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CMAQ: Advancing Mobility and Air Quality

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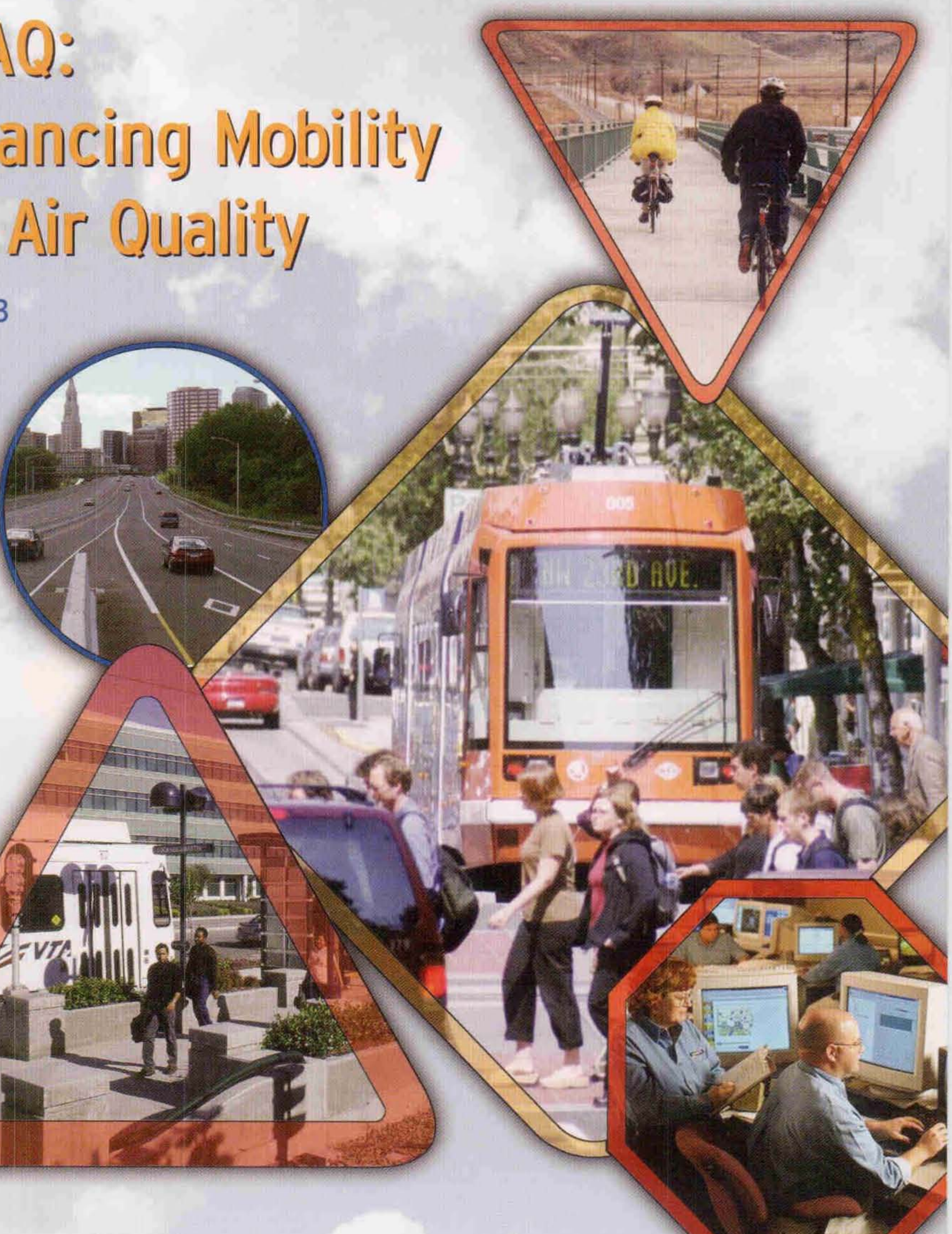

U.S. Department of Transportation
Federal Highway Administration

CMAQ:
Advancing Mobility and Air Quality

May 2003

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Office of Natural Environment

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Introduction

While the primary goal of the Congestion Mitigation Air Quality Improvement (CMAQ) program is to clean the air, many of the efforts supported by CMAQ contribute directly to the Nation's mobility goals. Projects that improve air quality through better traffic flow, enhanced transit services, provision of other modes of travel, or more choices for shippers also provide substantial benefits to the transportation system. Such improvements are often overlooked as the congestion piece of the CMAQ program is viewed as a goal secondary to air quality. This report provides some examples of mobility enhancements attributed to CMAQ.

Mobility

The United States is a very mobile nation. Americans traveled more than 2.7 trillion vehicle miles[1] and took more than 8.7 billion trips by transit in 2000.[2] More than 11 billion tons of freight were transported domestically via highway, rail, and air in 1997, with a total value of over $6.9 trillion.[3]

> **Mobility, at its simplest, can be defined as the ability to access goods, services, and destinations.**

Mobility affords many benefits to society. The ability to move freely provides increased opportunities for people and businesses to interact with each other, earn a living, visit friends and family, and take advantage of recreational opportunities. A mobile society also implies transportation choices, so that people of all ages and abilities have access to options for work and recreation. Ultimately, mobility is not so much about how many miles are traveled; rather, it is about how easy it is to access jobs, shopping, and schools, and to meet other personal needs that are direct quality-of-life measures.

Various methods can be used to assess mobility. Mobility can be measured in terms of travel times, level of traffic congestion, or duration of congestion—all of which focus on how long it takes to get from place to place. Mobility also can be measured in terms of the availability of travel choices, which may include different routes or modes of travel, such as transit, bicycling, and walking. Travel time reliability is another measure that can be used to gauge how well the system is functioning for the customer.

The Challenge

Since 1990, highway travel activity in the United States has grown more than twice as rapidly as the population, with a 25-percent total increase in vehicle miles traveled (VMT).[4] As a result of this growth in VMT, communities across the United States are facing substantial increases in traffic congestion.

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[1] U.S. Department of Transportation, Federal Highway Administration. *Highway Statistics 2000.* Table VM–1, Vehicle miles of travel and related data, by highway category and vehicle type. Washington, DC: U.S. Government Printing Office.

[2] U.S. Department of Transportation, Federal Transit Administration. *National Transit Database, 2000: National Transit Summaries and Trends.* On-line at: www.fta.dot.gov/ntl/database.html.

[3] U.S. Department of Transportation and U.S. Department of Commerce. *1997 Commodity Flow Survey. 1997 Economic Census* (Issued December 1999). Table 1a. Shipment Characteristics by Mode of Transportation for the United States: 1997.

[4] U.S. Department of Transportation, Federal Highway Administration. *Highway Statistics* (annual series, 1990 to 2000). On-line at: www.fhwa.dot.gov/policy/ohpi/hss/index.htm. U.S. Census Bureau. *Census 2000: Resident Population.* Table 4. On-line at: www.census.gov/population/cen2000/tab04.pdf.

Figure 1. Percentage Increase in Urban Congestion Levels, 1982–2000

Source: Calculation based on Texas Transportation Institute. *2002 Urban Mobility Study*. Exhibit A-3. Point Change in Travel Time Index, 1982 to 2000.

Figure 1 shows the percentage increase in congestion experienced in many urban areas across the country.

Gridlock on the roads occurs in large and small urban areas alike, leading to frustration for residents and economic problems for businesses in getting employees to work, goods to market, or customers in the door. Having few mobility options and congested roads limits the ability of people to get from place to place, wastes time and energy, contributes to air pollution, and leads to higher costs for goods and services.

Since 1982, the annual cost of congestion in 75 metropolitan areas has increased by more than 400 percent to $67.5 billion in 2000. These congestion costs include wasted time, fuel, and vehicle operating costs. On average, rush-hour drivers spend 62 hours delayed in traffic and burn nearly 100 extra gallons of fuel per year. In 2000, the delay totaled 3.5 billion hours, and the extra fuel amounted to more than 5.7 billion gallons.[3]

Worsening traffic congestion problems are not just confined to the largest metropolitan areas. Figure 2 shows the increase in the proportion of daily travel that occurs during congested conditions for urban areas of various sizes in the United States. From 1982 to 2000, the average annual travel delay per peak period more than quadrupled

Figure 2. Congested Travel as a Percent of Total Daily Travel, 1982–2000

Source: Texas Transportation Institute. *2002 Urban Mobility Study*. Exhibit A-10

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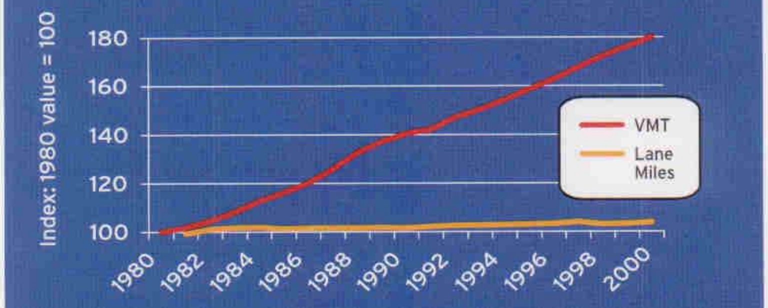
[3] Texas Transportation Institute. *2002 Urban Mobility Study*. On-line at: mobility.tamu.edu/ums/.

in areas with less than one million people. All of the size categories show more severe congestion for longer durations that affect more of the transportation network in 2000 than in 1982.

