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I-35W URBAN CORRIDOR DEMONSTRATION PROJECT: BUS-METERED FREEWAY SYSTEM

Ronald G. Hoffman, Transit Liaison Section, Minnesota Department of Highways

•THE Urban Corridor Demonstration Program has served as a catalyst in 11 major metropolitan areas in bringing together the resources of transit and highway agencies to undertake projects aimed at relieving peak-hour traffic congestion. We in the metropolitan area of Minneapolis-St. Paul are proud to be a part of this program.

The concept being developed in the Twin City Metropolitan Area was originally formulated by the Texas Transportation Institute (1). The TTI report concluded that the bus-metered freeway system was technically feasible at a number of sites, one of which was the Interstate 35W corridor, south of the Minneapolis central business district.

When Secretary John A. Volpe of the U.S. Department of Transportation announced the Urban Corridor Demonstration Program in January 1970, he stated that the purpose of the program was to test and demonstrate the use of available tools, including the programs of the Urban Mass Transportation Administration and the Federal Highway Administration, in attacking the peak-hour traffic congestion in corridors leading to and from central business districts. Based on the previous work done by the Texas Transportation Institute, a proposal to the Department of Transportation was submitted in March 1970 to conduct final planning for demonstration of the bus-metered freeway concept in the I-35W corridor. We were granted urban corridor planning funds in June 1970 for the first phase of a five-phase program. This first phase was completed in September 1971, and we are proceeding with the detailed design of the project components with construction to take place in 1972 and 1973. We plan to be operational during the third quarter of 1973.

Two proven concepts are to be combined in this project: one is express bus operation and the other is surveillance and control of freeways. As part of this project, facilities will be provided adjacent to the freeway for park-ride, kiss-ride, and transit transfer locations. Buses will be given preferential access to the freeway through special bus ramps and an override of the ramp meter (Fig. 1). As a bus approaches the meter, its presence will be detected by a detector in the bus ramp. The signal will then dwell on red for the automobiles until such time that the bus has passed the merge point of the auto-bus ramp. Automobiles will be metered onto the freeway only when their presence will not reduce the desired level of service. The metering rate will be determined and controlled by a central computer through the use of volume detectors along the freeway. Figure 2 shows a widened ramp allowing the bus to bypass automobiles. We will use this type of ramp configuration at locations where present right-of-way widths are not sufficient to provide a physical barrier between the auto and bus ramps. It is our desire to minimize the cost of the project by not buying additional right-of-way except for the use of park-ride facilities.

The I-35W corridor is one of five freeway corridors that will eventually serve downtown Minneapolis (Fig. 3). At the present time I-35W south and I-94 east are the only segments of freeway open to traffic. I-35W north of downtown is under construction, I-94 north is in the design phase, and a corridor study is under way for I-394 west of the central business district.

The I-35W demonstration corridor extends 16.5 miles south of the Minneapolis central business district (Fig. 4). Two major Interstate routes cross the corridor: I-94 is directly south of the central business district, and I-494 intersects I-35W at approximately the midpoint of the corridor. County Road 62 is a crosstown freeway having a common section with I-35W for approximately ¾ mile. The demonstration project was extended westerly along County Road 62 because it serves the Southdale shopping

gure 1. Preferential bus access to freeway system.

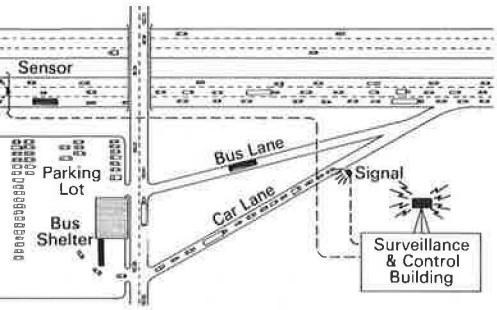


Figure 2. Wide ramp for bus bypass.

gure 3. St. Paul-Minneapolis metropolitan area.

