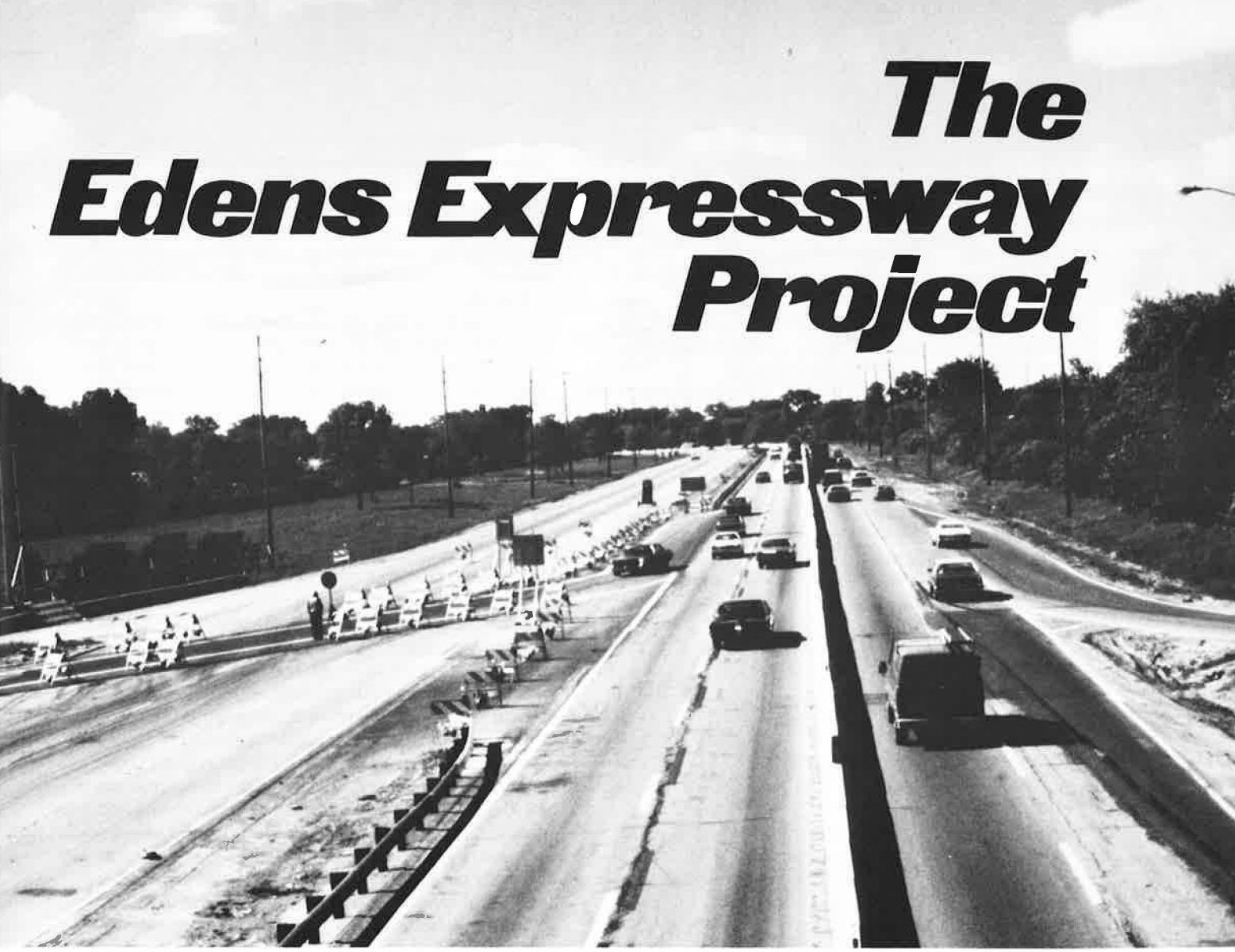
The Edens Expressway Project



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In October 1980, the Illinois Department of Transportation completed a three-year project that involved the major reconstruction of a 15-mile portion of Interstate 94 (Edens Expressway) located in the northern suburbs of Chicago. Originally constructed by the Cook County Highway Department, this section of the Chicago Metropolitan Expressway System was opened to traffic on December 20, 1951. A six-lane facility with interchange spacing varying from one to two miles, it carries an average daily traffic (ADT) volume that varies from 135 000 vehicles at its southern terminus with Interstate 94 (Kennedy Expressway) to 40 000 vehicles at the Lake-Cook County line.

