployment area, and the CBD. Cost estimates for expansion are being developed by the TPSD.

Additional work will be completed in phases, in order to have a fully functional ITS, although how the work will be funded is not clear. While the two-year signals upgrade helped automate the traffic management system,

the 13 ITS priorities from the regional ITS report have only been partially addressed.

As stated above, our testwork revealed that many core elements of a modern traffic system have been successfully installed. For example, the new TPSD Central Control Operations Center is complete, as is signal pre-emption for emergency vehicles within the Central Business District.

The ITS components that are partially complete to date are the enhanced traffic signal system, the video surveillance system, the advanced traffic controllers, adaptive signal control, vehicle detection loops, and dynamic lane control signs. One component, traveler information, remains to be addressed.

Further, several ITS priorities were not intended to be covered by this upgrade project. Video image detection, a complete incident management program, transit signal priority, and reversible lanes have not been addressed to date. Some items, such as reversible lanes, still need to go through the City's long-range planning efforts prior to being considered for implementation. On the other hand, the incident management program is one example of an ITS priority that could immediately benefit traffic flow, as the final section of this report illustrates. For an overview of the status of the 13 ITS priorities, see Exhibit 3.

EXHIBIT 3
Status of ITS Priorities

ITS PRIORITIES	IMPLEMENTED	PARTIALLY IMPLEMENTED	NOT IMPLEMENTED
Enhanced Signal System		✔	
Video Surveillance System		✔	
Management Center	✔		
Traveler Information			✔
Dynamic Lane Control Signs		✔	
Advanced Traffic Controllers		✔	
Video Image Detection			✔
Adaptive Signal Control		✔	
Incident Management Program			✔
Signal Preemption	✔		
Transit Signal Priority			✔
Arterial-Street Travel Time Measurement		✔	
Reversible Lanes			✔

Source: OCA verification.

While expenditures related to the signals upgrade project appear proper, the project's budget has been exhausted. Thus, with estimates of over 100 miles of

additional fiber optic cable still to be purchased, along with additional labor and other installation costs, funding sources and timelines have not been identified for system completion.

Accounting methods used during the signals upgrade make recording the value of assets difficult. Since the onset of the signals upgrade work, expenditures have been co-mingled with other nonsignal upgrade expenditures in the City's accounting system. As a result of our testwork, Infrastructure Support Services (ISS) accounting staff reviewed these project charges.

Many project-related charges were moved to three project specific accounts with budgets now matching the original $16.5 million earmarked for the signals upgrade project from the 1998 bond issue. However, because the budgets designated for the signals upgrade project in the 1992 bond issue and Intermodal Surface Transportation Efficiency Act (ISTEA) grant accounts were not isolated, more work is needed to identify these expenditures.

In addition, expenditures for equipment such as new controllers, cabinets, and cameras were improperly charged as consulting or interdepartmental charges. These expenditures have not been moved to appropriate expense categories in the City's accounting system.

In June 1999, the Governmental Accounting Standards Board (GASB) issued *Statement 34, Basic Financial Statements - and Management's Discussion and Analysis - for State and Local Governments*, establishing a new financial reporting model for state and local governments. GASB developed the new requirements to make annual reports more comprehensive and easier to understand and use. Depending on future City decisions with respect to this statement and the methodology of recording general fund infrastructure assets, recording of major components of the project may need to be clarified.

Some inventory documentation problems were noted in observations. However, they were minor and did not impact the success of the project. Issued inventory items are not properly tracked when returned to the TPSD warehouse for repair and future reuse.

Finally, we noted approximately $200,000 in project funds were expended on assisting the expansion of the GAATN network. Reimbursement for the GAATN work was supposed to be forthcoming, as this work was not part of the signals upgrade project. However, the TPSD has not received the funds.

Although we successfully tested the redundancy features of the signals upgrade, the TPSD has not developed guidelines to use these features to recover from disasters or unforeseen events. In the event of a communications line failure, the system has the ability to reroute information along a different line. Our testwork simulated a communications line failure,

and the results indicated that the upgraded signals management system has full functionality from a back-up facility. Furthermore, in the event of a total system failure, each intersection will remain in operation through the individual controllers, since the timing patterns are programmed into their software.

Nevertheless, the project plan design failed to identify service continuity risks to the traffic signal system and to recognize the need for planning to mitigate those risks during installation of the traffic management system. Signal timing data is currently archived at the Central Control Operations Center and will also eventually be archived at the back-up facility.

The TPSD has no documented guidelines for responding to unforeseen contingencies or disasters affecting traffic signals or the Central Control Operations Center. TPSD management has not assessed integration of the upgraded signals traffic management system into Citywide disaster response. Transportation division employees have been concentrating on installation of the system and may be relying on strategies developed for dealing with Y2K-related risks in the previous system. However, the TPSD expects the project consultant to deliver these guidelines prior to formal system acceptance. In the meantime, the division may not be able to respond as readily or efficiently to unplanned events compromising the traffic management capabilities of the upgraded signals system.

In addition, the City's Master Plan for Citywide Response to and Recovery from Major Emergencies and Disasters, revised in 1996, does not fully address the functions of an automated signals system. The only requirement is for the signals division to notify the chain of command, as defined in the plan, of "any traffic light outage affecting more than 10 intersections for more than two hours."