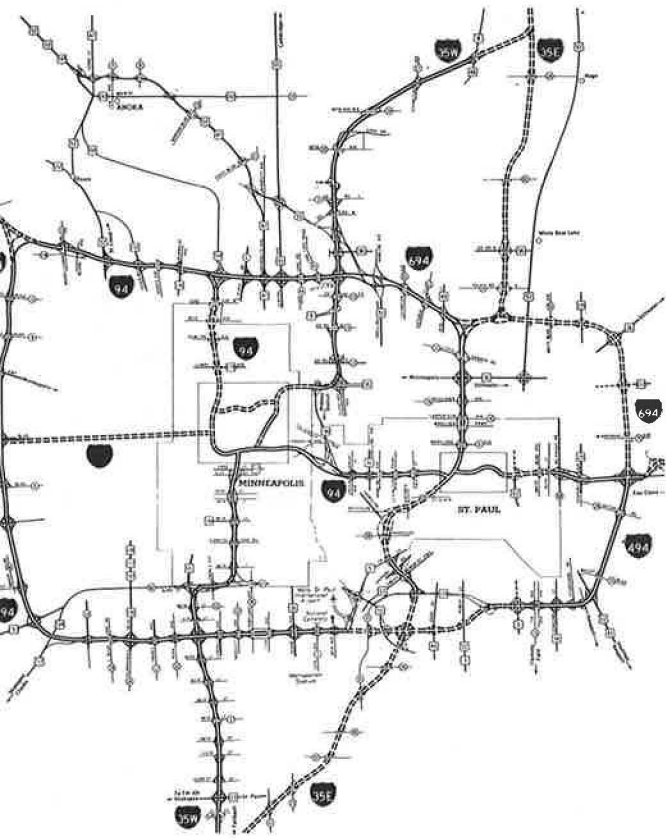
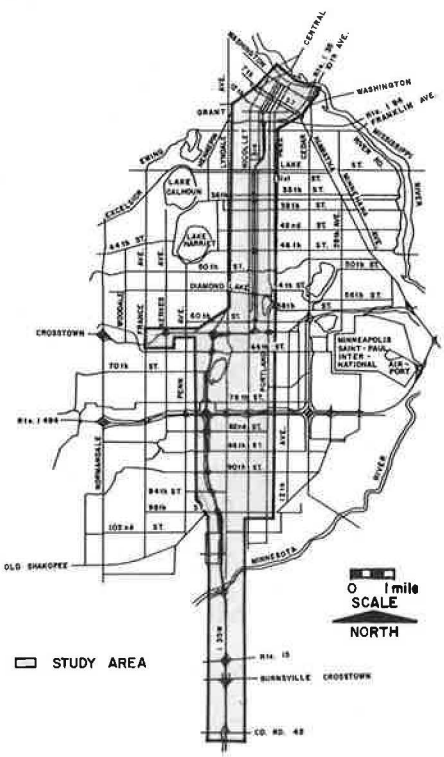


Figure 4. I-35W urban corridor demonstration project.



center, a major traffic generator in this area. The high volumes of traffic on County Road 62 make it necessary to include that portion of this roadway in our surveillance and control project. This corridor has a good system of parallel streets north of the Minnesota River that provide good alternate routes to I-35W. No convenient alternate routes are available south of the Minnesota River.

Beginning at the south end of the project we have 10.5 miles of four-lane freeway, extending from County Road 42 to the beginning of the common section at County Road 62 (Fig. 5). The freeway then widens to six lanes for 2.5 miles through the common section and north to 46th Street. At 46th Street an additional lane is added in each direction, giving eight lanes that feed traffic into and out of the I-94 area.

Figure 6 shows the 6:00 a.m. to 9:00 a.m. peak-period volumes. These volumes are rather low at the southern end of the project but increase as you approach I-494. Note that the volumes drop from 8,891 to 7,321, or 1,570 vehicles, in the I-494 interchange area. Because of this decrease in volume, we will not have to meter I-494. Note also that the volume of traffic entering the central business district is approximately 60 percent of that just south of I-94.