Figure 3. VMT and Lane Miles Growth, 1980–2000



Source: Federal Highway Administration. *Highway Statistics, Summary to 1995.* July 1997, Table VM-20 and HM-260; *Highway Statistics* (annual editions, 1996-2000), Table VM-3 and HM-48.

Why Are These Trends Occurring?

As population, incomes, and commerce have increased, more freight and passenger vehicles are using the road system. Communities have been unable to keep pace with this growth through new highway capacity, operational improvements, alternative modes of transportation, or transit enhancements. Community, environmental, and social goals also limit the amount of land communities are willing to dedicate to new transportation facilities. Nationally, vehicle travel increased 80 percent from 1980 to 2000, while road lane-miles increased less than 4 percent, as shown in Figure 3.[6]

Into the future, demands on existing infrastructure will only increase. Freight movement is expected to grow by about 3 percent annually, nearly doubling by 2020.[7] Passenger travel is expected to grow more slowly than in recent years, but it is nonetheless likely to grow more than 40 percent from 2000 to 2020.[8]

Although building new roadway capacity can help address some congestion issues, new construction to accommodate all of the demand is problematic in many urban areas. In some cases, available land is inadequate to build enough lanes to handle projected traffic volumes. In addition, new construction may not be accomplished without substantial harm to communities and environmental systems. In other cases, the mobility problem may stem from limited alternatives to driving.

What Kind of Projects Improve Mobility?

In addition to new highway capacity, a wide range of transportation options are available that can improve mobility. Improvements in mobility can occur by managing the existing transportation system more efficiently to reduce traffic congestion, creating mode choices that enable travelers to reach their destinations without driving, or transferring of freight from trucks to rail or water. This section explores how these type of projects improve mobility.

Traffic Management/Intelligent Transportation Systems (ITS)

Traffic management includes various means to improve traffic flow and reduce traffic delays. Traffic management improvements often rely on intelligent transportation systems (ITS), which use

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[6] U.S. Department of Transportation, Federal Highway Administration. *Highway Statistics, Summary to 1995.* Table VM–20 and HM–260; *Highway Statistics* (annual editions, 1996–2000), Table VM–3 and HM–48. On-line at: www.fhwa.dot.gov/policy/ohpi/hss/index.htm.

[7] U.S. Department of Transportation, Federal Highway Administration. *The Freight Analysis Framework: Basic Presentation.* May 2001. On-line at: www.ops.fhwa.dot.gov/freight/adfrmwrk/index.htm.

[8] Federal Highway Administration and Federal Transit Administration. *1999 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance Report.* May 2, 2000.

real-time, or near real-time, information about conditions on the roadway system, including data on traffic speeds, volume, incidents, and impacts of construction work zones. Strategies include use of advanced traffic signal-control systems, freeway management systems, incident management systems, electronic toll-collection systems, fleet management, data sharing, systems integration, and security/emergency management.

Advanced signal-control systems enable transportation agencies to respond appropriately to varying levels of highway traffic, through changes in signal timing and lane control and use of ramp meters, thereby making more efficient use of existing facilities. Freeway management systems detect problems with traffic flow and provide information to help transportation and public-safety agencies improve their coordination and response times. Real-time traffic information also can be shared with the public through variable message signs on highways, radio reports, telephone, the Internet, and in-vehicle systems to help drivers avoid congestion points. These systems have well documented benefits for traffic flow. Advanced traffic surveillance and signal-control systems have been demonstrated to reduce travel times from 8 to 25 percent. Freeway management systems, primarily through ramp metering, have reduced crashes by more than 24 percent while handling up to 22 percent more traffic at speeds significantly faster than pre-existing congested conditions.[9]

Incident management programs enable communities to identify and respond to crashes or breakdowns with the best and quickest type of emergency services, minimizing clean-up and medical response time. Traffic incidents cause an estimated 52 to 58 percent of total delay experienced by motorists in all urban areas.[10] As a result, incident management programs, which involve clearing crashes more quickly and giving real-time information to motorists so they can avoid those areas, have the potential for substantial mobility benefits. In fact, data show that incident management programs can reduce delay associated with traffic incidents by 10 to 45 percent.[11]

Electronic toll collection provides drivers at toll facilities with convenient and reliable automated transactions. Typically, the driver purchases a transponder that automatically deducts the toll fare from the driver's account so the vehicle may not even need to slow down to pay a toll. These systems can dramatically improve traffic flow at toll plazas, increasing the capacity by 200 to 300 percent compared to attended lanes, while also increasing the operational efficiency of toll collecting.[12]

Together, these ITS components—advanced traffic control, freeway management, incident management, and electronic toll collection—are often integrated into regional traffic management systems, which help to maximize the performance and effective capacity of the existing transportation network. In addition to these large-scale efforts, traffic flow improvements are often undertaken in a wide range of communities and involve such smaller-scale improvements as signal synchronization along a corridor and traffic signals that respond to traffic conditions to ensure that traffic moves smoothly and is not impeded by unnecessary delay.

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[9] Thirteen to 48 percent faster according to the Federal Highway Administration's ITS Joint Program Office. *Metropolitan ITS Brochure.* On-line at: www.its.dot.gov/TravelManagement/metro_its_brochure.htm. Also, see: Federal Highway Administration. *Intelligent Transportation Systems Benefits: 2001 Update.* Prepared by Mitretek Systems. June 2001.

[10] Texas Transportation Institute. *2002 Urban Mobility Report.* On-line at: http://mobility.tamu.edu/ums/.

[11] Federal Highway Administration, ITS Joint Program Office. *Metropolitan ITS Brochure.* On-line at: www.its.dot.gov/TravelManagement/metro_its_brochure.htm. Also, see: Federal Highway Administration. *Intelligent Transportation Systems Benefits: 2001 Update.* Prepared by Mitretek Systems. June 2001.

[12] Federal Highway Administration. ITS Joint Program Office. *Metropolitan ITS Brochure.* On-line at: www.its.dot.gov/TravelManagement/metro_its_brochure.htm. Also, see: Federal Highway Administration. *Intelligent Transportation Systems Benefits: 2001 Update.* Prepared by Mitretek Systems. June 2001.

Transit

Transit services include buses, light rail, heavy rail, commuter rail, and ferry operations, as well as small buses and vans providing more customized service. Public transportation makes it possible for millions of people to access work, school, medical appointments and other everyday activities.

Transit serves a wide range of users and needs and is the primary transportation choice in many markets. Public transportation can be particularly efficient in urban areas where people live in greater concentrations and most of their daily travel needs can be satisfied by transit. The cost of driving, insuring, and parking a car can make it difficult for many people, particularly young workers, to access some job markets. Transit can provide an affordable, and for many people, necessary alternative to driving. For others, transit is used for convenience, as public transportation is often less stressful and can be faster than driving to work. Trips to school are the second most common use of public transportation, and many school-age and college students enjoy the access transit provides to education, shopping, and other opportunities. Without public transportation, many senior citizens would be unable to move around the community to visit friends, get groceries, or see the doctor.

Projects to expand the transit system, such as new bus and shuttle services, can increase mobility by providing new opportunities to reach more destinations. Transit system improvements, such as busways, bus priority systems, and rail projects, often can increase the speed of transit services, reducing travel time for passengers and attracting people who might otherwise drive.

Advanced transit technologies, which increase the reliability and ease of using transit, and customer amenities, such as benches and shelters, can help to increase the comfort associated with transit and attract customers. New ways of monitoring and maintaining transit fleets through advanced locating devices and equipment-monitoring systems help improve the reliability of transit services. Real-time transit information systems provide access to better information about services. Electronic fare-payment systems, or smart cards, enable passengers to pay for parking, bus, and rail fares, and to easily transfer between transit systems using one smart card, rather than using exact change.

Nationally, over 14 million people use public transportation on a typical weekday.[13] While this is a relatively small portion of total travelers, transit carries a much larger share of the load in urban areas during peak periods when roadways are at or near capacity. As a result, transit not only provides an important mobility option, but also helps meet peak-period travel demand and thus relieve some pressure on roadways in urban areas throughout the United States.

More than just getting people from place to place, transit provides access to new opportunities by fostering communities where people can drive less and walk more by providing greater access to community events, and by meeting the needs of all citizens. In many parts of the country, transit-oriented development is an important part of local strategies to create more livable communities where people can take care of all their needs without driving.

HOV Lanes

High Occupancy Vehicle (HOV) lanes are for vehicles carrying a relatively high number of occupants, and usually serve carpools, vanpools, and transit vehicles. The quicker travel times afforded by these lanes can encourage drivers to switch from driving alone to ridesharing or transit, which helps to maximize the efficient use of capacity and can improve traffic flow in the general-use lanes. For those who must use congested travel routes, HOV lanes provide an option for a quicker ride when travelers join together to share the ride.