Recommendations

01. In order to offset the cost for the completion of cabling within the Central Business District, the Director of the TPSD should pursue recovery of costs from contractors who have damaged existing conduit.

MANAGEMENT RESPONSE: Concur/Implemented

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02. In order to clarify the recording of project-related expenditures, the Director of Infrastructure Support Services should isolate and separate project funding from the 1992 bonds and grant funding into project-specific accounts.

MANAGEMENT RESPONSE: Concur/planned

ISS will assess its accounting methods, isolate and separate project funding from the 1992 bonds and grant funding into project-specific accounts. This strategy will ensure the City is in compliance with GASB-34, regardless of the methodology chosen in the future by the City to record General Fund infrastructure assets.

03. To properly account for inventory items, the manager of the Traffic Signals activity at the TPSD should establish a perpetual inventory system that will track controllers, cabinets, and other high-value equipment, including those that are returned to the warehouse for repair and re-issue and those that are damaged beyond repair.

MANAGEMENT RESPONSE: Concur/planned

The Chief Signal Engineer will review existing inventory procedures and implement necessary changes to meet the objectives of the recommendation.

04. In order to recover funds expended outside the scope of the signals upgrade project, the Director of the TPSD should pursue reimbursement for work performed on the GAATN fiber-optic network.

MANAGEMENT RESPONSE: Concur/underway

Are currently reviewing expenditures and work completed with GAATN staff.

05. To support future funding decisions, the manager of the Traffic Signals activity at the TPSD should prepare cost estimates and time frames for completing additional phases of the signals upgrade project.

MANAGEMENT RESPONSE: Concur/planned

Consultant will prepare estimates for adding additional signals to the communication network. System expansion will be ongoing, dependant upon future funding availability.

06. In order to make use of the signal upgrade's redundancy features, the Transportation Division Manager should develop and communicate written guidelines for responding to unforeseen contingencies or disasters affecting traffic signals or the Central Control Operations Center.

MANAGEMENT RESPONSE: Concur/planned

The consultant will prepare final system documentation that will provide guidelines for addressing alternate levels of failure.

While signal system operators demonstrated competence in operating the basic features of the new traffic signals management system, additional training is needed if the City is to realize the full benefit of the new system.

Although training for signals staff members was not carried out exactly as specified in the engineering consultant contract, system operators were able to demonstrate competence in operating the basic features of the new signal upgrade computer system. Management was not able to show which staff had received what sort of training and when, primarily because the training database and personnel records do not contain information verifying training received by signals division staff.

We could not verify that signals staff training was offered as specified in the consultant contract. The contract for the signal system upgrade contained very specific language pertaining to formal classroom training that would be provided, along with options to videotape the training sessions. Some classroom training was provided, however, no videotapes were produced. Thus, the division lost an opportunity to impart a common body of knowledge by using classroom training and preserve the training sessions on videotape for later reference by new employees.

Furthermore, management could not show who had received training under the contract, when, or to what extent. Some training sessions for signals staff were apparently conducted more informally on the job, alongside contractors and consultants. One member of the staff explained that there had been some training on the ***icons***™ software about eight months before, but the system had not been installed at the time.

According to division supervisors, the stress of deadline pressures and consultant project manager turnover were the primary reasons for limited formal training opportunities. We observed other problems with documenting training, as the section below describes.

Employee training records are not maintained in personnel files or the Citywide training database. We were informed that the supervisors keep track of training, although no records were provided. An examination of official personnel records containing Success Strategies Performance Reviews (SSPRs) failed to show verification that the requisite 16 hours of training had taken place for each employee. Moreover, some SSPR records included comments that a particular employee was slated to take some training, usually from Texas Engineering Extension Service, but the records failed to document that the employee actually attended.

Furthermore, the signals division is not using the Citywide training database to record quantity and types of training received. An examination of the City's official employee training database failed to enumerate hours received in classes to support signal staff training and development. The database did show safety training sponsored by Infrastructure Support Services; however, these hourly sessions did not fulfill the requirement for 16 training hours.

Without records of training, the division is unable to inventory skills or demonstrate that employees are receiving the benefits of continuing education and development, important mechanisms for retention of loyal employees.

Personnel records show that signals staff come to the City with adequate skills and knowledge. An examination of signals division personnel records showed that the division has succeeded in hiring qualified employees. Austin's signal staff qualifications compare well with other similar traffic management operations.

Signals division installation and maintenance staff have numerous technical certifications and received their training from technical schools, universities, and the military. Engineering staff includes two engineers with advanced degrees in civil or transportation engineering. In addition, most engineering staff came with previous signal or transportation experience.

TPSD staff were able to demonstrate the functionality and capabilities of the new system, although we are unsure if enough employees are trained. During observations at the Central Control Operations Center, we noted that two signal engineer associates showed familiarity and competency in using the ***icons***™ traffic management software to operate the basic features of the new system.