The percentage of traffic with trip destinations within the central business district is shown in Figure 7. Although all of the traffic north of I-94 must enter the central business district, only 65 percent is destined for a location within the central business district. The reason for this is that the freeway system north and west of the central business district has not been completed.

Travel time studies were conducted as part of the corridor transportation inventory for both the morning and evening peaks. The average travel time in the morning peak for the 16.5 miles was 26 minutes, with the greatest time recorded as 30 minutes and the lowest as 17 minutes. The average travel time for the evening peak was 25 minutes, with a high of 26 minutes and a low of 18 minutes. Although the average speed is approximately 40 mph, there are problem areas where delays occur. The first critical section for the northbound traffic in the morning peak is in the Minnesota River area. Speeds drop as trucks have difficulty climbing the 3.0 percent grade out of the river valley. A truck lane is to be constructed as a solution to this problem. This will not be a part of the demonstration project, however. The combination of the County Road 62 common section and the Minnehaha Creek bridge causes another major delay. Heavy weaving volumes exist in the common section. The Minnehaha bridge does not have the full shoulder width, which creates a psychological speed restraint. The average speed in this section drops to 20 mph. The major delay for the evening southbound traffic exists in the section near 46th Street. A lane is dropped at 46th Street, but volume studies show only one-half lane of traffic actually exists. Speeds remain between 25 and 30 mph through the Minnehaha bridge area. The speed then gradually increases to the end of the project. Two goals of the demonstration are to decrease the average travel time to 18 minutes or an average of 50 mph for the 16.5 miles and to increase the minimum speed to 40 mph in all sections.

Besides the travel time studies and traffic volume studies in this corridor, we also conducted a transit travel demand study and I-35W origin-destination study. From these we obtained transit travel demand and patronage data, transit rider characteristics, and a summary of the travel patterns of those using transit. The I-35W origin-destination study included such things as trip purpose, auto occupancy, number of people living in the household, car ownership, age, and income for the auto users. The inbound origin-destination survey was taken during the morning peak at two ramps exiting into the downtown area as well as at the ramp at 31st Street, which is just south of the downtown area.

The data from the Fifth Avenue and Eleventh Street-Grant Street exits in the downtown area document travel patterns for those vehicles whose destination was the Minneapolis central business district. The data from 31st Street document travel patterns for trips to major generators south of the CBD and also provide data on vehicles going downtown via 31st Street and one of the parallel streets.

The survey technique used for this study was to record the license plates of automobiles using these ramps. The names and addresses of owners of the automobiles were then obtained from the motor vehicle registration files, entered on a mail-out

Figure 5. I-35W corridor dimensions.

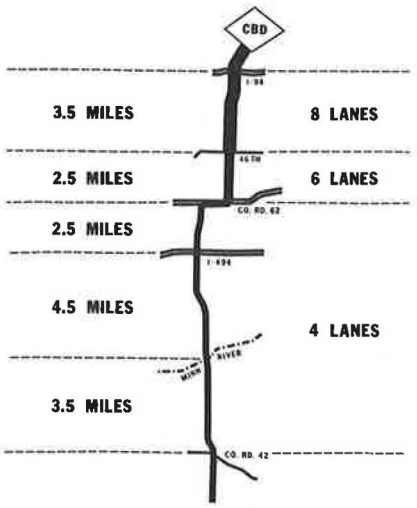


Figure 6. I-35W traffic volumes, northbound, morning peak.

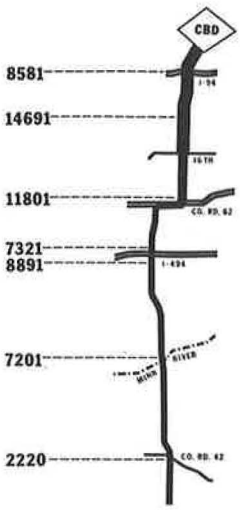


Figure 7. Percentage of CBD-bound traffic, morning peak.