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[13] American Public Transportation Association. *Public Transportation Fact Book: Fiscal Year 2000 Data*. On-line at: www.apta.com/.

Shared Ride Projects

In addition to HOV lanes, other transportation improvement projects make it easier for people to take advantage of the benefits of ridesharing. Park-and-Ride facilities provide a convenient place for people to join others in a carpool or vanpool or take advantage of transit service. Rideshare matching services help individual travelers find other people to join for rides. These projects enable the road system to carry more people with fewer vehicles, thereby increasing the efficiency of the transportation network and reducing traffic congestion. They provide alternatives to driving alone, which can yield benefits, such as reducing parking and vehicle operating costs and reducing travel time if HOV facilities are available.

Bicycle and Pedestrian Projects

Bicycle and pedestrian projects enable people who wish to use non-motorized forms of transportation to get around more easily. In places such as college towns or in urban areas, bicycling and walking offer real alternatives to the use of the motor vehicle. Examples of bicycle and pedestrian projects include providing on-street bicycle lanes, off-street trails, and improved sidewalk connectivity. These projects tend to be one-time capital investments that generate multiyear benefits. Although they may not measurably decrease congestion levels, they do provide alternatives to driving and can open up access to non-drivers, including children, to access employment, schools, parks, libraries, and other facilities. Many communities are recognizing the importance of non-motorized transportation for improving mobility and community livability by developing bicycle and pedestrian plans and improving the connectivity of these routes.

Freight/Intermodal Projects

Intermodal freight projects involve movement of goods from one transportation mode to another—for example, from truck to train or ship. Intermodal transport combines the door-to-door convenience of trucks with the long-haul economy of rail service or water transport. As a result, railroads, trucking companies, and intermodal marketing companies are forming productive partnerships to combine the best of multiple modes. Intermodal freight transport is growing rapidly, with nearly a tripling in trailer and container traffic on railroads over the period 1980 to 2001—from 3.1 million trailers and containers in 1980 to nearly 9.0 million in 2001.[14]

Because the highway system is heavily congested, transferring trailers and containers to rail and waterways helps to move goods in an efficient manner and to use these networks more efficiently. Based on a corridor study conducted by the Federal Highway Administration (FHWA), it is estimated that for every 10 containers carried on intermodal rail, a minimum of 7 trucks are taken off the highways.[15] A single intermodal train can take as many as 280 trucks off the highways.[16] In addition to helping reduce traffic on the Nation's heavily congested highway network, transferring goods from highways to rail and port also helps to improve roadway safety, reduce the rate of highway pavement deterioration and the costs of highway maintenance, and reduce fuel use and air pollutant emissions.

Freight projects that can improve the movement of goods across modes include the development of intermodal facilities, track improvements, new parking and container storage facilities, and freight control centers.

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[14] Association of American Railroads. *Railroad Facts.* On-line at: www.aar.org/.

[15] Federal Highway Administration, Office of Policy Development (prepared by Volpe National Transportation Systems Center). *Implications of Intermodal Freight Movements for Infrastructure Access, Capacity, and Productivity.* Washington, DC: Federal Highway Administration, March 1996.

[16] Association of American Railroads. *Intermodal Transport.* RR Industry Info Background Paper. On-line at: www.aar.org/.

How Can CMAQ Funds Advance Regional Mobility Goals?

The CMAQ program is a funding source for transportation projects that enhance air quality and ease traffic congestion. Although the primary goal of the CMAQ program is to fund transportation projects that improve air quality, many of the projects also help to reduce traffic congestion and increase mobility options. The CMAQ program funds all of the types of projects discussed previously that improve mobility: traffic flow improvements, transit services, HOV lanes and other shared-ride services, intermodal projects, and bicycle and pedestrian projects, among others.

Although CMAQ projects are not the whole solution, they can help to address mobility needs by enhancing the overall efficiency of the surface transportation network. They can provide system enhancements and new services where road capacity is constrained. New road capacity may in places also be needed to meet growing travel demand, and these different approaches can be complementary to wrestle with growing levels of congestion and frustration. From a system-wide perspective, it is important to note that individual projects will not likely "solve" all of a region's congestion problems, but they can have a measurable effect in specific corridors and places where funding is focused. This impact can be of extreme importance to businesses and activity centers, ports and airports, and residents facing localized congestion on a daily basis.

Brief Overview of the CMAQ Program

The CMAQ Program was established under the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 as a funding source for transportation projects and programs that help support the goals of the 1990 Clean Air Act Amendments. The program was authorized for a 6-year period at $6 billion. The program was reauthorized under the Transportation Equity Act for the 21st Century (TEA–21) in 1997 with funding of $8.1 billion for the 6 years of the Act, 1998–2003.

In the context of the Federal-aid Highway Program, CMAQ is but a small piece of the funding available to States for transportation-improvement projects. For example, the Surface Transportation Program (STP), which provides flexible funding for transit as well as highway projects, was authorized at $33.3 billion during the life of TEA–21. The National Highway System (NHS) program, which funds projects involving highways of national significance, was funded at $28.6 billion during the same period.

In the context of total available funding, CMAQ makes a small but targeted contribution toward addressing air quality and mobility issues. For example, all levels of government together spent more than $116 billion on highway and transit programs in 1999. CMAQ funding available to the States in that year was only about $1.3 billion, or about 1 percent of total transportation spending. Even a single major transportation infrastructure project can cost well over $1 billion, exceeding total national CMAQ funding for a year.

Although the CMAQ program is modest relative to any given region's transportation budget, the funds often are used in innovative ways to support transportation options and reduce traffic congestion. CMAQ funding is apportioned to States based on a legislative formula that takes into account the population in areas that do not meet air quality standards and the severity of regional air quality problems. States may use CMAQ funds for a variety of transportation-related measures and programs designed to help meet the national ambient air quality standards (NAAQS) for carbon monoxide, ozone, and particulate matter.

Overview of Project Types and Eligibility

An innovative feature of the CMAQ program is the flexibility it provides for eligible projects and programs. Selection of CMAQ projects is made at the State and local level but is subject to broad Federal guidelines on project eligibility. The main eligibility criterion is air quality improvement; however, increased mobility is a direct benefit of reduced congestion and mobility-improvement projects often yield emission benefits, as well.

Although CMAQ funds are designed to help metropolitan areas attain the NAAQS, hundreds of communities are using the program to promote mobility and air quality improvement. Projects range from constructing a small pedestrian connection to designing a regional bicycle network, building an HOV lane, and developing a regional system for congestion management. These projects not only promote air quality improvement, but also help to meet community and regional mobility needs by increasing transportation options, helping travelers avoid congestion, and encouraging a more efficient transportation system.

Case Studies

This report documents nine projects, funded in part by the CMAQ program, that are helping to enhance mobility. Figure 4 shows the locations of the projects. They represent just a sample of the hundreds of ideas and initiatives that communities are using to enhance mobility through the CMAQ program.

Figure 4. Location of Case Studies

Mobility and the CMAQ Program:

Case Studies

ARTIMIS— Cincinnati/Northern Kentucky Area

Type of Project

Traffic Flow

Project Cost

CMAQ Cost: $41 million

Total Project Cost: $57 million

Context and Background

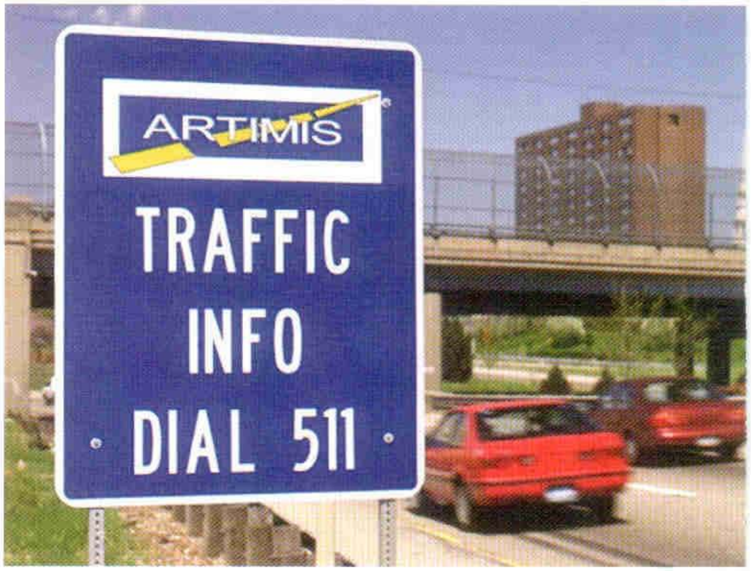
Over the 1980s and into the 1990s, the Cincinnati region experienced rapid congestion growth. According to the Texas Transportation Institute's *Urban Mobility Study*, peak period travel in congestion increased from 17 percent in 1982 to 40 percent in 1990, resulting in longer commutes. Over the same period, annual person-hours of delay increased from 2 million to 8 million hours.[17]

As freeways were becoming more congested, transportation officials in the Cincinnati area began looking at new technologies to help ease the burden on highways and lessen the frustrations of motorists. Emerging from this search were new methods of traffic technology or Intelligent Transportation Systems (ITS). In 1987, the Ohio-Kentucky-Indiana Council of Governments (OKI) started a feasibility study to determine if such as system could benefit the region's efforts to reduce traffic congestion and ozone levels. With the signing of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991, a preliminary design effort for a system was launched and completed in early 1993.