However, our work did not assess whether enough staff were adequately trained to provide the full benefits of the new automated traffic management system. TPSD management did not have redeployment plans prepared to show how staffing levels might change with the upgrade to the new traffic signal system. Engineering consultants recommended the addition of two

telecommunications experts to assist the operation of the upgraded traffic system. TPSD management said that these positions would not be filled, citing the City's budget constraints and the recent outsourcing of the telecommunications maintenance functions. Information received from other traffic management centers in the country indicated that Austin's staffing levels might be similar to other such operations. To some degree, the desired staffing level becomes a cost/benefit decision concerning the level of investment that will be made to help maximize traffic flow within the City.

Recommendations

07. In order to ensure that signals staff receive uniform training, the Transportation Division Manager should pursue delivery of formal training by the consultant and videotape the sessions for future use, as permitted according to the contract.

MANAGEMENT RESPONSE: Concur/implemented

All formal classroom training has been completed—including fiber optics, ATM networks, ATM switches, Codecs, Model 2070 controllers, ICONS, and NextPhase software. Videotaping was explored and judged impractical.

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08. To encourage employee development and meet City training requirements, the Transportation Division Manager should make sure that all training hours are recorded in the City's on-line training database and that training information is incorporated into personnel records.

MANAGEMENT RESPONSE: Concur/planned

Chief Signal Engineer will compile training and record in the training database.

Mechanisms to share information from the traffic management system with other agencies and the public are not in place.

The new signal system, when fully functional, will be capable of supporting area agencies facing traffic concerns by giving them real-time data on traffic flow. In addition, the system will also be capable of sending current traffic condition information to the public via an Internet site. However, the Transportation, Planning, and Sustainability Department (TPSD) has not accomplished these objectives and is currently working with other agencies on how to provide this information.

As of October 2001, the TPSD is not ready to share real-time traffic information with other agencies. While preliminary planning has taken place to ensure that all involved parties understand the need to use nationally standardized data protocols to share video and data, the details on how the data sharing will occur have not been finalized. The Texas Department of Transportation (TxDOT) is in the process of coordinating with the City's consultant on the adoption of a standard protocol to share data that is consistent with the National Intelligent Transportation System (ITS) Architecture.

TxDOT has an ITS in place on state and federal freeways in the Austin area and has received federal funding to assist in the integration of the state's ITS with the City's new traffic management system. Integration of the two systems will provide sharing of information that will benefit both entities and other agencies with whom TxDOT works, allowing all to react to actual traffic situations and minimize the response time for critical services. Some advantages of information sharing include:

- Public safety dispatchers can use both the City's new traffic system upgrade and TxDOT system cameras to help select the least-congested route for ambulances, fire trucks, and police units to use.
- The City of Austin's new traffic management system will be able to adjust the timing on some roads based on data showing levels of traffic exiting the freeway obtained from the state.
- TxDOT can use the City's traffic data to make decisions regarding freeway congestion levels based on the levels of traffic entering the freeway system.

To help accomplish this integration of systems, the City is building a Combined Emergency Communications Center and Transportation Management Center (CECC) with the assistance of TxDOT and other agencies. TxDOT, the City, and other agencies will have personnel working at CECC to coordinate, share, and dispatch information generated from the integrated traffic management systems. The CECC is scheduled to begin operating in 2003. However, since the City and TxDOT now have modern traffic management systems, opportunities exist to share data among themselves and with other agencies (e.g. the Austin Police Department) prior to the opening of the CECC.

The public will not be able to get up-to-date traffic flow information from the Internet to aid with daily commuting until the TPSD does further work. The TPSD planned for the inclusion of a webpage on the City's website that would graphically represent the levels of traffic on the City's arterial routes based on data gathered from the City's new traffic system. In addition, when implemented, this traffic webpage will allow citizens to view images downloaded from the traffic cameras so that they can plan their travel routes accordingly. The City's upgraded traffic management system will not feed traffic data to the website.

As of the upgrade deployment date, the traffic webpage was still being designed, and the logistics of transforming traffic data into graphic images were still being worked out. The City's main website, which is maintained by the City's Public Information Office, is intended to link to the traffic webpage. However, responsibility for the maintenance and update of the webpage had not been assigned.

As noted previously, system detector loops that are critical tools for information were not in place by the deployment date for the City's upgraded traffic management system. The loops were to be strategically placed on roads between intersections to gauge the speed and volume of vehicular traffic. When installed, information from these detector loops will be used to display traffic levels visually on the City's webpage.

Recommendations

09. To establish future data-sharing efforts, the Transportation Division Manager should coordinate with other City departments involved in the Combined Emergency Communications Center to resolve how the TPSD will share the video and data feeds under the adopted protocol.

MANAGEMENT RESPONSE: Concur/underway

Discussions with CECC and other departments have been ongoing. The division has provided a cable drop to the STAR Center. Signal personnel will be available at the STAR and CECC. The STAR and CECC will be responsible for acquiring needed hardware/software.

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10. To collect data on vehicular traffic to review and share with the public and to assist in setting signal timing patterns, the Transportation Division Manager should ensure the installation of the system detector loops.

MANAGEMENT RESPONSE: Concur/underway

Design is currently underway. Some system detectors have been completed.

