A Synopsis of CMAQ Demonstration Projects


Working Paper 01-10

by

Timothy Jackson
Engineering Intern

Tom Murtha
Chief Transportation Planner

Chicago Area Transportation Study
300 West Adams Street
Chicago, Illinois 60606
(312)793-3456

May, 2001
TABLE OF CONTENTS

A. Summary of CMAQ Demonstration Program ........................................... 1

B. Demonstration Project Narratives:
   1. IDOT: Arterial Incident Management Study (FY 93) .................. 3
   2. ICTMA: Multi-Employer Telecommuting Center (FY 93) ....... 3
   3. TMA of Lake County: Travel Demand Management Site Design and Site Startup (FY 93) .................................. 4
   4. Chicago Department of the Environment: Van Pool Program (FY 93, 95) ......................................................... 4
   5. Village of Deerfield/Transportation Management Association of Lake Cook: Suburb-to-Suburb Commuter Demonstration Project (FY 93, 94, 97, 99) .......... 5
   6. Transportation Management Association of Lake County: IL 60 Corridor Shuttle Service (FY 93) ................................. 6
   7. Chicago Transit Authority: Natural Gas Bus Project (FY 93) .... 7
   8. Chicago Transit Authority / Chicago Area Transportation Study: High Occupancy Vehicle Priority Parking and Subsidy (FY 93) ................................................................. 7
 10. Chicago Area Transportation Study / Transportation Management Association of Lake Cook: Ecoline Rideshare Kiosk Project (FY 94) .................................................. 9
 11. Regional Transportation Authority: Station Car Demonstration (FY 94) ............................................................... 10
 12. Chicago Department of Planning and Development: Green Line Land Use Design (FY 94) ................................. 10
 14. Chicago Department of Transportation: Traffic Management Center (FY99, 00, 01) ............................................. 11
 15. DuPage Mayors and Managers Conference: Traffic Management Center (FY 00) ......................................................... 12
 16. Chicago Department of Transportation: ShareCarGo! Car Sharing Demonstration Project (FY 00, 01) ......................... 12
 17. Chicago Transit Authority: Ethanol Fuel Cell Bus Program (FY 00) ................................................................. 13

Bibliography .................................................................................................. 25

Acknowledgements.................................................................................. 27
Appendices

Appendix A. FY 2001 CMAQ Demonstration Project Submittal Forms.14
Appendix B. Calculation of Air Quality Impact of Carpool
  Promotion at Blue Line Cumberland and River Road
  Station Park and Ride Facilities.....................................................17
Appendix C. Air Quality Analysis of Green Line Transit Oriented
  Development Projects ....................................................................18
Appendix D. Revised Air Quality Analysis of Village of
  Deerfield/Transportation Management Association of
  Lake-Cook Suburb-to-Suburb Commuter
  Demonstration Project. ..................................................................20
Appendix E. Air Quality Analysis of Access Management Elements
  of NIPC’s Land Use Design and Non-Auto Promotion
  Demonstration Project. .................................................................21

List of Tables

Table B-1. Inputs to Carpool Promotion Analysis.................................17
Table C-1. Inputs for Dwelling Unit Air Quality Analysis ......................18
Table D-1. Revised Air Quality Analysis of Lake Cook Shuttle..............20
Table E-1. Summary of Sources of Delay/Speed Data for Access
  Management...................................................................................21
Table E-2. Illustrative Air Quality Analysis of Access Control on
  Multi-Lane Suburban and Rural Highways Tons of
  Hydrocarbon Emissions per Mile of Roadway, 2000-2019
  Using Highway Capacity Manual Data .........................................22
Table E-3. Illustrative Air Quality Analysis of Access Control on
  Two-, Three-, and Four-Lane Cross Sections: Tons of
  Hydrocarbon Emissions per Mile of Roadway, 2000-2019
  Using Hummer and Lewis Model (2000).......................................23

List of Figures

Figure 1. Lake Cook Corridor, Metra Station Area...............................5
A. Summary of Northeastern Illinois CMAQ Demonstration Program.

The Congestion Mitigation and Air Quality Improvement Program (CMAQ) is a federally-funded program of transportation-related improvements. The improvements are selected to improve air quality and relieve congested transportation systems. The program was first funded by the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). The program was primarily designed to provide financial relief to states forced to reduce vehicle (mobile source) emissions by the Clean Air Act Amendments of 1990. The program finances Transportation Control Measures (TCMs, as defined in the Clean Air Act), which curb mobile source emissions by improving the transportation system.

In northeastern Illinois, the Chicago Area Transportation Study (CATS) Policy Committee, the region’s metropolitan planning organization (MPO) for transportation planning, programs CMAQ funds. The CATS Policy Committee reviews and approves each year’s program of CMAQ projects. The CMAQ Project Selection Committee selects CMAQ projects from among proposals by a variety of government agencies as well as non-governmental agencies that secure a public sponsor. The CMAQ Project Selection Committee consists of representatives of the operators of the major transportation systems in the region, plus the Illinois Environmental Protection Agency. The Illinois Department of Transportation administers the program, while CATS staff provides support in project programming.

The ISTEA subcommittee of the CATS Policy Committee developed programming principals for programming CMAQ funds in 1992 and 1993. Among the principals developed was that each selected project was to have quantifiable emissions benefits. To this end, CATS has approved projects to determine the air quality benefits of innovative projects for which existing emissions reductions data is either scant or non-existent. Of the approximately $550 million in federal CMAQ funds programmed in northeastern Illinois from the inception of the program in 1992 through FY 2001, nearly $7.5 million (more than 1%) was programmed for these demonstration projects.

Demonstrations are an attempt to add to the body of knowledge regarding innovative projects. For CMAQ purposes, projects are classified as demonstration projects primarily to demonstrate emissions benefits where existing vehicle emission information is scant. Feasibility issues, inter-jurisdictional issues, and funding issues are secondary in categorizing a project as a demonstration. Innovative projects that have defensible emissions reductions estimates, but have outstanding feasibility or operational issues, are not considered demonstrations in the northeastern Illinois CMAQ program, but are typically classified in the “other” category.

---

1 The Illinois Department of Transportation, suburban municipal governments, county governments, the Regional Transportation Authority, and the City of Chicago.
2 The figure quoted is a gross figure. This figure net of withdrawn projects and projects expending less than the programmed amount is $6.648 million as of May, 2001. The funds made available from withdrawn and under-cost projects were reprogrammed for other CMAQ projects.
3 CMAQ projects are categorized into bike/ped projects, commuter parking projects, demonstration projects, other projects, signal interconnects, traffic flow improvements, and transit improvements.
Since CMAQ demonstration projects cannot be selected based on reductions in vehicle emissions, vehicle miles traveled or trips, they are assessed using other criteria. Specifically, they are considered if they are innovative (not yet being done in the region), have regional applications beyond the specific project, and have potential emissions benefits that can conceptually be measured. The submittal form for CMAQ projects is in Appendix A.