The Project

The Advanced Regional Traffic Interactive Management and Information System (ARTIMIS) provides incident, congestion, and freeway management for 66 miles in Ohio and 22 miles in Kentucky in the Cincinnati metropolitan area. Funded by the Ohio Department of Transportation (ODOT) and the Kentucky Transportation Cabinet (KYTC), ARTIMIS was the first major ITS effort in Ohio and the second in Kentucky. With the support of CMAQ funds, the first elements of the system began operation in 1995.

The program is funded through several sources. The primary source of funds comes from the CMAQ program. Using CMAQ funds, the ODOT pays 75 percent of system-wide costs and the KYTC pays the remaining 25 percent. Components solely in Kentucky or Ohio are funded by the respective State. ARTIMIS attempts to manage congestion caused by lack of capacity, crashes, and disabled vehicles in the Cincinnati-Northern Kentucky area using modern technologies. Placed along key segments of the freeway system, more than 80 closed-circuit television cameras (consisting of full-motion color cameras, slow-scan color cameras, and fixed black-and-white cameras) relay information back to a control center via fiber optic cable and telephone lines. Information is then distributed to motorists via changeable message signs. Forty signs are



ARTIMIS was the first program in the nation to launch an area-wide 511 service.

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[17] Texas Transportation Institute. *2002 Urban Mobility Study*. On-line at: mobility.tamu.edu/ums/.

One of the ARTIMIS dynamic message signs.

located before the major freeway interchanges to advise motorists of traffic problems and potential alternate routes. Three portable changeable message signs can be towed to locations to meet a specific, short-term need.

ARTIMIS operates two dedicated radio channels and a traveler advisory telephone service, known as SmarTraveler®, which provides up-to-the-minute, route-specific traffic information during operational hours and construction information 24 hours a day. ARTIMIS was the first system in the United States accessible from both landline and wireless phones from one three-digit number (511). Real-time traffic information is also available over the Internet at www.artimis.org.

The system also runs a free motorist assistance program with five service patrol vans, called Samaritan vans, that patrol the central 88 miles of freeways within the region. ARTIMIS provides 51 percent of the funding for the vans, and CVS Drug Stores provide the other 49 percent. Drivers of the vans are certified mechanics and trained Emergency Medical Technicians who provide a variety of services, such as assisting motorists with temporary repairs, providing fuel, calling for assistance, and removing road debris. The vans are on patrol from 6:30 a.m. to 7:00 p.m. Monday through Friday and during selected events.

Results and Status

ARTIMIS has made a significant impact on congestion and travel delays since the 1995 launch of its Traveler Advisory Telephone Service. Total savings in reduced traffic delays, fuel consumption, and crashes are estimated to be $15.9 million per year.

On January 8, 1998, after the first 23 of the 40 total changeable message signs were placed into operation, the system was immediately put to the test when a tractor-trailer carrying hazardous material overturned and ruptured on I–75. The result was a total closure of the interstate for approximately 3 hours. Motorists followed the alternate routes that were posted, and a later analysis of the incident indicated that ARTIMIS saved approximately $100,000 in motorist use costs.

Other benefits of ARTIMIS include a 10-percent reduction in interstate highway crashes and an annual savings of one million gallons of fuel. Analysis using the ITS Deployment Analysis System model for estimating the impact of ARTIMIS also determined that travelers save approximately 860 daily hours during peak travel time due to the traveler information components. In terms of reliability, motorists save about 12,000 hours of unexpected delay daily during the morning peak period, and 6,940 hours daily during the evening peak period.[18]

Estimated Emissions Benefits

186 kg/day VOC

Contact

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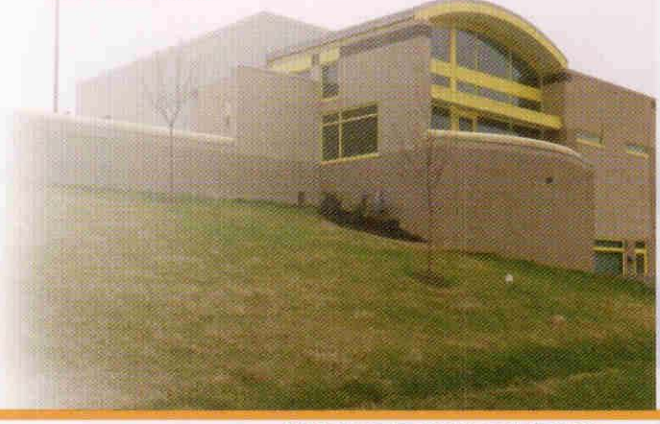
614-752-8099



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[18] Cambridge Systematics. *ARTIMIS Evaluation: Benefits of ARTIMIS.* Final Report. Prepared for Ohio-Kentucky-Indiana Regional Council of Governments. June 2001.

Belt Line Road/Denton Tap Road Signalization Project—Dallas County, Texas

Type of Project

Traffic Flow

Project Cost

CMAQ Cost: $62,000
Total Project Cost: $87,000

Context and Background

Not all effective mobility projects are large scale. Traffic congestion is often most keenly experienced in specific corridors, and small projects can be highly successful in generating localized time-savings and mobility benefits.

The 14-mile section of Belt Line Road and Denton Tap Road in the cities of Irving and Coppell is a case in point. This roadway section included several locations where traffic congestion was a problem. For instance, an intersection along Denton Tap Road experienced heavy traffic during times of day when vehicles were approaching or departing the Coppell High School. The eastbound approach at this intersection had a dedicated left-turn lane and two through lanes, but no dedicated right-turn lane, so any through traffic using the outside right lane caused right-turning traffic to queue when eastbound traffic was stopped at the light. Another constant source of congestion was the traffic associated with the Irving Mall. The intersections around the mall are closely spaced, and the intersection of Belt Line Road with the westbound approach to the mall was congested on Saturday afternoons.

The Project

For these locations, Dallas County decided that retiming traffic signals would help to improve travel times, reduce delay, and improve air quality. Project 75 of the Dallas County CMAQ Program included 32 existing signalized intersections and two proposed signalized intersections along the 14-mile section of Belt Line Road and Denton Tap Road. Coordination between the cities of Irving and Coppell was required, as the Belt Line Road crosses between jurisdictions.

As part of the project, initial traffic data were collected and analyzed to determine the existing signal timing characteristics, including phasing, cycle length and presence or absence of coordination. Based on this analysis, preliminary signal timing plans were developed for each of the proposed traffic control areas and time periods (morning peak, noon peak, afternoon off peak, evening peak, Saturday). Interval times and pedestrian clearance were taken into account in the development of the plans. The timing plans were then finalized and implemented with input from and coordination between the two cities. Finally, modifications were made to the signal timing based on observations of traffic flow and citizen input, and final travel time data were collected. In addition to the signal retiming, the project also involved making recommendations for hardware improvements and geometric improvements, some of which were implemented in order to further improve traffic flow in the corridor.

In addition to traffic signalization improvements, CMAQ funds were used to add a right-turn lane at Danieldale Road to further mitigate congestion.

Results and Status

The retiming of the traffic signals along the Belt Line corridor has generated definite improvements to traffic flow, including reductions in the number of stops for vehicles and travel time along Belt Line Road, increases in average speed in both directions, and shorter stop-delay times. For example, in the evening peak hour in the southbound direction, the average vehicle experienced a more than 60-percent reduction in the number of stops, from 13.3 to 4.7 stops on average, across the 14-mile corridor. Under those conditions, average speeds increased from 29 to 39 miles per hour, and travel time dropped from more than 26 minutes to 19.5 minutes. In total, it is estimated that the project resulted in an annual travel time savings of nearly 3 million hours, an annual decrease of 42.4 million vehicular stops at traffic signals, and an annual decrease in total delay time of nearly 300,000 hours.[19]

Recommendations were also identified for hardware and pavement marking improvements to further enhance the effectiveness of the retimed traffic signals. Regarding the congested intersection near the Coppell High School, it was identified that right-turning eastbound traffic at the school intersection would be aided by the conversion of the outside through lane to a right-turn-only lane, allowing this traffic to turn on red. It was also recommended that congestion around the Irving Mall could be reduced by adding right-turn capacity to the road and installing a "right-turn overlap" phase that allows protected right turns when the northbound traffic is stopped.

Estimated Emissions Benefits

1 kg/day VOC

Contact

Craig Goodroad

Dallas County CMAQ Office

214-747-6336

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[19] Sverdrup Civil, Inc. *Dallas County CMAQ Program, Project 75: Irving and Coppell, Belt Line Road/Denton Tap Road.* Appendices. Performed for Dallas County, City of Coppell, City of Irving. February 18, 1998.

Intermodal Freight Transfer Facility—Auburn, Maine

Type of Project

Intermodal

Project Cost

CMAQ Cost: $3 million

Total Project Cost: $5 million

Context and Background

Intermodal service involves moving containers between rail and truck, or other modal combinations, and is a fast growing part of the railroad business because it enables railroads to deliver goods miles from their rail lines. Intermodal services can increase efficient transportation services and energy efficiency because a train loaded with containers can carry the same load as dozens of trucks. This, in turn, can contribute to reduced truck traffic on congested highways, reduced damage to highways from heavy trucks, and improved air quality.