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11. In order to give the public direct access to benefits of the new traffic management system, the Transportation Division Manager should finalize the responsibility for maintaining the integrated website to ensure that educational web pages are designed and implemented.

MANAGEMENT RESPONSE: Concur/planned

Consultant will design and implement the web page.

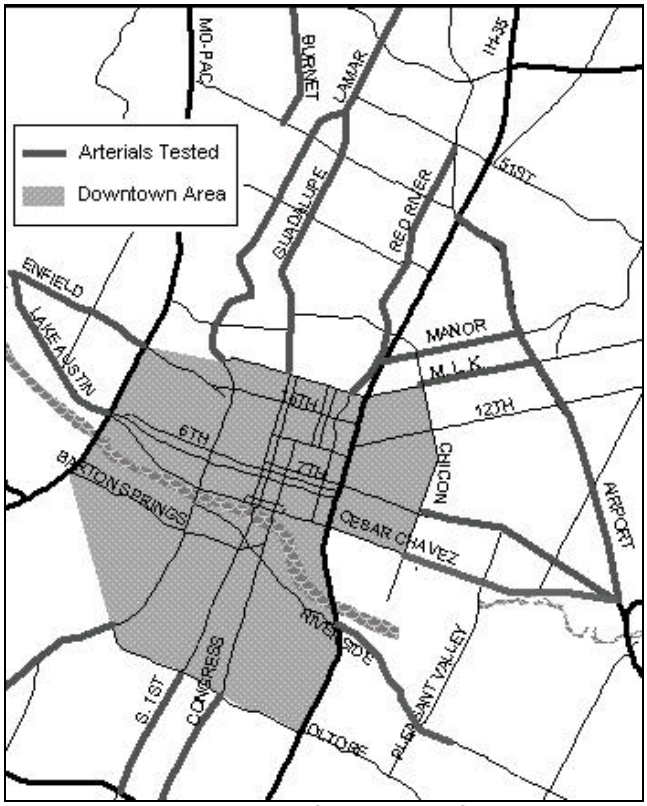
More can be done to minimize the effects of temporary traffic disruptions, both planned and unplanned.

Temporary traffic disruptions include construction sites, accident sites, and other impediments to traffic flow. A formal incident management program to minimize these disruptions was one of the 13 ITS priorities identified earlier in this report as a desired feature of Austin's traffic management system.

Specifically, overall tracking of construction activity is not extensive enough to allow the Transportation, Planning, and Sustainability Department (TPSD) to properly monitor City-permitted sites. In addition, the TPSD has not yet formalized coordination with the Austin Police Department (APD) on managing accident sites, and APD management of accident sites has been inconsistent.

Contractor noncompliance with time-of-day requirements to clear roadways creates a delay for drivers during rush hour and contributes to traffic problems. Current City policy specifies that contractors should not be working on the roadway between 7 a.m. and 9 a.m. or between 4 p.m. and 6 p.m. This requirement has been extended until 6:30 p.m. in the downtown area, which is bounded by Mopac on the west, Oltorf on the south, Chicon on the east, and Martin Luther King on the north.

EXHIBIT 4
Downtown and Arterial Streets Tested



SOURCE: Constructed by OCA from City of Austin geographic data.

TPSD inspectors recently increased enforcement for time-of-day construction violations by giving several contractors suspensions. These suspensions require contractors to stay off the roadway for a given period of time (usually 3 or 4 days). Because the contractors lose money while suspended, the incentive to not work during rush hour is greater.

However, even with increased enforcement by inspectors, noncompliance by contractors for time-of-day roadway restrictions was noted in field observations. We sampled downtown and arterial roadways (see Exhibit 4 above) for a two-week period during rush hour and noted 12 instances of noncompliance with time-of-day restrictions.

Contractor noncompliance may be caused by a shortage of TPSD inspectors to cover all sites occupying the roadway. The Work Zone Safety activity at TPSD is responsible for inspecting and enforcing the regulations outlined in the City Code of Ordinances and the Transportation Criteria Manual, which apply to construction work zones. Currently, there are only four TPSD inspectors to cover the City. As a result, inspectors primarily enforce regulations in the downtown area while arterials are not regularly inspected for noncompliance.

The universe of planned work zones is difficult to obtain and therefore problematic for management to monitor. A single source of sound and reliable information on permits to conduct work in roadways is not available. Further, permit information that is available does not specify when the work will be conducted. These conditions hamper TPSD inspectors' ability to monitor the construction sites and to schedule their routes efficiently. Measuring whether the sites are being managed to minimize impact on traffic is also affected by not knowing which locations to inspect. However, the TPSD is currently working with the Information Systems Department to increase the usefulness of the Permitting, Inspection, Enforcement, and Review (PIER) system for monitoring roadways.

We compiled a list of 64 daytime construction sites that could block roadways in and leading to downtown Austin during our two-week observation period. This list was based on data for capital improvement project sites, temporary right-of-way permits, barricade permits, right-of-way excavation permits, and fiber installation sites. The number of sites, however, may not be accurate because the sources for permit data do not specify exact dates for when construction will occur in the roadway. To validate the list of identified sites, we checked the sites to see if workers were present. This examination of sites indicated that only 25 of the 64 identified sites actually had work occurring when observed.