Among the initial impetuses for early CMAQ demonstrations was the requirement in the Clean Air Act Amendments of 1990 that employment sites with greater than 100 employees implement employee commute options programs. Many of the initial demonstrations were geared at determining what elements would be effective in employee commute options programs. When the employee commute options requirement was rescinded, the impetus for many of the demonstration projects was removed. Thus, the character of the demonstration projects submitted and the selection of projects by the CMAQ Project Selection Committee changed. The projects submitted and selected turned markedly away from the work commute trip as a sole focus. The focus became operations and technology issues.

An important feature of the CMAQ program in northeastern Illinois is the open process used to solicit and select projects. As a result of that process, a number of innovative projects were selected as demonstrations from agencies and participants that were not experienced in the federal-aid transportation project implementation process. Several of these demonstration projects were not successful. However, some risk of failure is inherent in any innovation. Project management by IDOT personnel and CATS staff usually caught failures before significant funds were expended. In some cases, staff worked with sponsors to make successes of projects that were facing difficulties. Even when the projects produced incomplete information, there was usually enough information presented to conduct a analysis of the project benefits. Thus, for successes, failures, and other projects, the programming of demonstration funds was successful at adding to the body of knowledge regarding innovative transportation projects in northeastern Illinois. The open process facilitated this innovation and success.

A note regarding air quality analyses used in the CMAQ Program in northeastern Illinois. Analyses of air quality impacts should be regarded as illustrative. The analyses allow a project to be compared to similar projects analyzed using similar methods and emissions input data. Thus, the cost effectiveness of on-going projects should not be compared using analyses conducted years apart. Likewise, the emissions benefits of highway projects should not be compared to transit projects, since the projects are analyzed using vastly different procedures making comparisons impossible. However, air quality analyses used in the CMAQ program give an indication of the relative scale and cost effectiveness of particular projects at a particular time.

All projects costs referenced in this paper (except in the appendices) are federal shares unless otherwise noted. Also, the information can be regarded as current as of Fall, 2000, though some updates were made in the final editing process.
B. Demonstration Project Narratives.

1. Illinois Department of Transportation: Arterial Incident Management Study (FY 93, TIP ID 13-90-0001).

Incidents (collisions, stalled vehicles, lost drivers, etc.) are a major cause of non-recurring congestion on arterials in the six county area. This problem is compounded by the wide array of jurisdictions that handle incidents. IDOT performed a management study with the hopes of developing a pilot program among involved agencies that would lead to the prompt removal of incidents from arterials, thus decreasing congestion. The Northwestern University Traffic Institute completed the study (Raub, 1996a and 1996b), funded with $206,297 in CMAQ funds. The focus of the report was methods for quickly removing incidents from arterials and minimizing incident impacts. The model for the arterial incident management program was the incident management program in place in metropolitan Chicago’s freeway system.

The report documented numerous arterial incidents within a study area along the Lake Cook Corridor in the northern part of the region. The authors estimated that better incident management could cut hydrocarbon emissions impacts of arterial incidents by half.

Implementation of the study results is now an issue being addressed on the corridor level. With federal transportation planning funds, the Cook County Highway Department, Northwestern University, and the Transportation Management Association of Lake-Cook are in the midst of a two-stage engineering study to develop an incident management system along Lake Cook Road from U.S. 14/Rand Rd. to US 41/Edens Expressway. The project involves twenty adjacent communities. The current focus of the project is using Intelligent Transportation Systems (ITS) technologies to monitor travel conditions and identify incidents. Information on incidents and travel times can be used to control and clear incidents, as well as for public information.

2. Illinois Corridor Transportation Management Association: Multi-Employer Telecommuting Center (FY 93, TIP ID 08-90-0036)

The CMAQ Project Selection Committee programmed $184,000 for a multi-employer telecommuting center. The Kane County Division of Transportation sponsored this project in a public-private partnership with the Illinois Corridor Transportation Management Association (ICTMA). The center would have allowed employers and employees from businesses and agencies throughout the region the opportunity to report to work at a common site accessible by public transit, thus reducing vehicle miles traveled, congestion, and emissions. The project would have eased implementation of the employee commute options mandate included in the Clean Air Act Amendments of 1990. Numerous administrative issues arose, resulting in a lack of support and the collapse of the project. No firm clients were secured for the telecommuting site. A total of $76,971
was expended on the project. A final report was issued for the project (Illinois Corridor Transportation Management Association, 1994).

3. Transportation Management Association of Lake County: Travel Demand Management Site Design and Site Startup (FY 93, TIP ID 10-90-0018)

This project, sponsored by the Village of Libertyville, was to apply travel demand reduction techniques to site design. Thus, new employment centers would be designed to be physically consistent with mass transit, ridesharing, and other transportation control measures. The project also would have designed marketing and incentive programs to recruit employees with a predisposition to travel demand reduction techniques. However, financial issues arose that precluded the Transportation Management Association of Lake County from moving forward with the project. Consequently, the TMA withdrew the project. CATS programmed $265,000 in federal funds for the project. No money was expended.

4. Chicago Department of the Environment: Van Pool Program (FY 93 and 95, TIP ID 01-94-0260)

This project was designed to decrease vehicle miles traveled, congestion and emissions by encouraging the formation of new vanpool groups and utilizing the resources of existing and new private vanpool service providers. The Chicago Department of the Environment administered the project, contracting with VPSI. Subsidies were to be made available to major employers within the city of Chicago impacted by the employee commute options requirements of the Clean Air Act Amendments and to Chicago residents who commute to employment sites in outlying areas. CATS programmed $84,825 in FY 93 and $233,100 in FY 95. Performance reports from the Chicago DOE indicated disappointing results for this vanpool project. CATS staff analyses showed a poor rate of diversion from SOVs and a high rate of diversion from transit. CATS staff analyses also showed that many of the “new” vanpools formed for the project were reconstituted old vanpools. No final report has been submitted to CATS staff, nor is one expected. As of October, 2000, all funds programmed for the project had been expended.
5. Village of Deerfield / Transportation Management Association of Lake Cook: Suburb-to-Suburb Commuter Demonstration Project (FY 93, 94, 97, 99, TIP ID 10-94-0128)