To provide infrastructure for its railroad lines to grow, the State of Maine partnered with local rail lines to build a truck-to-rail intermodal facility in Auburn, located about 40 miles north of and inland from Portland, Maine. Auburn is well situated as an intermodal hub because of its proximity to rail lines, an airport, the Maine Turnpike, and the State highway network; both the railroads and local authorities saw an opportunity for growth.

Auburn is bisected by the St. Lawrence & Atlantic Railroad, which runs 260 miles between Portland and St. Rosalie, Québec. The St. Lawrence & Atlantic connects with Canadian National Railway at Richmond, Québec, which gives Maine access to deep-water ports at Halifax in the east and Vancouver in the west. Shippers on the West Coast with products from Asia have the option of using two rail lines that cross the United States, but the journey across Canada bypasses congestion in Chicago and can be less expensive for shippers. The Auburn terminal is less than 3 miles from the Maine Turnpike and 140 miles from Boston.

The Project

The St. Lawrence & Atlantic Railroad partnered with the Auburn/Lewiston Metropolitan Area, the State of Maine, and FHWA, to build the Maine Intermodal Terminal in Auburn. The 35-acre terminal opened in 1994, and consists of a double-track, gravel-yard facility for transfer of containers between truck and rail. The project improved track and added parking and container storage, a weighing and freight-control operations center, and a lift provided by the railroad. A mechanized packer now lifts cargo containers between flatbed rail cars and truck frames for a range of products.

Auburn's Intermodal Freight Transfer Facility celebrates its 75,000th container.

Among the goods are: containers filled with clothing from Asia headed toward L.L. Bean in Freeport, wine from California's Napa Valley headed for state liquor stores in New Hampshire, and a range of consumer goods headed to major New England markets. Trucks arriving with westbound cargo deliver: rolls of Maine paper for a printing press in the Midwest, Maine-made fiberboard for construction in California, and Poland Spring bottled water headed for the West Coast.

Results and Status

Only a decade ago, there was no intermodal traffic in Auburn. In its first year in operation, the Maine Intermodal Terminal handled about 6,000 containers. It was estimated that in order to break even the facility needed to move between 10,000 and 12,000 containers a year. In 2001, it handled a volume of 15,000 containers. It is the largest of three intermodal cargo facilities in the State, and since opening in 1994, has moved more than 75,000 shipping containers.[20] Results from the first phase of the project were so successful that in 2001, increased storage was added at the facility, using $0.5 million in CMAQ funds.

The intermodal facility has made Auburn a central point for transportation exchanges in the Northeast. Its location near Canada allows freight to move by rail straight from Vancouver, British Columbia, into Auburn for local and regional distribution. Given an increase in the amount of international containers, the facility is trying to bring an on-site customs agent to the facility, or expand the agency's Portland district to include Auburn and assign a visiting inspector. Currently, when Customs Service inspections are needed, the containers need to be taken by truck to Portland.

Freight originating in the Midwest now can be moved by rail, thus reducing the flow of long-haul truck carriers into the area. This reduction of long-haul truck traffic has generated air quality improvements and enhanced the viability of local trucking services. The local economy has improved through an increase in the number of regional distributing companies, and additional warehousing space. Additionally, goods producers needing raw and bulk goods have moved to the area, further bolstering the local economy.

Estimated Emissions Benefits

7 kg/day VOC, 77 kg/day NOx (First Phase)

Contact

Alan Bartlett

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207-624-3560

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[20] "Where the Rail Meets the Road." *Portland Press Herald.* July 21, 2002, page 1F.

I-84 HOV Lanes—Hartford, Connecticut

Type of Project

Traffic Flow

Project Cost

CMAQ Cost: $11 million

Total Project Cost: $24 million

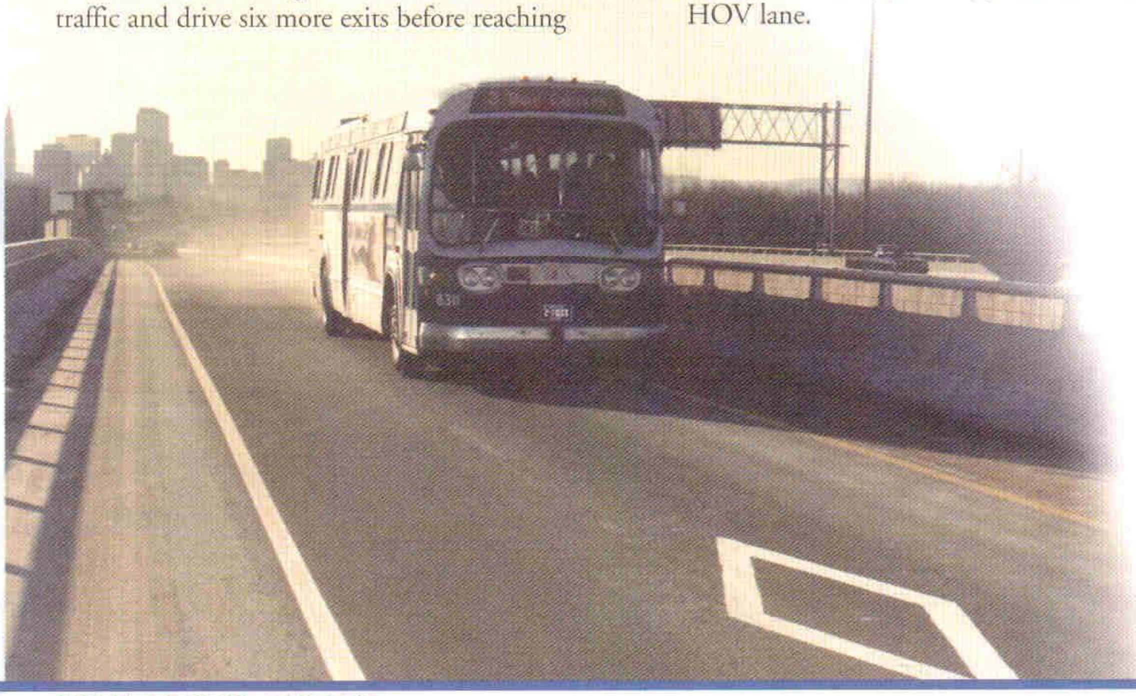
Context and Background

HOV lanes are available in the Hartford area on Interstate 384, Interstate 84 (east of Hartford), and Interstate 91 (north of Hartford). Often during peak commuter hours, mainline traffic on Interstates 84 and 91 is very heavy and congested. Traffic on the HOV lanes, on the other hand, usually moves at free-flow speed during peak hours, providing time savings for people who carpool, vanpool, and use transit.

The HOV lanes along I–84, however, were an incomplete system that did not serve commuter travel into downtown Hartford efficiently. Opened in 1989, the I–84 HOV lanes started in Vernon to the east and terminated in East Hartford about 1.5 miles short of the Founders Bridge into Hartford. Carpoolers, vanpoolers, and bus riders had to merge back into mainstream traffic and drive six more exits before reaching downtown Hartford. That segment of freeway into downtown Hartford had congested traffic levels, operating at Level of Service "F," indicating severe traffic delays, with an average speed of only 9.4 miles per hour during the morning peak hour period. This congestion made commutes downtown slow for even those who chose to rideshare.

The Project

This project involved extending HOV lanes on I–84 by 1.5 miles to downtown Hartford. Work began on the extension in the summer of 1999; the extension opened for service in June 2001. The new lanes extend to the Founders Bridge, enabling carpoolers destined for the downtown area to use the lanes all the way into Hartford. Only those HOV users crossing the Bulkeley Bridge to destinations farther west continue to merge with westbound main-line traffic. In addition, the I–84 HOV lanes were restriped to facilitate more flexible operation. Eastbound travelers now can enter the lanes from I–84 or Route 15, allowing carpoolers the option of using the HOV lane if the mainline becomes congested. The restriping also gives eastbound users of the Charter Oak Bridge the opportunity to enter the HOV lane.



Results and Status

The project has increased the speed and reliability of travel time for people sharing rides into Hartford. According to Ravi Chandran, Supervising Engineer for the Connecticut Department of Transportation, traffic jams on I–84 westbound going into Hartford regularly add 10 minutes but can easily become half-hour delays, as compared to no delay at all in the HOV lane. Vanpoolers say the HOV lane extension has made their commutes much easier and faster. "The HOV lane is a godsend to the van," said Janet Grous, a business systems analyst at ING, who drives a vanpool from Vernon to Hartford.[21]

Downtown employers agree that the HOV lane extension has made the commute easier and faster for their workers. "We're located right where the Founders Bridge comes into downtown, so the HOV terminus is especially convenient for our workers," according to Jon Sandberg, spokesman for Phoenix Home Life Mutual Insurance Company. "The HOV lane has helped us encourage ridesharing among our employees and decrease the demand on highway usage."[22]

By increasing speeds for carpoolers and transit traveling into Hartford, the project improvements have enhanced the attractiveness of ridesharing to work. According to a traffic count study conducted annually by the Connecticut Department of Transportation, in the first year of operation, the improvements resulted in a 25-percent increase in HOV lane usage during the peak hour and a 34-percent increase in usage during the overall peak period. The use of the HOV lane translates into a more efficient highway system, and recently completed counts show that the I–84 westbound HOV lane is effective. Between 6 a.m. and 9 a.m. on an average day in September 2002, 1,095 vehicles carrying 3,660 people traveled in the HOV lane, compared to an average of just over one person per vehicle in the general-purpose lanes.