Traffic incidents are not handled consistently by police officers. The Police Department is responsible for handling traffic management at the scene

of traffic incidents. Traffic incidents include collisions, debris in the roadway, and stalled vehicles.

To facilitate traffic management and safety at incident scenes, several requirements relating to traffic management are identified in the Police Department's general orders. These include putting on a safety vest anytime an officer is exposed to traffic, protecting the incident scene to warn other traffic, diverting traffic around the incident with manual direction or traffic devices, and clearing the roadway as soon as practical.

In addition to the general orders, the APD distributes a manual for incident management to academy cadets. This manual describes appropriate traffic management techniques for incident scenes based on transportation engineering principles. These techniques include:

- Positioning the police vehicle 50 feet upstream from the accident,
- Activating police vehicle warning lights,
- Positioning the police vehicle's steering wheel to minimize damage if the vehicle is hit, and
- Using reflective traffic cones to deflect traffic from the incident.

To test management of traffic incidents by police officers, we observed incidents occurring during rush hour in the downtown area and on major arterials. During a two-week period, we observed a total of 49 incidents with 57 officers present at these incidents. Depending on the type of incident scene, different techniques are applied. The exhibit below indicates some of the techniques recommended for incident management and whether they were used at applicable scenes.

EXHIBIT 5
APD Incident Management

TECHNIQUE	# OF TIMES APPROPRIATE FOR SCENE	# OF TIMES USED AT SCENE
Establishing 50 Foot Perimeter to Warn and Divert Traffic	33	14
Activating Vehicle Lights to Warn Oncoming Traffic	41	37
Positioning Wheels to Minimize Impact of Additional Collisions	34	7
Using Traffic Cones to Divert Traffic	15	2
Using Reflective Safety Vests	57	35
Summoning Appropriate Entity to Clear Debris	22	17
Ensuring That Summoned Entity Clears Debris	17	12

SOURCE: APD General Orders and APD Incident Management Manual.

The erratic application of traffic management practices at incident scenes impacts traffic flow and increases the risk to officers and the public in the following ways:

- Inappropriate distance and signage warning traffic of the upcoming incident adversely impacts traffic flow.
- Officers and the public are at greater risk because safety precautions are not taken at incident scenes.
- The debris from an accident may be left in the roadway slowing traffic and potentially causing additional accidents.

Inconsistent management of traffic at incident scenes may be attributable to variations in training and supervision. Whether or not an officer uses certain safety and traffic flow strategies on the scene varies depending on when the officer went through the academy, who the officer's Field Training Officer was during their first months of patrol, the areas emphasized by the officer's current commanding officer, and the areas emphasized by the officer himself.

Officers who joined the department prior to 1998 have not received in-service training on the techniques contained in the current Incident Management Manual. In addition, even officers who have recently been through the academy may not use the training they received, because supervising officers do not consistently reinforce proper traffic management once new officers are in the field. Many supervisors were hired prior to the 1998 change in training and have not received in-service training on updated responsibilities.

The TPSD is not responsible for responding to unplanned incidents, but could be helping the APD manage these disruptions. Although the TPSD is not responsible for responding to unplanned changes to traffic flow such as accidents, the TPSD could be helping with training of officers, assisting in clearing the roadway, and using the capabilities of the upgraded traffic system to monitor traffic incidents.

TPSD staff have the expertise to train officers about best practice traffic management techniques and the knowledge to assist at traffic scenes requiring long-term lane closures or major debris removal. Likewise, the new traffic management system can be used to expedite the identification of traffic incidents requiring police response.

Wreckers are not consistently in compliance with time allowed to arrive on-scene, and police officers do not enforce compliance through ticketing. Wreckers are an important part of traffic incident management. Requirements for wrecker response time and removal of debris from the roadway by wreckers are established in the City Code. During rush hour on specified highways (currently Mopac, I-35, and 183 – known as the "rush hour zone"), wreckers on the police rotation list must respond to accidents within twenty minutes. For

all other incidents not on the specified highways, wreckers must respond within forty-five minutes.

EXHIBIT 6
Wrecker Response Compliance

	# OF WRECKERS OBSERVED	# OF WRECKERS IN COMPLIANCE
Wreckers In Rush Hour Zone – 20 Minute Requirement	30	25
Wreckers Not in Rush Hour Zone – 45 Minute Requirement	20	14
Total Wreckers	50	39

SOURCE: OCA observations

The majority of wreckers observed were in compliance with the 20-minute requirement for the highways during rush hour and the 45-minute requirement for other collision or stall locations. However, 11 of the 50 wreckers tested (22%) did not arrive within the specified time frame. When wreckers do not arrive on time or do not arrive at all to an incident scene, the vehicles may be left in the roadway rather than moved off the roadway to a safer location and impede traffic flow for a longer period. In addition, officers may have to stay at the accident waiting for a wrecker and cannot answer additional calls.

Some wreckers arriving late on the observed incident scenes were either unable to locate the collision or stuck in the traffic created by the incident. Wreckers were sometimes dispatched from the direction in which traffic was heaviest, making it harder to reach the scene.