This project investigated, developed, implemented, and marketed a shuttle service serving city-to-suburb and suburb-to-suburb commutes to a suburban employment center along Lake Cook Road (depicted in Figure 1). Approximately 30,000 employees work in the six-mile-long corridor. A new commuter rail train station and parking facility, funded with $2,388,000 in CMAQ funds, was opened at Lake Cook Road in 1994. By providing shuttle service from the new train station, the project facilitated commuting by transit to the corridor, thus reducing vehicle miles traveled and automobile emissions. In addition, sidewalks were constructed in the vicinity of the new commuter rail train station to facilitate walking access trips from transit to employment sites. Since its inception, the "Shuttle Bug" program has transitioned from vans to buses and grown into a successful operation that continues to provide a viable means of transportation for commuters. Demand for the shuttle service grew steadily over the demonstration grant life from 110 trips per day in March, 1996 to over 500 trips per day in late 1998 and continued to grow after the project proceeded to a normal, non-demonstration operating phase. As of early 2001, as the service approached its fifth anniversary, ridership is more than 800 daily trips (TMA of Lake Cook, 2001). Demand grew sufficiently to necessitate the implementation of an additional suburb-to-city late afternoon Metra train run in 1997 (funded with $541,600 in FY 97 CMAQ funds). The most recent surveys of users indicated that prior to the shuttle service, 57% of users drove alone to their work site (Baltutis and Fish,

Figure 1.
Lake Cook Corridor, Metra Station Area
1998, survey results, question 5). Also noted was the fact that the market for such a shuttle service was for passengers boarding at stations at least ten miles from the shuttle site (ibid., p. 9).

While the project has been successful at attracting riders, the preliminary estimate of the cost effectiveness of the project indicates that, for 2000, the $/ton of VOCs eliminated totaled about $200,000 (see Appendix D, p. 20). This figure is somewhat more expensive than alternative transit operating improvements.

The Transportation Management Association (TMA) of Lake Cook spearheaded the project under Village of Deerfield sponsorship. Members of the TMA, consisting of many of the large employers in the corridor, provided the local match for the project. The TMA diligently participated in the feasibility study, demonstration, and the conversion to an on-going service. TMA members currently contribute one third of the operating cost of the shuttle, making the project a model public-private partnership (TMA of Lake Cook, 2001). Another interesting aspect of the project was the recruitment of an entrepreneurial firm to provide the shuttle service when none of the established paratransit operators in the region could provide service to meet the project budget. The project won national praise in a USEPA document (USEPA, 1999).

A feasibility study was produced with FY 93 money (Barton-Aschman Associates, 1994); subsequent demonstration funds were used to implement, operate, and market the project. Federal program amounts expended for the feasibility study, sidewalks, and operations demonstration totaled $1,093,396. In addition, $312,000 was programmed and expended for the third year of operations after the demonstration phase was complete.

The Lake Cook Shuttle Bug demonstration project was particularly successful in providing a model for other Metra station shuttles. Similar shuttles are in operation or are planned and funded for Lake Forest, Lincolnshire, Glenview, and Hoffman Estates (TMA of Lake Cook, 2001).

6. Transportation Management Association of Lake County: IL 60 Corridor Shuttle Service (FY 93, TIP ID 10-90-0019)

In 1993, the TMA of Central Lake County\(^4\) proposed a work program to plan and provide reverse feeder service from rail transit stations to work sites in the IL 60 corridor. Funding from the CMAQ Program was secured for a feasibility study of this project. The feasibility study showed a limited market (TMA of Lake County, 1994). There were simply not enough participating employers along the corridor to justify implementation of the project. The number of employees in the corridor was small at the time. Additionally, lack of participation was partially caused by the perceived relation of the project to the unpopular employee commute options mandate. However, the feasibility report noted several alternative lower cost shuttle options, which focused on employer

\(^4\) The Transportation Management Association of Lake County was the successor agency to the Transportation Management Association of Central Lake County.
programs and Pace vanpool services, which offers an employee shuttle option. $31,841 in federal funds were expended on the study.

In FY 1997, a rideshare encouragement project that made use of the IL 60 corridor study, called the Platinum Program, received CMAQ funding. However, the TMA soon thereafter disbanded, and the project was subsequently withdrawn without expending CMAQ funds. However, shuttle service to the Lake Forest/Conway Park area in the Route 60 corridor began on March 19, 2001 from the Union Pacific North Line, which provides good city-to-suburb headways and also serves densely populated neighborhoods in the City of Chicago and in north shore suburbs (TMA of Lake Cook, 2001).

7. Chicago Transit Authority: Natural Gas Bus Project (FY 93, TIP ID 16-90-0004).

The Chicago Transit Authority (CTA) submitted a proposal to develop specifications for natural gas buses and to design natural gas fueling facilities and appurtenant facilities. $651,200 was programmed for this engineering. An additional $8,860,000 was seen as necessary for facility construction and the purchase of 25 natural gas buses, but was not programmed.

The CTA used part of the programmed funds for a feasibility study of all alternative fuels compared with clean diesel technology. The final report (Chicago Transit Authority, 1994) recommended a two-pronged approach. First, because of rapidly developing technologies, the CTA should continue to use clean diesel technology as long as emission standards are met and no alternatives are mandated. Natural gas buses were not recommended as cost-effective at that time. Secondly, the report recommended continued study of alternative fuel buses and participation in the testing and development of promising technologies.

In implementation of the study, the CTA has remained focused on diesel technology. In addition, the CTA participated in the development and testing of hydrogen fuel cell buses using the remainder of the funds programmed for this project and an additional sum of $4,600,000 of FY 96 and FY 97 CMAQ funds. Lastly, the CTA is participating in a demonstration of using ethanol reformers to power fuel cell buses. $80,000 in CMAQ funds have been programmed for this latest initiative. (See the project narrative for project 17 below, p. 13).

8. Chicago Transit Authority (CTA) /Chicago Area Transportation Study (CATS): High Occupancy Vehicle (HOV) Priority Parking and Subsidy (FY 93, 16-90-0005)

In May of 1992, the Chicago Department of Transportation completed the expansion of the CTA parking garage at the Cumberland Avenue rapid transit station. Part of the first floor of the garage was set aside for HOV priority parking. Data gathered during 1992 and 1993 revealed an under-utilization of the HOV priority parking (only 20% of HOV spaces were actually occupied by HOVs), representing a lost opportunity to reduce
congestion, vehicle miles traveled and emissions. Factors contributing to this under-
utilization included poor access control to the HOV parking spaces, failure to enforce the
HOV-only parking rules and a lack of incentive for HOV parking. The efficient
utilization of the facility was especially important at the time, which was coincident with
the massive reconstruction of the adjacent Kennedy Expressway and the resulting
increased transit use.

Along with CATS, the CTA devised a four component demonstration project to rectify
the utilization problems. This project improved access control and rule enforcement,
marketed and provided incentives for HOV parking. The promotion was also extended to
the nearby River Road CTA rapid transit station in Rosemont late in the demonstration.
The preferential treatment of HOV vehicles accounted for an increase in carpooling as an
access mode of up to 50% at the time of the promotion (CTA, 1995). Highly visible
“monster” two-story promotional balloon guide signs also had a positive impact on the
use of the parking facility by car-poolers and single-occupant vehicles as well (CTA,
1996).