Estimated Emissions Benefits

8 kg/day VOC, 3 kg/day NOx

Contacts

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860-594-2148

Drivers head west in the HOV lane from East Hartford toward the Founders Bridge.

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[21] "HOV Lane Extension Provides Tremendous Benefit to Commuters." *The Commuters Register*, Connecticut, December 2002, page 23.

[22] Ibid, page 23.

Metra North Central Service (NCS)—Chicago, Illinois

Type of Project

Transit

Project Cost

CMAQ Cost: $29 million

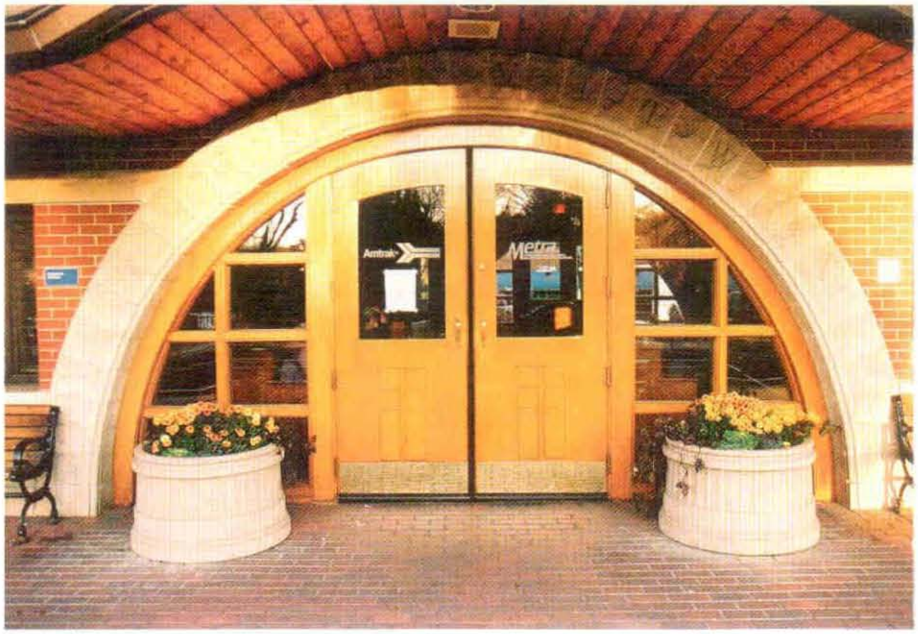
Total Project Cost: $141 million

Context and Background

Residents along the I–94 corridor in Lake County north of Chicago commute more than 50 miles to downtown Chicago. The I–94 highway is also extremely congested, and experiences some of the highest levels of traffic delay in the Chicago area and the Nation as a whole.[23] Congestion on I–94 and surrounding roads presented a problem for residents of towns such as Antioch, near the Wisconsin border, commuting into the Nation's third most congested urban area.[24]

The Project

In 1996, Chicago's commuter rail service, Metra, with help from some $29.3 million in CMAQ funds (from fiscal years 1993, 1994, and 1995) opened its North Central Service (NCS). This train was the first new commuter rail service implemented in northeastern Illinois since 1926. It runs 53 miles between Antioch and Chicago, stopping at 14 stations. South from the Antioch coach yard, the NCS uses 40.7 miles of Canadian National Railway trackage, along which there are 10 new suburban stations in Lake and Cook Counties, plus a new transfer station at Chicago's O'Hare International Airport. South of O'Hare, the NCS joins Metra's Milwaukee District West (MD–W) line, with which it shares 12.7 miles of trackage to the Chicago Union Station terminus. The NCS trains also stop at two of the MD–W's intermediate stations. The corridor includes the two most significant hubs of employment in the six-county northeastern Illinois region: the Chicago central business district and the area surrounding O'Hare International Airport.



A Metra commuter rail station in suburban Chicago.

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[23] Cambridge Systematics. *Unclogging America's Highways: Prescriptions for Healthier Highways.* Washington, DC: Highway User's Alliance, November 1999.

[24] Texas Transportation Institute. *2002 Urban Mobility Study.* On-line at: mobility.tamu.edu/ums/.

The NCS schedule currently consists of 10 trains each weekday between Antioch and Chicago—4 morning peak inbound and 4 evening peak outbound trains, plus 1 train in each direction in the afternoon. There is no weekend service. A run between Chicago Union and Antioch Stations takes 85 to 87 minutes. Each of the 10 new suburban NCS stations has commuter parking available for $1.50 per day.

Results and Status

The additional Metra line has added another commute option for residents of Lake County and increases the mobility of others who are unable to use the Metra line. According to a 1999 study, the total number of auto trip diversions attributable to the North Central Service was estimated at between 487,000 and 670,000 vehicle trips annually. The increased mobility that this rail line brings has economic value for the region as well. The 1999 study also found that 57 percent of riders said the rail service was very important in their choice of home location, thus helping to bolster local real estate values.[25]

As a result of the line's success, Metra is planning to construct a second mainline track to accommodate increased service and operating speeds, as well as the construction of five new stations and parking facilities. The additional track, new stations and related improvements will allow Metra to increase its North Central Service from 5 to as many as 11 roundtrips daily.

Estimated Emissions Benefits

225 kg/day VOC, 248 kg/day NOx

Contact

Ross Patronsky

Chicago Area Transportation Study

312-793-3474

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[25] Parsons Brinckerhoff Quade & Douglas, Inc. *CMAQ Analysis: North Central Service Impact Evaluation—Phase II: Final Report.* Chicago: Metra, June 1999.

NAVIGATOR-Advanced Transportation Management System (ATMS)—Atlanta, Georgia

Type of Project

Traffic Flow

Project Cost

CMAQ Cost: $54 million

Total Project Cost: $140 million

Context and Background

The Atlanta region is known for its traffic congestion; it is one of the fastest growing metropolitan areas in the country. Atlanta's population nearly doubled from 1.6 million to 3.0 million between 1982 and 2000, and system-wide daily vehicle miles traveled tripled over this period.[26] As host to the 1996 Olympic Summer Games, Atlanta was expected to draw some two million visitors plus thousands of athletes, coaches, and officials from around the world. Given the region's reputation for traffic congestion, regional leaders were concerned about accommodating the influx of people and traffic for the Olympics. Few things could destroy the excitement of the Olympics—not to mention the reputation of the region and economic opportunities stemming from the event—faster than transportation gridlock. Solutions were needed to improve mobility for the games, as well as to promote the continued economic well-being of the region.

The Project

The Advanced Transportation Management System, or NAVIGATOR, was developed to help better manage traffic flow and provide real-time traffic information to improve transportation decisions and public information. NAVIGATOR is a computerized transportation communication system that employs fiber optic technology to gather traffic information. It uses video detection, radar detectors, and more than 450 closed-circuit television cameras to monitor traffic flow. The system enables control center managers to detect traffic incidents and congestion rapidly, and subsequently dispatch Highway Emergency Response Operators (HEROs). Five ramp meters are used to control highway traffic flow, and information technologies (such as 67 changeable message signs, the Internet, and 140 information kiosks) help provide motorists with real-time traffic information. In developing the system, more than 400 traffic intersections were upgraded to improve signal coordination throughout Atlanta and the metropolitan region.

I–85 and I–285 intersection north of Atlanta.

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[26] Texas Transportation Institute. *2002 Urban Mobility Study.* On-line at: mobility.tamu.edu/ums/.

In addition to elements that improve highway traffic flow, the system includes transit management, electronic fare payment, and multimodal traveler information. The Metropolitan Atlanta Rapid Transit Authority (MARTA) has access to information generated by the ATMS and shares information on road conditions. For example, information on an accident that is radioed into MARTA by bus drivers is available to ATMS to help manage traffic patterns and incident response.

The system is housed in a $14 million transportation management center (TMC). Operated by the Georgia Department of Transportation (and centrally located in Atlanta on the same compound as the Georgia State Patrol and the Georgia Emergency Management Agency), the TMC serves as the control center for transportation emergencies. Having all surveillance and control functions under one roof facilitates decision-making and helps Atlanta's transportation officials more effectively manage the day-to-day demands of the transportation system. The TMC is linked to seven regional Transportation Control Centers in Clayton, Cobb, Dekalb, Fulton, and Gwinnett counties, the City of Atlanta, and MARTA. These satellite facilities and the TMC monitor 90 miles of interstate highway in the Atlanta region and represent the forefront of ITS traffic data gathering, communications, analysis, and incident-response activities.