In addition, a tracking system for wrecker dispatch and arrival times has only recently been developed and is only in place to track wrecker response rates on the highways designated for the rush hour zone. Therefore, the APD does not generate data on wrecker response rates for City streets and does not have a sufficient history on the wreckers to guide training and enforcement efforts.

Beyond timely response, debris removal is the responsibility of any wrecker called to an incident scene whether or not a vehicle is removed from the scene. As shown earlier in Exhibit 5, five of seventeen accident scenes (29%) were not cleared of debris even though a wrecker was called.

Wrecker noncompliance in terms of both debris removal and response time may be linked to several causes. One cause may be the lack of training of police officers on enforcement of both debris removal and response time

requirements. Officers do not necessarily know that wreckers can be called back to a scene to remove debris, or that wreckers can be issued tickets when they do not arrive or arrive late to a scene.

Recommendations

12. To facilitate inspection and improve compliance of contractors at construction sites, the manager of the Work Zone Safety activity should work with the Information Systems Department to complete permitting information system improvements to provide accurate data for monitoring and enforcement by inspectors.

MANAGEMENT RESPONSE: Concur/planned

The Work Zone Safety Manager will review existing procedures and work with ISD to identify improvement opportunities.

13. To improve the consistency of traffic management at incident scenes and minimize the impact of incidents on traffic flow, the Training activity at the Police Department should develop and implement in-service training on traffic management based on the Incident Management Manual used in Academy training.

MANAGEMENT RESPONSE: Concur—this would be a joint venture of APD training staff and staff of Traffic/STAR command

Strategies:
1. **Underway**--Revision of General Orders regarding Collision Investigation to update requirements and procedures
2. **Planned**--Develop additional training curriculum on policy changes and appropriate techniques for scene management
3. **Planned**—Train all sworn personnel up to and including rank of commander.

14. To effectively develop the ITS priority of an incident management system, the manager of the Transportation Division should work with responsible parties to develop a coordinated traffic incident management system.

MANAGEMENT RESPONSE: Concur/Planned

TPSD will assist APD with training for traffic management. Plans are in place to work with APD at the STAR Center and the future Combined Emergency Communications Center.

15. To improve wrecker response to incidents and clear the roadway more rapidly, the Wrecker Enforcement section at the Police Department should disseminate information to officers addressing enforcement of wrecker noncompliance.

MANAGEMENT RESPONSE: Concur—this would be incorporated into the training segment listed for # 13

Add component to Collision Investigation training to review the wrecker ordinance and enforcement for noncompliance, including proper citations to be issued and/or reports to be filed.

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APPENDIX A
MANAGEMENT RESPONSE

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MEMORANDUM

TO: Stephen L. Morgan, City Auditor

FROM: Austan S. Librach, P.E., AICP
Director
Transportation, Planning and Sustainability Department

DATE: November 16, 2001

SUBJECT: Response to 2001 Signalization Audit

Attached are the responses to the questions and recommendations in the 2001 Signalization Audit. We appreciate the in-depth review of the signaliztion program. If you have any questions, please contact me at 974-3257, or Dave Gerard, at 974-7022.

Austan S. Librach, P.E., AICP
Director
Transportation, Planning and Sustainability Department

Lisa Y. Gordon
Assistant City Manager

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ACTION PLAN
TRAFFIC FLOW AND SIGNALIZATION AUDIT

Rec. #	Recommendation Text	Proposed Strategies for Implementation	Status of Strategies	Responsible Person/Phone Number	Proposed Implementation Date
01	In order to offset the cost for the completion of cabling within the Central Business District, the Director of the TPSD should pursue recovery of costs from contractors who have damaged existing conduit.	Concurrence	Implemented	David Gerard Division Manager 974-7022	Complete
02	In order to clarify the recording of project-related expenditures, the Director of Infrastructure Support Services Department should isolate and separate project funding from the 1992 bonds and grant funding into project-specific accounts.	Concurrence ISS will assess its accounting methods, isolate and separate project funding from the 1992 bonds and grant funding into project-specific accounts. This strategy will ensure the City is in compliance with GASB-34.	Planned	Otis Williams 974-7073	6-30-02

03	To properly account for all inventory items, the manager of the Traffic Signals activity at the TPSD should establish a perpetual inventory system that will track controllers, cabinets, and other high-value equipment, including those that are returned to the warehouse for repair and re-issue and those that are damaged beyond repair.	Concurrence. The Chief Signal Engineer will review existing inventory procedures and implement necessary changes to meet the objectives of the recommendation.	planned	Ali Mozdbar Chief Signal Engineer 457-4870	3-1-02
04	In order to recover funds expended outside the scope of the signals upgrade project, the Director of the TPSD should pursue reimbursement for work performed on the GAATN fiber-optic network.	Concurrence Currently reviewing expenditures and completed work with GAATN staff	underway	David Gerard	2-1-02
05	To support future funding decisions, the manager of the Traffic Signals activity at the TPSD should prepare cost estimates and time frames for completing additional phases of the signals upgrade project.	Concurrence Consultant will prepare estimates for adding additional signals to the communication network. System expansion will be ongoing, dependant upon future funding availability	planned	David Gerard	6-1-02