A 1997 CATS follow-up survey indicated some lasting effects, for carpool use was
However, carpools lost much of the gain after the promotions were ended. Carpools rose
from 23 vehicles prior to the promotion to a peak of 100 vehicles during the 1994
promotion, falling to 57 vehicles by 1997. In FY 1999 and 2000, the CTA received
additional CMAQ grants totaling $200,000 for parking promotion system-wide. The
initial FY 1993 demonstration project was programmed for $160,000. Expenditures
totalled $160,293.

Promotion (FY 94, TIP ID 13-94-0021)

This project produced a model overlay zoning ordinance that was designed to improve air
quality through various land use regulations, including promotion of alternatives to
automobiles and improved traffic flow. These regulations were packaged in such a way
to promote them to both municipal offices and the private development sector.
Furthermore, like most zoning ordinances, the provisions of the ordinance were designed
to be severable, so communities could adopt provisions of the ordinance as they applied
to their local conditions, while dropping other provisions. The advantage of the
ordinance is its organization as an overlay district, providing provisions affecting
development without affecting the underlying zoning of the land, while also focusing the
geographic area affected by the zoning. Provisions of the ordinance include access
control along arterial streets, transit access, bicycle/pedestrian access, mixed use
development, parking management, and design features such as setbacks, lot widths,
architectural façades, and landscaping.

Although the CTA did not perform a quantitative air quality analysis as part of the report, the information
collected is sufficient to do so, using standard assumptions in the CMAQ project evaluation process. Staff
estimates the dollars per ton of VOC eliminated by the project at $194,174. See Appendix B, p. 17
The Northeastern Illinois Planning Commission (NIPC) worked closely with the city of Woodstock and the village of Vernon Hills in the development of the ordinance provisions. Provisions of the model overlay zoning ordinance were adopted in Woodstock in 1996. Vernon Hills chose not to use the overlay zoning ordinance, but incorporated many of its provisions into a planned unit development agreement for the subject site. The focus of Vernon Hills was on traditional neighborhood design, while the focus of Woodstock was to create an ordinance to put into place recommendations of the city’s Route 47 Corridor Study and IDOT’s Strategic Regional Arterial Study for Route 47.

The Vernon Hills project resulted in CMAQ project initiatives. The original focus of the ordinance was on the Cuneo estate along Illinois Route 21. A CMAQ grant was awarded in FY 1995 for the development of pedestrian amenities for the project, known as Town Center Boulevard (Vernon Hills, 1994). However, the project was not developed. The overlay ordinance development and the CMAQ grant were refocused on the Ranney Addition adjacent to US 45 and Prairie Road, known early as Village Commons (Vernon Hills, 1996). This development was also delayed, and CMAQ funding was withdrawn in late 1997. However, the neo-traditional transit-oriented development is now being completed and is referred to as “Centennial Crossing.” This development has been successful, with homes priced in the $400,000 range. An FY 2001 CMAQ intersection improvement was programmed at US 45 and Prairie Road which, as a secondary effect, will provide access to the new development subject to the early CMAQ demonstration.

Other communities that worked with NIPC in the process included Naperville, Aurora, Lockport, and Harvey. The model overlay zoning ordinance is still being distributed by NIPC staff as part of its Access Management Handbook (Northeastern Illinois Planning Commission, 1998).

Information provided was not sufficient to conduct an air quality analysis of such developments as Centennial Crossing. An analysis of long-term development activities was not feasible within the short life of the project. Work trip patterns cannot be analyzed until 2000 census figures are released, when build-out has been completed. Information was also not sufficient for analyzing access management from an air quality perspective. However, an air quality analysis using information gleaned from several other sources is presented in Appendix E (page 21).

Programming and expenditures for the ordinance development project totaled $80,000.

10. Chicago Area Transportation Study / Transportation Management Association of Lake Cook: Ecoline Rideshare Kiosk Project (FY 94, TIP ID 10-94-0127)

The purpose of this project was to develop and deploy a system of kiosks to enable rideshare matching at employer sites in the Lake Cook corridor. The goal was to reduce vehicle trips and improve air quality by easing the rideshare match procedure and making
matches more likely by encouraging ridesharing among a large population at a particular employment site. The project was to involve software development, purchasing of hardware and kiosks, training of employee coordinators and a marketing/promotion program directed at corridor based employer cluster groups in northern Cook County and southern Lake County. Difficulties arose with the original vendor, so the project was not deployed with CMAQ funds. Of the original $112,000 programmed for the project, $67,000 was expended. The kiosk project is being implemented with IDOT funds at two Lake Cook corridor employers as the “Caravan” project. The kiosks are expected to be operating in 2001. No report is available to date regarding the project.

11. Regional Transportation Authority: Station Car Demonstration (FY 94, TIP ID 13-94-0022)

The purpose of this project was to evaluate the ability of station cars to serve as a employment-destination complement to regional transit service for city-to-suburb and suburb-to-suburb commutes. The project was also designed to determine station cars’ effectiveness in meeting regional employee commute options regulations. In FY 94, the RTA applied for $440,000 in CMAQ funding. During the preparations for project implementation, it was determined that federal regulations required that the station cars must be accessible to the disabled, making the project much more costly than anticipated. The RTA decided that they could no longer justify staff and financial support for this project, and subsequently withdrew the project. No CMAQ funds were expended on the project. No follow-up project is expected.

12. Chicago Department of Planning and Development: Green Line Land Use Design (FY 94, TIP ID 01-94-0236)

The goal of this project was to demonstrate through feasibility studies, designs and implementation strategies how transit-oriented development for transit stations would result in increased public transit ridership and reduced automobile use. This project produced land use plans for four locations along Chicago’s Green Line, identifying projects to complement existing land uses and bring new activities to stations along the Green Line with varying strengths and weaknesses in the existing land-use mix. These plans demonstrated how the developments would coordinate bicycle, pedestrian, automobile and public transit use within the context of the immediate area surrounding each station. The project was designed to be coincident with the nearly $400,000,000 Green Line rehabilitation project.

Four station locations were analyzed in detail. The project analyzed the potential emission reductions for residential trip generation. This information is analyzed for cost effectiveness (with revised trip generation and emissions factors) in Appendix C (p. 18). The analysis shows that transit oriented development is an expensive means toward vehicle emissions reductions.
While no developments have yet been constructed as a result of this project, the demonstration project was under way in the midst of an effort to redevelop the 63rd/Halsted station area, reconfiguring traffic in the area to complement pedestrian-oriented developments and eliminate the traffic bypass of the commercial district. The effort also involves the relocation of the Kennedy-King College to the station area. Highway improvements are expected to begin in FY 2003 (Chicago Area Transportation Study 2000, TIP ID 01-98-0069).