Results and Status

The incident management components of the system resulted in substantial savings in traveler delay. Using conservative estimates, Georgia DOT estimates that the incident management components of NAVIGATOR have reduced the average incident duration by 23 minutes, from an average of 64 minutes to 41 minutes. All elements of incident management are faster: incident detection and verification are faster due to traffic camera coverage; response identification and dispatch are speeded up by the computer system; and response time and clearance are also faster due to the HEROs (previously, local police and fire agencies responded to freeway incidents). It is estimated that, in total, the incident management components of NAVIGATOR have resulted in nearly 3.2 million hours in reduced delay time per year for travelers on Atlanta's highways. The delay savings accrued mostly during the peak hours of traffic, with 6:00 a.m. to 10:00 a.m. delay reductions of 1.3 million hours and 3:00 p.m. to 7:00 p.m. reductions of 1.9 million hours. These savings have resulted in a cost savings of $45 million per year for travelers.[27]

Beyond the incident management components, NAVIGATOR also provided motorists with information to make informed decisions regarding their traveling options, including ways to avoid spending time stuck in traffic delays. The system also improved the reliability of transit schedule information and decreased traveler waiting time. The Georgia DOT suggests that other benefits of the system include improved roadway safety, reduced air pollution, and more efficient use of emergency services.

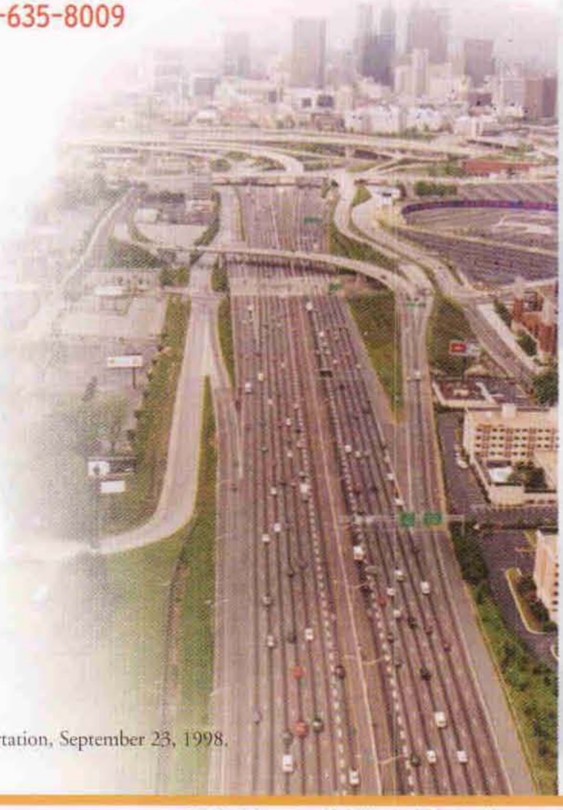
Estimated Emissions Benefits

614 kg/day VOC, 578 kg/day NOx

Contact

Mark Demidovich

Georgia Department of Transportation
404-635-8009



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[27] Presley, Michael and Katherine Wyrosdick. *Calculating Benefits for NAVIGATOR, Georgia's Intelligent Transportation System.* Atlanta: Georgia Department of Transportation, September 23, 1998.

New York City Transit 63rd Street-Queens Boulevard Connection—New York City

Type of Project

Transit

Project Cost

CMAQ Cost: $44 million

Total Project Cost: $645 million

Context and Background

New York City Transit (NYCT) is the largest rail and bus transit system in North America. The system consists of more than 6,000 passenger railcars, approximately 4,500 buses, 660 track miles, and 468 passenger stations. New York City's financial crisis in the 1970s and other economic factors that led to investment neglect left the NYCT infrastructure in disrepair by the early 1980s. Some lines were noted for their inefficiency and limited operational flexibility, resulting in a functionally inefficient operation that often slowed trains and reduced throughput in stations. In recognition of the need to rebuild the network, the first 5-year capital program was launched in 1982 in an effort to reverse this trend. Since that time, NYCT has made considerable strides toward bringing most assets to a state of good repair, and to make investments to enhance the NYCT system.

The 63rd Street-Queens Boulevard Connection project is a case in point. In 1969, NYCT began construction of a new subway link to Manhattan to alleviate congestion on the Queens Boulevard line. The connector consisted of a tunnel under the East River and land-based tunnels on both sides of the river. Funding issues, however, prevented this route (called the 63rd Street line) from being completed as planned on the Queens side, and so it was terminated at the 21st Street station. The tunnel lived through various ill-fated incarnations, including the idea of using it as a link for a new subway express line through Queens, but these plans were abandoned during the city's fiscal problems in the 1970s.

Dubbed the "tunnel to nowhere" because it terminated one stop into Queens, the partially finished line was put into service in 1989 by NYCT. Given the limited connection, it had only a small ridership in Queens and was underused. Meanwhile, nearly 200,000 people using the Queens Boulevard Line (QBL) to commute between Queens and Manhattan experienced severely overcrowded trains. The E and F routes along the QBL operated at more than 120-percent capacity during peak hours.

The 63rd Street Connection is shown as the dashed orange line connecting the 21st Street station to the Queens Boulevard Line.

The Project

The 63rd Street-Queens Boulevard Connection project had a simple mission: to traverse 1,500 feet underground to connect the 63rd Street tunnel to the Queens Boulevard Line. The link involved extending the existing tunnel from just east of the 21st Street station to the QBL roughly halfway between the Queens Plaza and 36th Street stations. It was designed to increase the number of rush-hour trains into Manhattan by 50 percent, from 30 to 45, easing overcrowding on the E and F lines. Although only about one-third of a mile was needed to connect the two subway lines, the project was situated in a complex subterranean infrastructure posing significant engineering challenges. The construction site was under a heavily traveled seven-lane State road (Northern Boulevard) leading to the Queensborough Bridge into Manhattan, and within a commercial area surrounded by five-story buildings. In addition, lying about 8 feet directly below the road was a five-track subway tunnel that was part of NYCT's Independent line, and directly to the east were the Sunnyside Yards, which accommodate Amtrak and Long Island Railroad train operations. Concerns about settlement of the old tunnel and adjoining buildings required implementation of measures to support the tunnel and buildings. Many utilities within the project site had to be relocated to make way for construction. Construction was started in September 1994, and completed in 2001.

The Connection is currently served by the "F" train connecting Queens and Manhattan.

Results and Status

The 63rd Street-Queens Boulevard Connection provides a desperately needed overflow for what were the jammed E and F lines running through Queens. The F express was rerouted through the new tunnel, and the V, a brand-new train line, was added along Queens Boulevard as a local along the route the F once took. As a result of the increased number of trains running along the QBL with the connection, New York City Transit estimates that the average Queens rider on the E, F, and R lines saves approximately 31 hours per year because of the 63rd Street Connection project.

Some service changes that were implemented with the opening of the new connection created dissatisfaction among some commuters who had taken the F express through its old route. However, the connection enabled a significant expansion of service capacity for NYCT, increased commuter options for customers, reduced overcrowding between Manhattan and Queens, and reduced commute time for passengers.

Service enhancements such as this have proven vital to accommodating and sustaining customer growth. From 1995 to 2000, the number of unlinked passenger trips on the NYCT system grew by nearly a third.[28] Transit is vital to the economic viability of New York City and helps reduce traffic overcrowding by keeping an estimated half-a-million cars out of Manhattan's central business district each day.[29]

Estimated Emissions Benefits

91 kg/day VOC, 36 kg/day NOx, 645 kg/day CO

Contact

Mark Pascaris

Capital Program Development
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646-252-4925

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[28] U.S. Department of Transportation, Federal Transit Administration. *National Transit Database, 2000.* On-line at: www.fta.dot.gov/ntl/database.html.

[29] New York City Transit. *About New York City Transit: The Importance of Public Transit.* On-line at: www.mta.nyc.ny.us/nyct/facts/ffintro.htm.

Pedestrian Access to Transit—Portland, Oregon

Type of Project

Bicycle/Pedestrian

Project Cost

CMAQ Cost: $840,000

Total Project Cost: $950,000

Context and Background

Portland has a strong history of supporting pedestrian access. In 1994, Metro, the regional government of the Portland metropolitan area, adopted a 50-year regional growth-and-development concept that calls for "development of a true multimodal transportation system which serves land use patterns, densities and community designs that allow for and enhance transit, bike, pedestrian travel and freight movement."[30] Compared to many other large cities, Portland has a high share of nonmotorized travel. Nearly 12 percent of the trips in downtown Portland are made by people who walk to transit. Easy street crossings, sidewalk continuity, street connectivity, and topography of the inner, older neighborhoods facilitate pedestrian access.