06	In order to make use of the signal upgrade's redundancy features, the Transportation Engineering and Operations division manager should develop and communicate written guidelines for responding to unforeseen contingencies or disasters affecting traffic signals or the Central Control Operations Center.	Concurrence. The consultant will prepare final system documentation that will provide guidelines for addressing alternate levels of failure.	planned	David Gerard	7-01-02
07	In order to ensure that signals staff receive uniform training, the Transportation Engineering and Operations division manager should pursue delivery of formal training by the consultant and videotape the sessions for future use, as permitted according to the contract.	Concurrence. All formal classroom training has been completed—including fiber optics, ATM networks, ATM switches, Codecs, Model 2070 controllers, ICONS, and NextPhase software. Videotaping was explored and judged impractical.	Implemented	David Gerard	

08	To encourage employee development and meet City training requirements, the Transportation Engineering and Operations division manager should make sure that all training hours are recorded in the City's on-line training database and that training information is incorporated into personnel records.	Concurrence. Chief Signal Engineer will compile training and record in the training database	planned	Ali Mozdbar	2-01-02
09	To establish future data sharing efforts, the Transportation Engineering and Operations division manager should coordinate with other City departments involved in the CECC to resolve how the TPSD will share the video and data feeds under the adopted protocol.	Concurrence. Discussions with CECC and other departments have been ongoing. The division has provided a fiber cable drop to the STAR Center. Signal personnel will be available at the STAR and CECC. The STAR and CECC will be responsible for acquiring needed hardware/software.	underway	David Gerard	8-01-02; provision of data and video dependent upon centers acquiring hardware and software
10	To collect data on vehicular traffic to review and share with the public and to assist in setting signal timing patterns, the Transportation Engineering and Operations division manager should ensure the installation of the system detector loops.	Concurrence. Design is currently underway. Some system detectors have been completed	underway	David Gerard	8-01-02

11	In order to give the public direct access to benefits of the new traffic management system, the Transportation division manager should finalize the responsibility for maintaining the integrated website to ensure that educational web pages are designed and implemented.	Concurrence. Consultant will design and implement the web page	planned	David Gerard	8-01-02
12	To facilitate inspection and improve compliance of contractors at construction sites, the manager of the Work Zone Safety activity should work with the Information Systems Department to complete permitting information system improvements to provide accurate data for monitoring and enforcement by inspectors.	Concurrence. The Work Zone Safety Manager will review existing procedures and work with ISD to identify improvement opportunities.	planned	Garry Silagy	8-01-02

14	To effectively develop the ITS priority of an incident management system, the manager of the Transportation Division should work with responsible parties to develop a coordinated traffic incident management system.	Concurrence. TPS will assist APD with training for traffic management. Plans are in place to work with APD at the STAR Center and the future Combined Emergency Communications Center.	Planned	David Gerard Division Manager 974-7022	3-1-02 Complete 8-1-02

APD Responses:

13	To improve the consistency of traffic management at incident scenes and minimize the impact of incidents on traffic flow, the Training activity at the Police Department should develop and implement in-service training on traffic management based on the Incident Management Manual used in Academy training.	Concur—this would be a joint venture of APD Training staff and staff of Traffic/STAR command 1. Revision of General Orders regarding Collision Investigation to update requirements and procedures 2. Develop additional training curriculum on policy changes and appropriate techniques for scene management 3. Train all sworn personnel up to and including rank of Commander.	1. Underway 2. Planned 3. Planned	Cmdr. C.K. Hart 974-5726 Lt. C. Smith 499-8271	January 2002 February 2002 August 2002
15	To improve wrecker response to incidents and clear the roadway more rapidly, the Wrecker Enforcement section at the Police Department should disseminate information to officers addressing enforcement of wrecker noncompliance.	Concur—this would be incorporated into the training segment listed for #13 Add component to Collision Investigation training to review the wrecker ordinance and enforcement for non-compliance, including proper citations to be issued &/or reports to be filed.	1. Planned	Cmdr. C.K. Hart 974-5726 Lt. C. Smith 499-8271	August 2002

APPENDIX B
TEXAS TRANSPORTATION INSTITUTE
ANNUAL TRAFFIC DELAY PER PERSON

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Annual Traffic Delay Per Person[a]