CMAQ programming and expenditures for the demonstration project totaled $260,000.


The vision of the DuPage Multi-Jurisdictional Signal Coordination Prototype project is to combine the resources of participating agencies across the county to plan, design, implement, operate, maintain and monitor a coordinated traffic signal system to facilitate traffic movement in DuPage County. The project scope includes preparing plans, specifications and cost estimates for the installation of hardware and the formulation of timing plans to link two independently developed closed loop signal systems operated by separate agencies.

Two arterial corridors are being improved as part of the demonstration. First, Saint Charles Road is an arterial with signal systems controlled by several municipalities and IDOT. Second, 75th Street has signals controlled by the City of Naperville and DuPage County. The system intersects with Illinois 83, a high-volume arterial whose signal system takes priority over the intersecting arterial roadways. A multi-jurisdictional advisory committee is addressing the institutional, technical and policy issues. In FY1999, CMAQ awarded the DuPage Mayors and Managers Conference $225,280 worth of funding. The engineering contract has been awarded, and a kickoff took place in the Fall of 2000.

While institutional considerations loom large in the project, a bigger issue from the CMAQ perspective is the issue of the project benefits. Specifically, will multi-jurisdictional cooperation reduce delay on arterial roadways, or would each jurisdiction’s best signal plan provide a good substitute for a unified system? How are the relative benefits of multi-jurisdictional projects to be calculated? The CMAQ program staff is seeking to answer these questions through this demonstration project.

14. Chicago Department of Transportation: Traffic Management Center (FY 99, 00, 01, TIP ID 01-99-0014)

The Traffic Management Center (TMC) will integrate the operations of the various city agencies currently involved with traffic control into one building and an institutional framework will be developed, allowing traffic data and information to be collected, then
shared with both regional agencies and the travelling public. During the preliminary engineering and design phase, the optimum location for the TMC will be determined and an institutional framework for traffic control will be outlined. In addition, evaluation methodologies will be established. During the construction phase, the means for traffic control will be established. The TMC will be integrated into the regional intelligent transportation systems (ITS) architecture.

Documented benefits from other cities with TMCs (Atlanta, Houston, Seattle, Milwaukee and Minneapolis) include reduced travel times, increased average speeds, enhanced highway capacity and reduced emissions. Chicago’s system will be unique insofar as it will be focused on an arterial system in a very dense urban environment. A total of $2.8 million has been programmed for the project as of May, 2001. Total programming is expected to exceed $6 million. $1,244,800 has been obligated to date.

15. DuPage Mayors and Managers Conference: Traffic Management Center (FY 00, TIP ID 08-99-0105)

The DuPage TMC will enable the countywide coordination and integration of traffic communication systems. The primary function of the DuPage center will be to combine the resources of participating agencies to plan, design, implement, operate, maintain and monitor existing and future coordinated traffic signal systems in DuPage County. The TMC will also provide a multi-modal traveler information center, incident and emergency management programs, traffic flow and congestion monitoring systems and electronic toll and fare collections systems. The TMC will be integrated into the regional intelligent transportation systems (ITS) architecture.

Expected benefits include reduced travel times, increased average speeds, reduced emissions and increased traveler safety. $200,000 has been programmed for the project. No funds have been obligated. As of Fall 2000, the request for proposals is being developed. Institutional issues are also being addressed now.

16. Chicago Department of Transportation/Center for Neighborhood Technology: ShareCarGo! Car Sharing Demonstration Project (FY 00, 01, TIP ID 01-00-0039)

Car sharing is a transportation alternative in some regions and countries. The Center for Neighborhood Technology, with Chicago Department of Transportation sponsorship, plans to conduct a two-year pilot program with hopes of becoming the first major metropolitan area in the Midwest to offer car sharing to its population. Car sharing is a pay-per-use system similar to other vehicle rental operations, and its intent is to reduce dependency on automobile use by providing access to an auto for those who use transit on most occasions but wish to use an auto on a few occasions each month. Car sharing is designed to reduce car ownership, thus reducing vehicle miles traveled, congestion and emissions. Effects of car sharing on trip generation and mode split will be studied. Reporting on the results of Chicago’s car sharing project will provide information for
future facilities in the region and around the country. $250,000 was programmed for the project in FY 2000. An additional $192,000 has been approved in FY 2001 funding.

17. Chicago Transit Authority: Ethanol Fuel Cell Bus Program (FY 00, TIP ID 16-95-0039)

The goal of this project is to demonstrate the feasibility and benefits of using an ethanol reformer to power fuel cell bus technology. While the project originally foresaw adding reformers to three existing fuel cell buses, that approach was not cost effective. Rather, the CTA has opted to participate in a project with the Illinois Institute of Technology (IIT) to develop the technology. The IIT project is anticipated to be national in scope. This program will demonstrate the practicality, environmental benefits, energy security benefits and the commercial potential of this domestically produced and renewable fuel. Preliminary discussions with IIT have taken place. $80,000 in CMAQ funds were programmed and obligated for this project.
Appendix A

FY 2001 Demonstration Project
Submittal Form
## CATS FY 2001 CMAQ PROJECT SUBMITTAL FORM
### FOR DEMONSTRATION PROJECTS

### I. PROJECT IDENTIFICATION

<table>
<thead>
<tr>
<th>DATE OF SUBMITTAL</th>
<th>SPONSOR’S PROJECT IDENTIFICATION CODE AND/OR NAME</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>PROJECT SPONSOR</th>
<th>CONTACT FOR THIS PROJECT (NAME, ADDRESS, PHONE, FAX)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>OTHER AGENCIES PARTICIPATING IN PROJECT</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>TIP PROJECT ID, IF PROJECT IS ALREADY IN FY 00-04 TIP</th>
</tr>
</thead>
</table>

### II. PROJECT LOCATION

<table>
<thead>
<tr>
<th>NAME OF STREET OR FACILITY TO BE IMPROVED</th>
<th>MARKED ROUTE #</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>PROJECT LIMITS: 1ST REFERENCE POINT/CROSS STREET/INTERSECTION</th>
<th>MARKED ROUTE #</th>
<th>COUNTY &amp; MUNICIPALITY</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>PROJECT LIMITS: 2ND REFERENCE POINT/CROSS STREET/INTERSECTION</th>
<th>MARKED ROUTE #</th>
<th>COUNTY &amp; MUNICIPALITY</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>OTHER PROJECT LOCATION INFORMATION</th>
</tr>
</thead>
</table>