It is certain that the planners who designed this roadway in the 1940s did not anticipate these heavy traffic

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demands. In the 30 years that the pavement has been in service, it has experienced traffic loadings equivalent to more than 40 years of theoretical life. In 1966, the Edens Expressway received a 3-in bituminous overlay, and, at that time, it was anticipated that an additional 1.5-in resurfacing in 1976 would maintain the pavement integrity.

In 1977, when the Edens Expressway was again being evaluated for maintenance needs, a determination was made that a major expansion in the scope of the rehabilitation work must be considered. The roadways and bridges had suffered extensive deterioration, the original drainage facilities based on a 10-year storm intensity were inadequate and caused frequent closings due to flooded viaducts, superelevation designs did not meet current criteria and were not correctable with asphalt overlays, satisfactory vertical clearances could not be maintained with the magnitude of resurfacing required, median guardrail maintenance required frequent daytime lane closures that caused congestion, and annual maintenance costs were averaging $860 000. Another important influence was the fact that only rehabilitation efforts that incorporated the latest design and safety standards could qualify for federal funding. Without substantive federal funding, this project would not have been possible.

After full review of the design alternatives, it was decided to remove the old pavement and construct a 10-in continuously reinforced concrete pavement. In addition, a supplemental main drain would be added, shoulders would be reconstructed, bridges would be redecked, a concrete barrier wall would replace the median guardrail, acceleration and deceleration lanes would be lengthened, and signing, lighting, and traffic surveillance equipment would be modernized. With this goal Illinois' traffic engineering challenge was to develop and implement a plan for expeditious project accomplishment providing a safe environment for drivers and construction workers with a minimum of public inconvenience.

Traffic Control Plan

Traffic control planning for Interstate 94 actually began in 1966 when it was first resurfaced. As this project represented the state's first experience in dealing with urban Interstate reconstruction that affected high traffic volumes, basic traffic planning procedures were developed that recognized the areawide traffic impact of such expressway projects. An evaluation of the various traffic control alternatives for expeditiously completing such work attempted to minimize traffic corridor impact while maximizing work area availability.

The traffic engineering task was to develop a traffic control plan that considered the following factors: motorist and worker safety; motorist delay in both time and money; traffic control costs; extent of work area required for construction; traffic volumes on the main line and ramps; continuity and simplicity of traffic controls; access for emergency vehicles; available alternate routes and public transportation service; local law enforcement agencies' capability of controlling traffic; prevailing speed of traffic; the number and location of existing ramps; and methods of communicating traffic control information to motorists.

Although no formula was established for individually evaluating these factors, consideration was given to each, based on experience and knowledge obtained over the last 13 years of planning major expressway projects.

Illinois transportation officials decided that use of a "combination of reverse flow and shoulder use" was the best traffic control option. It provided for motorist safety by using a physical barrier to separate traffic in opposite directions. It also provided the greatest construction worker safety because all traffic was physically restricted from the work area by the median guardrail, the largest work area for construction equipment movement and the only alternative that allowed work on three lanes of pavement at one time. Finally, the traffic controls were simple and easily understood.

The decision to reconstruct one directional three-lane roadway at a time and use the other roadway for two-way traffic service (by upgrading the shoulder) resulted in a three-year construction schedule beginning in 1978. In the first year, more than $19.4 million was expended just to prepare for the major roadway reconstruction in 1979 and 1980. Contracts were awarded to upgrade the right shoulder of the southbound roadway that would become the fourth lane and install 15 miles of temporary concrete barrier wall (10-ft sections weighing 4000 lb. each) that were fabricated and delivered to the site.

Before the project got under way, traffic engineers participated in a District Expressway Task Force with representatives from the Bureaus of Maintenance, Design, Construction, Programming, Traffic Systems Center, and Electrical to develop the initial project schedule.