1999

	Population Group[b]	Urban Areas	1999 Population (000s)	Annual Delay Per Person (Hours)	Rank
1	Vlg	Los Angeles, CA	12,600	56	1
2	Lrg	Atlanta, GA	2,860	53	2
3	Lrg	Seattle-Everett, WA	1,995	53	2
4	Vlg	Houston, TX	3,130	50	4
5	Vlg	Washington, DC-MD-VA	3,490	46	5
6	Lrg	Dallas, TX	2,385	46	5
7	Lrg	Denver, CO	1,860	45	7
8	Med	Austin, TX	650	45	7
9	Lrg	St. Louis, MO-IL	2,005	44	9
10	Vlg	San Francisco-Oakland, CA	4,025	42	10
11	Vlg	Boston, MA	3,020	42	10
12	Lrg	Miami-Hialeah, FL	2,100	42	10
13	Lrg	San Jose, CA	1,670	42	10
14	Lrg	Orlando, FL	1,120	42	10
15	Med	Nashville, TN	640	42	10
16	Vlg	Detroit, MI	4,020	41	16
17	Lrg	Minneapolis-St. Paul, MN	2,330	38	17
18	Lrg	San Bernardino-Riverside, CA	1,405	38	17
19	Lrg	San Diego, CA	2,700	37	19
20	Lrg	Indianapolis, IN	1,015	37	19
21	Med	Louisville, KY-IN	835	37	19
22	Med	Tampa, FL	880	35	22
23	Vlg	New York, NY-Northeastern, NJ	16,430	34	23
24	Vlg	Chicago, IL-Northwestern, IN	8,085	34	23
25	Lrg	Portland-Vancouver, OR-WA	1,490	34	23
26	Lrg	Sacramento, CA	1,370	34	23
27	Lrg	Fort Worth, TX	1,370	33	27
28	Med	Albuquerque, NM	565	33	27
29	Lrg	Cincinnati, OH-KY	1,280	32	29
30	Med	Charlotte, NC	625	32	29
31	Lrg	Phoenix, AZ	2,575	31	31
32	Lrg	Baltimore, MD	2,160	31	31
33	Med	Jacksonville, FL	850	30	33
34	Lrg	Ft. Lauderdale-Hywood-Pomp. Bch., FL	1,470	29	34
35	Lrg	Columbus, OH	1,025	29	34
36	Med	Providence-Pawtucket, RI-MA	910	28	36
37	Med	Tacoma, WA	605	27	37
38	Vlg	Philadelphia, PA-NJ	4,580	26	38
39	Lrg	Kansas City, MO-KS	1,390	24	39
40	Lrg	San Antonio, TX	1,240	24	39
41	Lrg	Norfolk, VA	1,030	24	39
42	Med	Tucson, AZ	670	23	42

43	Lrg	Milwaukee, WI	1,265	22	43
44	Med	Memphis, TN-AR-MS	975	22	43
45	Lrg	Las Vegas, NV	1,260	21	45
46	Lrg	Cleveland, OH	1,880	20	46
47	Sml	Colorado Springs, CO	440	20	46
48	Med	Honolulu, HI	695	19	48
49	Med	Hartford-Middletown, CT	640	19	48
50	Med	Omaha, NE-IA	590	19	48
51	Lrg	New Orleans, LA	1,105	18	51
52	Med	Salt Lake City, UT	895	18	51
53	Med	Fresno, CA	550	18	51
54	Lrg	Oklahoma City, OK	1,040	17	54
55	Lrg	Pittsburgh, PA	1,790	14	55
56	Med	El Paso, TX-NM	650	14	55
57	Sml	Salem, OR	190	14	55
58	Med	Albany-Schenectady-Troy, NY	505	10	58
59	Sml	Spokane, WA	330	10	58
60	Sml	Eugene-Springfield, OR	220	10	58
61	Sml	Beaumont, TX	145	9	61
62	Lrg	Buffalo-Niagara Falls, NY	1,075	8	62
63	Med	Rochester, NY	620	8	62
64	Sml	Corpus Christi, TX	315	7	64
65	Sml	Bakersfield, CA	390	6	65
66	Sml	Laredo, TX	180	5	66
67	Sml	Boulder, CO	115	5	66
68	Sml	Brownsville, TX	150	3	68

SOURCE: Unaudited 1999 data from the Texas Transportation Institute's 2001 Urban Mobility Study, Tables A-1 and A-2.

Note a: Only includes estimated freeway and principal arterial street travel conditions.

Note b: Vlg – Very Large urban areas — over 3 million population
Lrg – Large urban areas — over 1 million and less than 3 million population.
Med – Medium urban areas — over 500,000 and less than 1 million population.
Sml – Small urban areas — less than 500,000 population.

APPENDIX C
GLOSSARY OF ACRONYMS AND TERMS

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APPENDIX C
GLOSSARY OF ACRONYMS AND TERMS

APD	Austin Police Department
CAMPO	Capital Area Metropolitan Planning Organization
CapMetro	Capital Metropolitan Transportation Authority
CBD	Central Business District
CCTV	Closed-Circuit Television
CECC	Combined Emergency Communications & Transportation Management Center
CIP	Capital Improvement Project
COA	City of Austin
FHWA	Federal Highway Administration (part of USDOT)
GAATN	Greater Austin Area Telecommunications Network
GASB 34	The Governmental Accounting Standards Board (GASB) *Statement 34, Basic Financial Statements - and Management's Discussion and Analysis - for State and Local Governments* in June 1999.
icons™	(Integrated Control of Networks) an advanced transportation management system developed by Gardner Systems, Inc. and Econolite Control Products, Inc.
ISS	Infrastructure Support Services
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITS	Intelligent Transportation Systems
MPO	Metropolitan Planning Organizations
NAFTA	North American Free Trade Act
SSPR	Success Strategies Performance Reviews
TEA-21	Transportation Equity Act for the 21st Century
TPSD	Transportation, Planning, and Sustainability Department
TTI	Texas Transportation Institute (at Texas A&M Univ.)
TxDOT	Texas Department of Transportation
USDOT	U. S. Department of Transportation