### III. ANTICIPATED FINANCING

**SEE LISTS.**

<table>
<thead>
<tr>
<th>FUND SOURCE</th>
<th>PHASES (✓ ALL THAT APPLY)</th>
<th>FEDERAL FISCAL YR (✓ ONE)</th>
<th>TOTAL COST (THOUSANDS)</th>
<th>FEDERAL COST (THOUSANDS)</th>
<th>FUNDING STATUS (✓ ONE)</th>
</tr>
</thead>
</table>

| CMAQ         | ✓ MIS/AA ✓ ENG            | ✓ ENG-1 ✓ ENG-2          | ✓ ROW ✓ CONST ✓ IMPLEMENTATION | [Blank] | [Blank] | [Blank] |

| ✓ MIS/AA ✓ ENG | ✓ ENG-1 ✓ ENG-2 | ✓ ROW ✓ CONST ✓ IMPLEMENTATION | 00 | 01 | [Blank] | [Blank] | [Blank] |

| ✓ MIS/AA ✓ ENG | ✓ ENG-1 ✓ ENG-2 | ✓ ROW ✓ CONST ✓ IMPLEMENTATION | [Blank] | [Blank] | [Blank] | [Blank] | [Blank] |

| ✓ MIS/AA ✓ ENG | ✓ ENG-1 ✓ ENG-2 | ✓ ROW ✓ CONST ✓ IMPLEMENTATION | 00 | 01 | [Blank] | [Blank] | [Blank] |

| ✓ MIS/AA ✓ ENG | ✓ ENG-1 ✓ ENG-2 | ✓ ROW ✓ CONST ✓ IMPLEMENTATION | 00 | 01 | [Blank] | [Blank] | [Blank] |

### IV. PROJECT DESCRIPTION AND MAP -- DEMONSTRATION PROJECTS ONLY.

1. PROJECT PURPOSE (WHAT WILL BE LEARNED FROM THIS PROJECT?)

---

[Blank lines for additional notes or descriptions.]
<table>
<thead>
<tr>
<th>2. WHAT ARE THE REGIONAL APPLICATIONS OF THIS PROJECT?</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>3. DESCRIBE ANY OTHER DEMONSTRATION PROJECTS, EITHER UNDERWAY OR COMPLETED, WITH WHICH THIS PROJECT IS RELATED.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>4. WHAT FURTHER PROJECTS DO YOU ANTICIPATE RESULTING FROM THIS PROJECT?</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>5. PROJECT LOCATION. PLEASE ATTACH A MAP ON ADDITIONAL SHEET. INFORMATION MUST BE SUFFICIENT TO ACCURATELY LOCATE THE PROJECT ON A LOCAL STREET MAP.</th>
</tr>
</thead>
</table>
Appendix B
Calculation of Air Quality Impact of Carpool Promotion at Blue Line Cumberland and River Road Station Park and Ride Facilities.

a. VOC reductions are calculated using the following table:

<table>
<thead>
<tr>
<th>Year (i)</th>
<th>Increase in Carpools (a)</th>
<th>Grams per Mile of VOCs Eliminated at 20 mph. 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>77</td>
<td>1.381</td>
</tr>
<tr>
<td>2001</td>
<td>63</td>
<td>1.249</td>
</tr>
<tr>
<td>2002</td>
<td>49</td>
<td>1.186</td>
</tr>
<tr>
<td>2003</td>
<td>35</td>
<td>1.122</td>
</tr>
<tr>
<td>2004</td>
<td>21</td>
<td>1.061</td>
</tr>
</tbody>
</table>

VOC reductions can be estimated conservatively using the following formula:

\[
\sum_{i=2000}^{2004} a_i b_i (255)(10)(1.2) / 907184.6
\]

where

- \(a_i\) = carpools in year i (see Brooks 1997, p. 5)
- \(b_i\) = grams per mile at 20 miles per hour in year i
- 255 = days per year, assumed to be 255 by CMAQ Project Selection Committee
- 10 = miles per day per person, equivalent to two access trips (CTA 1995, p. 19)
- 1.2 = carpool excess occupancy
- 907184.6 = grams per ton.

This formula yields a reduction of 1.03 tons over the 5-year effective life of the project. Using the total project cost of $200,000.00, the dollars per ton of VOCs eliminated is $194,174.

This calculation assumes that only the access trip VMT is saved, rather than the entire line haul trip VMT. In addition, it assumes a straight-line reduction in the number of carpools using the facility as a result of the promotion.

---

6 USEPA MOBILE5b fleet emissions model, all vehicles, as used in FY 2001 CMAQ project analysis.
Appendix C
Air Quality Analysis of Green Line Transit Oriented Development Projects

The report prepared for the CMAQ Green Line Station Land Use Demonstration project identified potential developments, their costs, and, in the case of residential developments, an air quality analysis of the developments (Camiros Ltd, 1998, Appendix).

This analysis improves the Camiros residential air quality analysis, using accurate emission rates and putting the benefits in terms of the project costs\(^7\). Developments analyzed are limited to those for which development costs were reported.

Dwelling unit analysis inputs are shown in Table C-1.

<table>
<thead>
<tr>
<th>Input</th>
<th>Central-Lake</th>
<th>Ashland-Lake</th>
<th>47th-Prairie</th>
<th>63rd-Halsted</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dwellings</td>
<td>20</td>
<td>0</td>
<td>126</td>
<td>390</td>
<td>536</td>
</tr>
<tr>
<td>Total Cost</td>
<td>$2,730,000</td>
<td>0</td>
<td>$11,439,000</td>
<td>$30,615,000</td>
<td>$44,784,000</td>
</tr>
<tr>
<td>Cost Not Supportable by Mortgage(^8)</td>
<td>$1,312,000</td>
<td>0</td>
<td>7,095,600</td>
<td>$19,716,000</td>
<td>$28,123,600</td>
</tr>
<tr>
<td>Trip Generation(^9)</td>
<td>138</td>
<td>0</td>
<td>797</td>
<td>2,360</td>
<td>3,295</td>
</tr>
</tbody>
</table>

The following analysis shows the emissions analysis for the mode split benefit of locating the dwelling units in a transit-rich environment. For this purpose, non-CBD city of Chicago household travel survey data was compared to household travel survey data for the remainder of Cook County. Thus, the suburban auto trips would have had an 84.7% share, or 2791 trips per day (Chicago Area Transportation Study 1993a p. 45). City auto trip shares would total 55.7%, or 1,835 trips per day (Chicago Area Transportation Study 1993b p. 50), a difference of 956.\(^{10}\)

---

\(^7\) Camiros used 9 grams per mile as the emissions rate, which is far too high (see Table B-1 in appendix B). In addition, there is some inconsistency between the air quality analysis and the development feasibility analyses for key projects in the station area. Because cost data is available only in the development feasibility analyses, those numbers were used as input to this analysis, rather than data provided in the report’s appendix. See Camiros, pp. 42, 91, and 116.

\(^8\) The projected rents in the station areas are not sufficient to cover the project costs. Equity (assuming developers speculating on future values of the property) or a public subsidy would be required to cover the difference between the total cost and the supportable mortgage. This cost is over and above a land write-down already assumed in some station analyses.