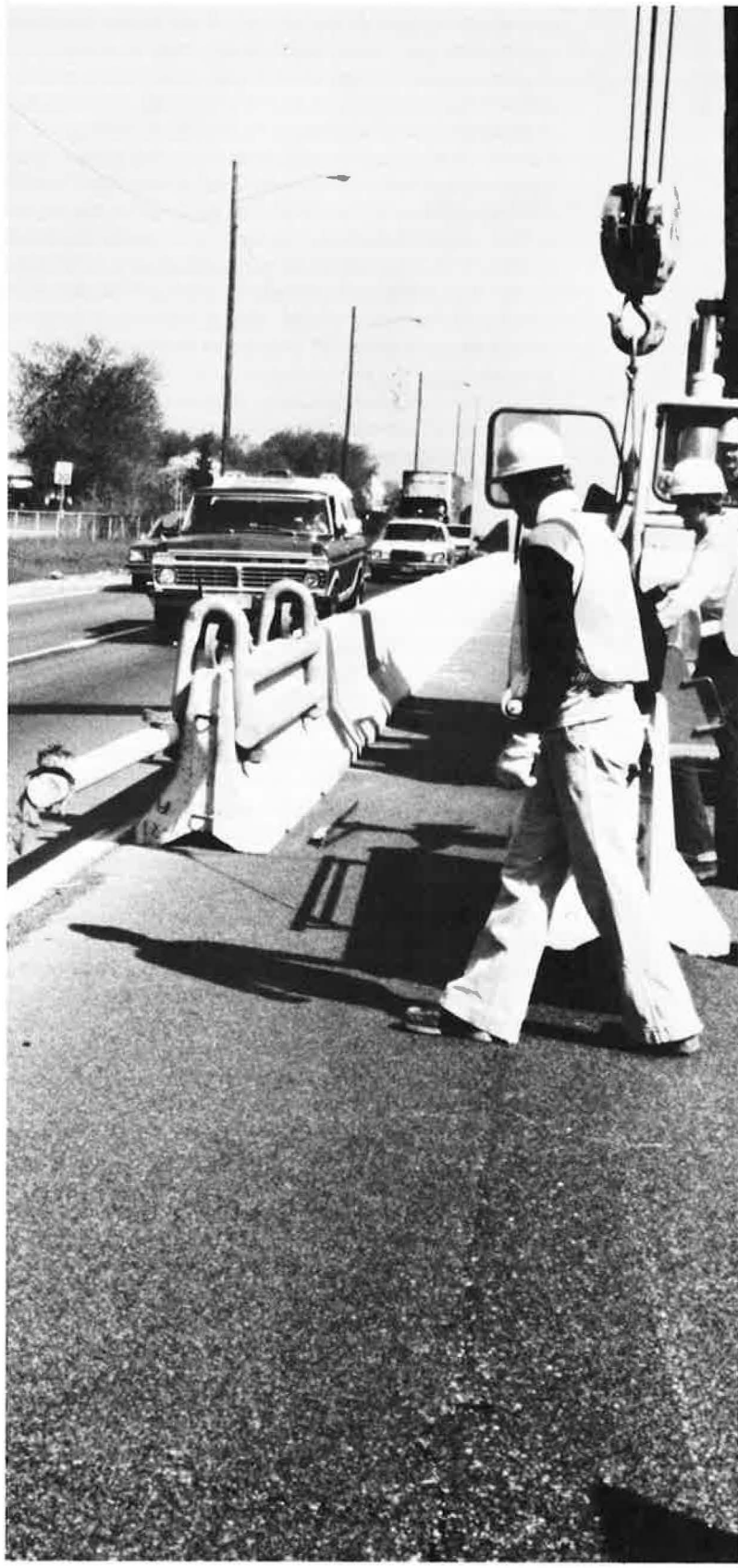
Major highway agencies that would be affected by the Edens Expressway reconstruction project—Illinois Toll Highway Authority, Cook County Highway Department, and the City of Chicago Public Works Department—were informed of the general project details and proposed schedule to ensure that alternate routes operated by these agencies would be available during the duration of the project.

Informal briefings on the planned project traffic controls and communications were held with the District Communications Center supervisors and dispatchers, Emergency Traffic Patrol supervisors, Traffic Systems Center personnel, and Bureau of Maintenance engineers.

Special individual project and traffic control briefings were given to the radio station personnel who regularly broadcast daily peak-period traffic reports.

Special advance signing was erected on the northbound and southbound approaches to the Edens Expressway two weeks in advance of project start. The signs read, "Edens Repairs Begin April 27—Only Two Lanes Open".

Placement of temporary concrete barrier wall under traffic conditions (note placement guide to ensure straight alignment on installation).



Arrangements were made to display project-start alert messages on two commercial changeable message advertising signs adjacent to the Kennedy Expressway two weeks in advance of the project start.

Two special signs were erected prior to the project start to encourage ridesharing and to publicize the Regional Transit Authority telephone number that motorists could use to obtain routing information on mass transit service alternates.

Special informational meetings were held with representatives of the Division of Public Transportation and regional Transit Authority to discuss the project traffic impact and schedule and to provide estimates of expected diversions to mass transit. Plans were also reviewed for additional commuter parking at stations that would be affected by the project.