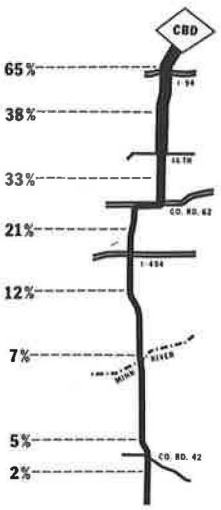
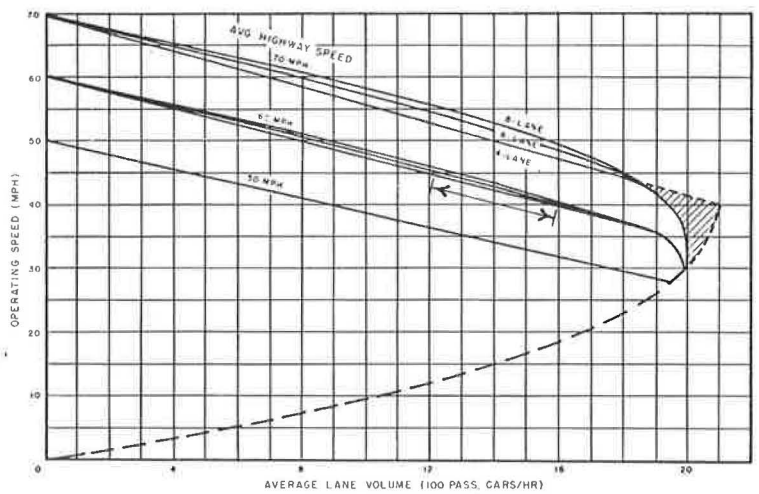


Figure 8. Speed-volume curve showing proposed improvement.



mail-back postcard, and sent to the highway user. These cards were mailed out within 48 hours of the time the license plate was recorded.

As a result of the data collection and analysis work on this project, it is recommended that we proceed with implementation. The final plan has recommended 12 proposed new routes for express bus service. It is estimated that the 12 proposed new routes and the revised existing express lines together will carry about 6,000 passengers on a typical weekday. Many of these passengers will be switching from existing local bus service; however, slightly more than one-third of the total riders will be former auto users. It is a goal of the project to capture 15 percent of the auto drivers and auto passengers in the corridor in the peak periods. In order to initiate the transit plan, 48 transit vehicles will be necessary to provide the recommended level of service; 34 of these buses will be for the 12 proposed new routes and 14 for the revised existing express lines. We will construct seven new bus ramps to provide preferential access for the buses. Three park-ride facilities have also been recommended as part of the project.

We will be experimenting with two types of express bus operations. The first one is to use the express bus for pickup and delivery of patrons along the city street system. The second operation will involve only a stop at a park-ride facility and then express into the downtown area. It is also recommended that the freeway surveillance and control system be programmed to operate at lower volumes and higher speeds than systems currently in operation throughout the country. Figure 8, a standard speed-volume curve, shows that the maximum of 2,000 vehicles per hour is achieved at approximately 30 mph. We expect to back off on this curve to a speed of approximately 40 to 45 mph to guarantee the travel time of the buses and the autos entering the freeway system. By doing this we hope to attract more patrons to the express buses.

The capital cost for all elements of the recommended bus-metered freeway system is $4,731,000. The control center building and equipment, the surveillance and control components, the television system we expect to use, and the communication system are estimated to cost $1,703,000. The recommended transit service plan consisting of transit vehicles, exclusive bus ramps, park-ride facilities, waiting shelters, and bus-stop signs is estimated to cost $3,028,000.

At the present time we have received a grant to construct the surveillance and control center. The architect has nearly completed the plans for this building, and we expect to let a contract soon.

Interstate (90 percent) funds have been approved for the design and installation of the freeway surveillance and control equipment as well as for the special bus ramps. Funding for the buses required for this project is expected to come from the Urban Mass Transportation Administration. Because of the fine cooperation that we have had with the Federal Highway Administration as well as with the Urban Mass Transportation Administration, we are proceeding on this project on a very optimistic schedule and expect to be in full operation in approximately 20 months.

REFERENCE

1. A System to Facilitate Bus Rapid Transit on Urban Freeways. Texas Transportation Institute, Dec. 1968.