\(^9\) Per ITE, 1987 Trip Generation p. 294, trip generation for an apartment building can be estimated by the equation Trip ends = 5.92 X Dwelling units + 51. Note that the appropriate analysis is based on known information (apartment dwellings) rather than household characteristics, since the household characteristics are unknown.

\(^{10}\) As the city of Chicago auto mode split is on the low end of a range of estimates, this analysis is generous toward TOD. This mode split is used for this analysis because it is the only one known to the authors that is calculated for all trips, rather than motorized trips or work trips.
Using a mean suburban trip distance of 5.43 miles, the annual VMT saved by locating the 536 dwelling units in the city would be $5.43 \times 956 = 5191$ per day. Multiplying by 355 days yields an annual 1,842,805 VMT reduction. Summing the products of the annual VMT reduction and the yearly emission factor from MOBILE5b for the years 2001 through 2020, a total of 31.69 tons of VOCs would be saved over the twenty-year life of the project.

Thus, plugging in project costs from the “Total” column of Table C-1, the potential subsidy per ton of VOCs eliminated would be approximately $887,000. The total cost of the developments would be approximately $1,413,000 per ton of VOCs eliminated.

This calculation is illustrative only. Arguments can be made about using higher or lower factors (e.g., the mode split figures used were not factored by household characteristics and are for weekdays only). In addition, the subsidies shown by the report to be necessary are high because of market conditions; lower required subsidies would yield somewhat lower public costs for emissions benefits. However, the bottom line is that the calculation shows that transit-oriented development can be an expensive way to achieve vehicle emissions reductions.11

---

11 The calculation does not consider any other possible benefits of transit oriented development, which may or may not be substantial.
Appendix D
Revised Air Quality Analysis of Village of Deerfield/Lake Cook TMA Suburb-to-Suburb
Commuter Demonstration Project

The air quality analysis of the Lake Cook commuter shuttle demonstration project was conducted in 1998 using 1997 data and contemporary costs. The dollars per ton of VOCs eliminated was approximately $200,000. However, cost and ridership have both increased over time. To determine how the increased maturity of the service affected the cost effectiveness of the project, the air quality analysis was recalculated using current information. The analysis shows that the increased ridership benefits were offset by increased program costs. The calculation follows.

Table D-1
Revised Air Quality Analysis of Lake Cook Shuttle

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Ridership (Daily Trips, One-way) (from Baltutis and Fish, 1998 and TMA of Lake Cook, 2001)</td>
<td>385</td>
<td>800</td>
</tr>
<tr>
<td>B</td>
<td>Diversion Rate from Automobiles (from Baltutis and Fish, 1998)</td>
<td>57.1%</td>
<td>57.1%</td>
</tr>
<tr>
<td>C</td>
<td>Diverted Trips per Day, One-way (= A * B)</td>
<td>220</td>
<td>457</td>
</tr>
<tr>
<td>D</td>
<td>Line Haul Trip Length, One-way, miles (derived from Baltutis and Fish, 1998)</td>
<td>15.5</td>
<td>15.5</td>
</tr>
<tr>
<td>E</td>
<td>Days per Year (CMAQ Methodology)</td>
<td>260</td>
<td>260</td>
</tr>
<tr>
<td>F</td>
<td>VMT Eliminated per Year (= C * D * E)</td>
<td>886,600</td>
<td>1,841,710</td>
</tr>
<tr>
<td>G</td>
<td>Emissions of Grams per Mile of VOCs per Vehicle Mile Traveled at 20 mph for 2000 (USEPA MOBILE5a (1997) and 5b (2001) fleet emissions model, all vehicles, as used in CMAQ project analysis)</td>
<td>1.416</td>
<td>1.334</td>
</tr>
<tr>
<td>H</td>
<td>Grams per Ton</td>
<td>907,184.6</td>
<td>907,184.6</td>
</tr>
<tr>
<td>I</td>
<td>Tons of VOCs Eliminated per Year [(F * G) / H]</td>
<td>1.384</td>
<td>2.708</td>
</tr>
<tr>
<td>J</td>
<td>Annual Cost (from Baltutis and Fish, 1998, p. 1, and TMA of Lake Cook, 2001).</td>
<td>$340,000</td>
<td>$545,000</td>
</tr>
<tr>
<td>K</td>
<td>Dollars per Ton of VOCs Eliminated (2000)</td>
<td>$245,664</td>
<td>$201,255</td>
</tr>
</tbody>
</table>

Note: Using the 1996 MOBILE5a emission rate of 2.096 grams per mile, the dollars per ton of VOCs eliminated was $165,979. The calculation of the diverted trips per day and annual costs are somewhat different than that done by Baltutis and Fish (1998, p. 15), but the results are similar.
Appendix E
Air Quality Analysis of Access Management Elements of NIPC’s Land Use Design and Non-Auto Promotion Demonstration Project

No quantitative analysis of the air quality impacts of access management techniques was performed as part of NIPC’s Land Use Design and Non-Auto Promotion Demonstration Project. However, a rudimentary analysis of access management techniques is possible.

NIPC’s *Access Management Handbook* sets out some basic principles and techniques of access management (pp. I-3 – I-6):

- “Establish an access classification system,
- Limit conflict points,
- Separate conflict points,
- Separate turning volumes from through movements,
- Locate traffic signals to facilitate traffic movement,
- Limit direct access on higher speed roads
- Incorporate access management into subdivision and land use regulations
- Use public transportation friendly design.”

Medians, shared driveways, and frontage roads are some of the design treatments for access management.

These techniques and design treatments result in reduced delay and increased speed. Estimates of impacts of different levels of access are summarized below:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Multi-lane rural and suburban highways, with signal spacing &gt;= 2 miles</td>
<td>Two, three, and four lane cross sections not within 500 feet of a signalized intersection</td>
</tr>
<tr>
<td>Limitation</td>
<td>Wide signal spacing assumption limits applicability in northeastern Illinois. Free-flow speeds.</td>
<td>Data collected in North Carolina only.</td>
</tr>
<tr>
<td>Analysis Table</td>
<td>E-2</td>
<td>E-3</td>
</tr>
</tbody>
</table>
Table E-2
Illustrative Air Quality Analysis of Access Control on Multi-Lane Suburban and Rural Highways
Tons of Hydrocarbon Emissions per Mile of Roadway, 2000-2019
Using Highway Capacity Manual Data