Out of these meetings came suggestions that were adopted. These included (a) placing reference numbers every 1/10 mile on the portable concrete barrier wall that separated the opposing traffic flows so that emergency equipment could be more accurately dispatched, (b) providing emergency agencies with keys to pedestrian fences and gates so that emergency access could be facilitated, and (c) obtaining a commitment for helicopter evacuation of injured by the Chicago Fire Department (within the City of Chicago) and the U.S. Coast Guard unit stationed at Glenview Naval Air Station.

An important development from these preconstruction coordination meetings was initiation of a motorcycle

paramedic service by the Village of Northfield (located adjacent to the Edens Expressway). Anticipating difficulty in gaining access to the available lanes and the construction work zone, the village obtained a $10 000 grant from the Allstate Insurance Company Foundation. This grant funded the purchase of two motorcycles and basic life-support supplies for paramedic use.

The operational responsibility for the Chicago Metropolitan Area Expressway System has required the development of special activities that are unique within the Illinois Department of Transportation and the nation. Because of the heavy traffic demands on the system, which accommodates 25 percent of the metropolitan area vehicular travel and results in ADTs that exceed 200 000 in many sections and an annual accident experience that exceeds 700 accidents/mile on some portions of the system, special techniques and operational units have been established. Implemented since 1961, a three-part coordinated traffic operational program has been developed for reducing congestion, increasing safety, conserving energy, expediting emergency responses, providing motorist aid, and developing information for the general public and the media. This operational program consists of the District Highway Communications Center, which collects and disseminates traffic information and dispatches and coordinates needed services on a continuous basis; the Emergency Traffic Patrol fleet of radio-equipped service trucks for handling traffic incidents and other operational problems; and the Traffic Systems Center backbone electronic surveillance system for automatic traffic condition and incident detection monitoring and reporting. These specialized activities proved invaluable during the Edens Expressway reconstruction project.

Besides the backup that regularly occurred from capacity-reducing incidents, the Edens Expressway had a major recurring morning rush-period backup caused by traffic merging with the southeastbound Kennedy Expressway. From the analysis of data collected through the existing surveillance system and operational observations, ramp metering at eight locations southbound was included to alleviate this recurrent congestion problem.

The existing Edens-Kennedy Expressway surveillance instrumentation had provided traffic planning data for analysis to determine the probable traffic impact of daily operations during reconstruction. Traffic surveillance information was obtained in the summer of 1978, when the inbound right lane was closed during the shoulder reconstruction stage to allow for the comparison of inbound demand with counts outbound, where no closures existed and the full roadway was available to traffic. Also, counts were compared on the Kennedy Expressway at various points to help estimate inbound traffic diversion patterns. Finally, the operational experience gained during several previous expressway resurfacing projects was reviewed.

The data studied during the inbound Edens shoulder reconstruction showed that from 13 000 to 15 000 inbound vehicles diverted daily, in both peak and off-peak periods (from 65 000 inbound ADT), with no apparent diversion outbound. This indicated inbound diversion to other routes, without significant diversion to other modes, perhaps because only one-half of a commuting trip was affected. About one-half of the inbound diversion was traced to the west leg of the Kennedy Expressway.

The analysis of surveillance data not only showed what inbound patterns could be expected during the reconstruction but also illustrated that other modes and travel options needed more motorist consideration. Public transportation and ridesharing, in particular, were emphasized as alternatives in the advance project publicity.

The value of the surveillance instrumentation for traffic planning and operations, as well as for real-time incident management and traffic reporting, resulted in the use of temporary detection stations during the 1979 reconstruction work. The initial excavation work for temporary ramps and other activities quickly removed most existing surveillance loops from operational service.

Highway Advisory Radio (HAR)

After Travelers Information (and Highway Advisory Radio) stations were changed from experimental to regularly established status by the Federal Communications Commission in 1977, tentative plans were made for establishing one or more such stations in the Schaumburg District. A need was recognized for a radio advisory service as a means of communicating with motorists during the course of highway construction projects.

As soon as radio equipment for the contemplated type of service has been type-accepted by the Federal Communications Commission, transmitting licenses were applied for. They were granted on August 14, 1978. Other than in an extremely low radiated power or an experimental licensing category, these are believed to be the first licensed highway advisory radio stations in the United States. Continuous transmissions from both stations began on March 28, 1979.

The HAR system was used to encourage motorist consideration of alternate routes or transportation modes by providing advance information concerning closures of travel lanes or interchanges and to afford safer travel by inducing motorists to (a) observe the posted speed limits, (b) be alert for construction personnel and vehicles, and (c) refrain from using the shoulder for routine travel. It also served to help reduce accidents and lessen congestion by attempting to achieve less abrupt lateral lane movements, increase compliance with speed limits, and minimize other breaches of law within the construction zone through motorist education and encouragement of motorists to report violators to a designated telephone number. Further, HAR also advised motorists to divert to alternate routes by broadcasting the existence of severe accidents that resulted in significant congestion. The program minimized negative public reaction to the construction project by explaining in general terms what was closed, what was being done, and why it was necessary.