As with most North American cities, however, the city of Portland has its share of edge communities developed around automobile transportation, where streets were built with suburban design features. Some streets lack sidewalks, have wide lanes and streets with higher vehicular speeds, incorporate few pedestrian amenities, or have intersections configured to optimize vehicular turning movements rather than pedestrian crossings. An inventory of sidewalks and curb ramps conducted for the Portland Pedestrian Master Plan showed that these areas were largely lacking pedestrian facilities, even on arterial streets. A travel behavior survey conducted by Metro in 1994 also found that about 28 percent of all trips in inner, mixed-use areas were made on foot, compared to only 5 percent in suburban areas in the region.[31]

Because transit riders generally begin and end their trips as pedestrians, the Portland Office of Transportation was interested in understanding how the pedestrian environment affects transit use. It recognized that even though the region had a good transit system, an unattractive or unsafe walking environment discourages people from using transit. Given a projection of regional population growing by about 50 percent between 1994 and 2020, increasing transit use was seen as an important component of the regional transportation plans.[32]

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[30] *Metro Region 2040 Plan.* Portland, OR. On-line at: www.metro-region.org/.

[31] *Metro Household Activity Survey, 1994.* (This modal share figure is for walk-only trips; it does not include walk-to-transit trips, which are counted as part of the transit modal share.)

The Project

The Portland Office of Transportation initiated a study and demonstration project to look at one such factor: improving pedestrian access to transit. The study asked whether improving pedestrian access would encourage transit use, especially among "choice" riders (riders who have access to cars and therefore do not have to ride transit).

The project proceeded in three phases: the study itself, planning and design, and a demonstration. During the study phase, planners identified neighborhoods with high numbers of choice riders not using transit, asked residents why they did not use transit, and identified five factors influencing transit use: continuous path to stops, personal safety, shorter pedestrian routes, comfort, and understanding of the transit system. During the planning and design phase, planners developed design guidelines for five types of areas: primary transit stops, secondary transit stops, neighborhood transit areas (the area between the stop and the nearest intersections), primary pedestrian routes, and special conditions (such as retail/commercial areas or uncurbed streets).

Pedestrians cross the street near streetcar stop.

Finally, during the demonstration phase a number of pedestrian improvements were made in the Roseway neighborhood in northeast Portland. These improvements included curb extensions, bus shelters, pedestrian refuge islands, new sidewalks and corner curb ramps, street lighting, and tree planting and landscaping. The demonstration project was completed in 1998.

Results and Status

Telephone surveys with 178 neighborhood residents made before and after the improvements showed that there was a positive impact on transit usage. The surveys suggested about a 10 percent increase in transit trips within the study area (this finding is not statistically significant, however, given the small sample size). The benefits of the improvements extended beyond increasing the number of transit trips taken by residents. The pedestrian improvements facilitated walking trips for various purposes, many of which did not involve transit. The project had a clear impact on the residents' sense of safety while using the pedestrian network; it also supported increased mobility for all ages and physical capabilities.

Portland has emphasized these type of transit access improvements as it has expanded its light rail system, including promoting transit-oriented development around stations as a way to provide increased access to housing, jobs, and shopping via transit. The City of Portland is committed to providing the benefits of walking to all residents by supporting pedestrian travel as a safe, efficient, desirable, and accessible mode throughout the city's neighborhoods, and in 1998, developed a Pedestrian Master Plan to guide priorities for the city.

Estimated Emissions Benefits

6 kg/day VOC, 8 kg/day NOx, 29 kg/day CO

Contact

Bill Hoffman

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[32] *Metro Region 2040 Plan.* Portland, OR. On-line at: www.metro-region.org/.

Tasman Corridor West Light Rail Extension (Phase I)—Santa Clara County, California

Type of Project

Transit

Project Cost

CMAQ Cost: $15 million

Total Project Cost: $325 million

Context and Background

Santa Clara County is located in the San Francisco Bay Area and encompasses part of the area commonly referred to as "Silicon Valley." This area is a major employment hub, drawing employees from across the Bay Area as well as the Central Valley and Central Coast.

Santa Clara County is also home to some of the most congested corridors in California. According to the California Department of Transportation, one of Silicon Valley's commuter corridors—Interstate 680 over the Sunol Grade—recently topped the Bay Bridge as the region's worst daily commute. Five other corridors that feed into the Silicon Valley have made the "10 Worst Bay Area Commute Corridors" list. According to the Valley Transportation Authority, Silicon Valley commuters lose 34,000 hours each weekday in traffic moving below the speed limit.[33]

In response to this congestion, the Tasman West Light Rail Project was a regional effort involving four cities and the Santa Clara Valley Transportation Authority (VTA) in partnership with the Federal Transit Administration, the California Transportation Commission, the Joint Powers Board, and the Metropolitan Transportation Commission. The line extension was designed to give Silicon Valley employees an alternative to the area's clogged freeways and expressways.

The Project

In December 1999, the Tasman West Light Rail Project opened for service to the public, a year ahead of scheduled completion and on budget. The project is a 7.6-mile extension of the existing 21-mile light rail transit system that radiates from downtown San Jose. The existing light rail line served about 22,000 riders per weekday.

Running east-to-west across the northern part of the county, the new line links employment centers and residential areas in Mountain View, San Jose, Santa Clara, and Sunnyvale. Operated by the Santa Clara VTA, the extension serves 12 new stations within the four cities. Many of the stops are adjacent to major employers such as Cisco Systems, Inc., Lockheed Martin, NASA/Ames Research Center, and Rolm Siemens. The light rail also provides direct service to the Whisman area in Mountain View, where Netscape and other large businesses are located. The area is already densely developed, and major new road construction was not feasible.

In downtown Mountain View, a multimodal transit center with park-and-ride facilities provides connections between light rail, Santa Clara VTA buses and shuttles, and Caltrain, the heavy rail commuter train service between Gilroy and San Francisco. In addition to connecting the cities it serves, the transit center enables passengers to connect with Amtrak service to Sacramento, bike routes, and county expressways.

Light rail service in Santa Clara County runs 24 hours a day, 7 days a week. Each of the 50 vehicles in the light rail fleet is equipped with wheel-chair tie-downs and interior racks for bicycles, and every light rail station connects with VTA buses.

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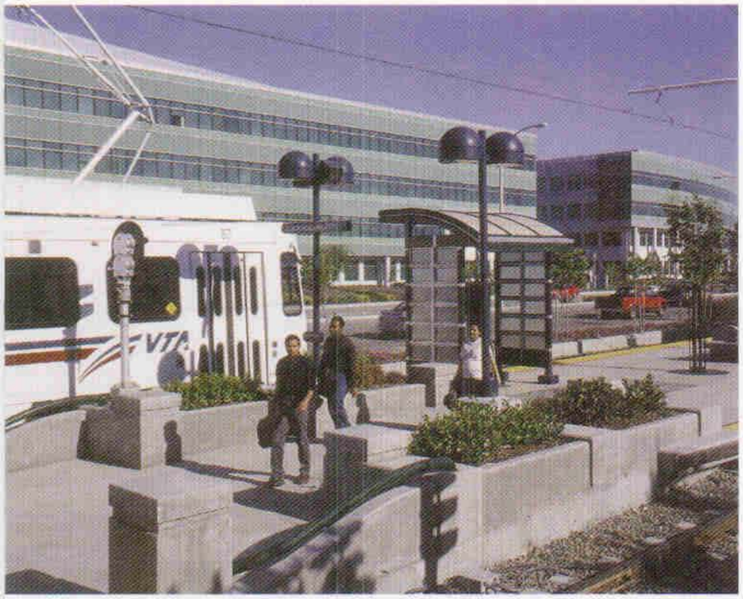
[33] Kennedy, Keith, Jr. "Toward Solving the Commute Challenge." *San Jose Mercury News*, February 15, 1998, page 4F.

Results and Status

Area residents and workers now have convenient access to public transportation to the various economic and residential areas of Santa Clara County. In fiscal year 2002, ridership along the Tasman Line (including both the Tasman West Project and Tasman East Phase I, which opened in May 2001) was 1.05 million, with a robust average weekday ridership of 4,570.

The line has also spurred transit-oriented development in a suburban area often characterized as sprawling. During the 3 years of construction of the light rail extension, more than 9 million square feet of office space and 4,500 housing units were built along the light rail extension corridor.[34] At the time of its opening, an estimated 62,000 jobs were located along the Tasman corridor within walking distance of the new stations, and this figure is expected to increase to 180,000 jobs within a decade. About 15,000 residents lived within walking distance of the stations at opening, and this figure is projected to double within only a few years, as an urban-style housing and office boom takes place.[35]

Many of the residents of these new developments moved closer to work to avoid the traffic congestion and take advantage of the light rail transit line. According to a former commuter on Highway 237, even though his commute by car was only 25 minutes, it was a painful ride. "I didn't like traveling 237 at 10 miles per hour . . . that was not pleasant."[36] He moved to a new home just steps from the light rail line, where he can hop on the trolley, read the paper, and relax on his way to work. Given the success of the light rail line, VTA plans future light rail line extensions that will take light rail into Milpitas, East San Jose, and Campbell.


VTA station on the Tasman Corridor line.

Estimated Emissions Benefits

84 kg/day VOC, 192 kg/day NOx,
55 kg/day PM10

Contact

Mike Arrow

Santa Clara Valley Transportation Authority
VTA Tasman Information Line
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[34] Gary Richards. "Growth Follows the Tracks: Housing, High-Tech Offices Spring Up Along New Light-Rail Line." *San Jose Mercury News*, December 16, 1999, page 1A.

[35] Ibid, page 1A.

[36] Ibid, page 1A.


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