<table>
<thead>
<tr>
<th>Access Points per Mile</th>
<th>Median or TWLTL</th>
<th>Speed</th>
<th>ADT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>10,000</td>
</tr>
<tr>
<td>0</td>
<td>Yes</td>
<td>40.0</td>
<td>41.53</td>
</tr>
<tr>
<td>0</td>
<td>No</td>
<td>38.4</td>
<td>42.91</td>
</tr>
<tr>
<td>10</td>
<td>Yes</td>
<td>37.5</td>
<td>43.66</td>
</tr>
<tr>
<td>10</td>
<td>No</td>
<td>35.9</td>
<td>45.26</td>
</tr>
<tr>
<td>20</td>
<td>Yes</td>
<td>35.0</td>
<td>45.26</td>
</tr>
<tr>
<td>20</td>
<td>No</td>
<td>33.4</td>
<td>47.05</td>
</tr>
<tr>
<td>30</td>
<td>Yes</td>
<td>32.5</td>
<td>48.01</td>
</tr>
<tr>
<td>30</td>
<td>No</td>
<td>30.9</td>
<td>50.13</td>
</tr>
<tr>
<td>40</td>
<td>Yes</td>
<td>30.0</td>
<td>50.13</td>
</tr>
<tr>
<td>40</td>
<td>No</td>
<td>28.4</td>
<td>52.51</td>
</tr>
</tbody>
</table>

Key assumptions used in this analysis include the following:
- The ideal free-flow speed used for this analysis is assumed to be 40 mph.
- Emissions are calculated over 20 years (similar to other highway improvements).
- Source of emissions data: USEPA MOBILE5b fleet emissions model, all vehicles, as used in CMAQ project analysis.
- Benefits are not assumed to deteriorate over time.

Adjustment factors used for this analysis:
- A lack of a median or left-turn lane reduces speeds by 1.6 miles per hour (Table 7-2)
- For each 10 access points per mile per direction up to 40 access point per mile, speeds are reduced by 2.5 miles per hour (Table 7-5).

The analysis can be used to calculate the air quality benefit of an access control project. For example, going from 30 access points per mile without a median to 10 access points per mile without a median would reduce emissions by about 13%. For a mile section of roadway with 20,000 ADT, emissions would be reduced from 100.26 tons to 87.32 tons over twenty years. If one spent $1,000,000 to control access in this way along a mile section of suburban multi-lane highway, the dollar cost per ton of VOCs eliminated would be $77,279.

Note that the assumption here is that the effect of increased traffic is linear (these are multi-lane roads with ADTs of 20,000 or less; applicability at higher ADTs would need to be reviewed).
Table E-3
Illustrative Air Quality Analysis of Access Control on Two-, Three-, and Four-Lane Cross Sections
Tons of Hydrocarbon Emissions per Mile of Roadway, 2000-2019
Using Hummer and Lewis Model (2000)

<table>
<thead>
<tr>
<th>Commercial Driveways per Mile</th>
<th>Cross-Section (lanes)</th>
<th>10,000 ADT</th>
<th>15,000 ADT</th>
<th>20,000 ADT</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>2</td>
<td>37.89</td>
<td>43.66</td>
<td>36.40</td>
</tr>
<tr>
<td>10</td>
<td>3</td>
<td>39.13</td>
<td>42.21</td>
<td>38.50</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td>39.17</td>
<td>42.21</td>
<td>38.96</td>
</tr>
<tr>
<td>20</td>
<td>2</td>
<td>36.36</td>
<td>44.45</td>
<td>33.90</td>
</tr>
<tr>
<td>20</td>
<td>3</td>
<td>38.42</td>
<td>42.91</td>
<td>37.31</td>
</tr>
<tr>
<td>20</td>
<td>4</td>
<td>38.54</td>
<td>42.91</td>
<td>38.18</td>
</tr>
<tr>
<td>30</td>
<td>2</td>
<td>34.95</td>
<td>46.12</td>
<td>31.72</td>
</tr>
<tr>
<td>30</td>
<td>3</td>
<td>37.74</td>
<td>43.66</td>
<td>36.22</td>
</tr>
<tr>
<td>30</td>
<td>4</td>
<td>37.89</td>
<td>43.66</td>
<td>37.42</td>
</tr>
<tr>
<td>40</td>
<td>2</td>
<td>33.61</td>
<td>47.05</td>
<td>29.83</td>
</tr>
<tr>
<td>40</td>
<td>3</td>
<td>37.08</td>
<td>43.66</td>
<td>35.16</td>
</tr>
<tr>
<td>40</td>
<td>4</td>
<td>37.31</td>
<td>43.66</td>
<td>36.70</td>
</tr>
</tbody>
</table>

Derived from Hummer and Lewis (2000, pp. 32-33).

Key assumptions used in this analysis include the following:
- The ideal free-flow speed used for this analysis is assumed to be 40 mph.
- Emissions are calculated over 20 years (similar to other highway improvements).
- Source of emissions data: USEPA MOBILE5b fleet emissions model, all vehicles, as used in CMAQ project analysis.
- Benefits are not assumed to deteriorate over time.
- Additional key assumptions from Hummer and Lewis:
  - Directional split 60/40
  - Peak hour factor .9
  - Ten percent of ADT in peak hour
  - One side street of 1500 ADT per mile
  - Commercial Driveway ADT of 600
  - Side street curb radius of 16 feet
  - Driveway curb radius of 5 feet
The Hummer and Lewis model is an expansion of the Chapter 11 analysis in the HCM to account for delay to through vehicles on major streets because of left and right turns at non-signalized intersections. Note a caveat that the delay at 3- and 4- lane cross sections due to right-turning vehicle may be overestimated (p. 25).

An analysis similar to that used for the HCM data shows that for a 20,000 ADT roadway, going from a two-lane cross section with 30 commercial driveways per mile to a three lane cross section with 10 commercial driveways per mile would yield a 24.54 ton reduction in VOC emissions over a 20 year period. If one spent $1,000,000 to realize these benefits, the cost of the project would be $40,750 per ton of VOCs eliminated. (The cost here is somewhat lower than in the HCM analysis since the HCM analysis does not include congestion and emissions caused by the 2-lane cross section).
BIBLIOGRAPHY


\(^{12}\) The ICTMA is now defunct. Contact CMAQ Program at CATS for copies.
Acknowledgments:

Many individuals assisted the authors with information. First, special thanks are due to the project sponsors who provided the information referenced in this report. In addition, among CATS staff, Gerald Rawling and Tom Vick were especially helpful in their institutional memories. Mr. Rawling had been the project manager for many of the projects described in this paper, making successes of several projects that were having difficulty, while controlling costs for projects facing greater difficulties; his insight was valuable. In addition, Don Kopec, George Johnson, Shannon Cairns, and Patricia Berry assisted with project information. Patricia Berry, Kermit Wies, Marty Johnson, and Gerald Rawling provided comments on successive drafts and useful suggestions for improvements.

Lastly, thanks are due to Andrew Plummer and all of the current and former members of the CMAQ Project Selection Committee who, by funding a number of demonstration projects, added to the body of knowledge regarding innovative transportation projects in northeastern Illinois.