By dialing 1610 on their AM-radio dial, motorists were given 24-h, up-to-date information on the status of lane closures, ramp closures, temporary traffic arrangements, and information on incidents affecting Edens Expressway traffic flow.

Special signs were erected on the northbound Kennedy Expressway near its junction with the Edens Expressway and on I-41 at the Edens approach to inform motorists of both the radio frequency and the point on the expressway system where transmissions can be received. More than 300 taped messages were prepared and played during the two-year (1979 and 1980) construction period.

A "mail back" motorist survey conducted in August 1979 revealed that 36 percent (of 160 questioned) tuned to 1610 AM for messages occasionally. In 1980, a flashing beacon and associated sign were added to the HAR system signing to alert motorists to the radio information availability in addition to advising them when to tune in for special bulletins regarding construction area congestion.

Speed Limit

A speed limit was established at 35 mph during the 1979 and 1980 construction work. Although the violation rate increased during some nonpeak periods and the police ability to enforce it was limited, it was felt warranted and effective. Comparing speed studies taken before and after construction, the prevailing speed of traffic was reduced 10 mph. This reduction in speed reduced accident severity and increased working area safety.

Accident Experience

Because of the lane width and horizontal clearance reductions resulting when a normally three-lane directional roadway and right shoulder were converted to a two-way operation separated by a concrete barrier, the accident experience was closely monitored. Of additional concern was the impact of the reduced acceleration-deceleration lane lengths due to the use of the right shoulder as a moving lane.

During the period from May 20, 1979, to October 21, 1979 (when all traffic was using the southbound roadway), 543 accidents (62 percent northbound and 38 percent southbound) occurred. This compared numerically with 578 accidents experienced in 1977 and 730 accidents in 1978 during the same time period. However, since traffic volumes were less during the 1979 construction, the actual accident rate (expressed in accidents per vehicle miles driven) was slightly higher.

Reconstruction Traffic Impact

Once the Edens Expressway work began, with traffic confined to two lanes in each direction on one roadway, the traffic impacts were monitored continuously by the temporary surveillance instrumentation. Real-time data were used for incident detection and traffic reporting purposes. Counts and congestion records were retained daily for analysis of the traffic pattern changes.

In general, the Edens handled more than 70 percent of its normal amount of weekday traffic during the reconstruction, although less than two-thirds of the normal capacity was available for use. The percentage diversion in peak periods was up to 5 percent higher than the 24-h average. There was more peak-period diversion at the start of the project and less congestion on Edens until traffic balancing in the first weeks established the new patterns. Of the daily trips diverted, some 40-50 percent were again traced to use of the Kennedy Expressway's west leg.

Slightly more inbound morning peak-period congestion was experienced during reconstruction while the outbound afternoon peak-period congestion nearly doubled. Perhaps one reason for more outbound diversion than inbound relates to the variance in peak-period congestion.

Other changes noticed in traffic patterns included less peak-period congestion on the Kennedy Expressway southeast of the Edens Expressway junction and additional peak-period congestion on the Kennedy Expressway's west leg due to the diverted traffic impacts. Although no data were analyzed, observations of considerably less truck traffic were reported for Edens Expressway, combined with noticeable increases on the Tri-State Tollway (a parallel route approximately six miles west of Edens Expressway).

Since more than half of the diverted traffic was absorbed by routes, modes, or alternatives other than the Kennedy west leg without causing any major traffic problems, it is speculated that combinations of the following were factors affecting traffic demands:

- Many arterial routes handled some diverted traffic without significantly disrupting normal conditions.
- Some through traffic, such as long-haul truckers and Interstate drivers, avoided Edens completely by using I-294, I-290, I-90, or combinations thereof.
- Some longer-trip drivers shared rides or diverted to public transportation, taking advantage of commuter rail feeder buses and extra trains provided by the Regional Transit Authority.
- Many drivers cancelled, substituted, combined, or otherwise avoided Edens Expressway trips of a discretionary nature, such as for shopping, recreation, or nonurgent work purposes. The energy crises, which began in April 1979, served to further encourage motorists to conserve vehicle trips due to the price and availability of fuel.

Finally, the Edens reconstruction project illustrates that proper traffic planning will help establish public awareness of a project and its expected impacts. The fact that the predicted traffic chaos never resulted demonstrates that the planning and implementation of the overall traffic program were most effective.